



Columbia Center on Sustainable Investment

A JOINT CENTER OF COLUMBIA LAW SCHOOL
AND THE EARTH INSTITUTE, COLUMBIA UNIVERSITY

A Framework to Approach Shared Use of Mining-Related Infrastructure

March 2014

**Perrine Toledano, Sophie Thomashausen, Nicolas Maennling,
Alpa Shah**



Australian Government
Department of Foreign Affairs and Trade



About the Columbia Center on Sustainable Investment

The Columbia Center on Sustainable Investment is a joint center of Columbia Law School and the Earth Institute at Columbia University and a leading applied research center and forum for the study, practice and discussion of sustainable international investment. Our mission is to develop and disseminate practical approaches and solutions to maximize the impact of international investment for sustainable development. CCSI's premise is that responsible investment leads to benefits for both investors and the residents of host countries. Through research, advisory projects, multi-stakeholder dialogue and educational programs, CCSI focuses on constructing and implementing a holistic investment framework that promotes sustainable development and the mutual trust needed for long-term investments that can be practically adopted by governments, companies and civil society.

Acknowledgements

The research has been funded by the Department of Foreign Affairs and Trade through the Australian Development Awards Scheme under an award titled, *Using Mining Infrastructure for Broader Economic Development*.

The views expressed in the publication are those of the authors and not necessarily those of the Commonwealth of Australia. The Commonwealth of Australia accepts no responsibility for any loss, damage or injury resulting from reliance on any of the information or views contained in this publication.

The team thanks the experts listed in Annex A that were gathered on November 15 to provide feedback. The team additionally thanks Pierre Pozzo di Borgo for further inputs.

Suggested Quote

Perrine Toledano, Sophie Thomashausen, Nicolas Maennling, and Alpa Shah, "A Framework to Approach Shared Use of Mining-Related Infrastructure," Columbia Center on Sustainable Investment, Columbia University, (2014).

Contents

Introduction.....	4
Framework 1	
Shared Use of Rail and Port Infrastructure	12
Framework 2	
Shared Use in the context of Power	35
Framework 3	
Shared Use in the context of Water	52
Framework 4	
Shared Use in the context of Information and Communication Technologies	72

Introduction

CCSI's work to date on the questions of "shared use"

Since 2011, the Columbia Center on Sustainable Investment (CCSI) has extensively researched how mining-related infrastructure can best be leveraged for economic development. A first working paper sets out the findings for mineral railways and ports. A second working paper extends the research to power infrastructure. Both are available for download from CCSI's website at: <http://ccsi.columbia.edu/work/projects/leveraging-infrastructure-investments-for-development/>.

In 2012-2013, CCSI collaborated with the World Bank to systematically assess the potential and challenges of power-mining integration in Sub-Saharan Africa. To that end, CCSI built the Africa Power-Mining Database in 2013: it contains 455 projects in 28 Sub-Saharan African countries with a minimum of US\$250 million gross value of ores reserves, in all project phases, spanning the years 2000-2020. This database estimates the demand for power in 2000, 2012 and 2020 and identifies the range of past, present and future power sourcing arrangements for the 455 projects. The study also includes an assessment of the different institutional settings and policy instruments that have the potential to lead to improved integration between mines' investment plans in power infrastructure and governments' plans for national power development.

In April 2013, CCSI was awarded a grant from the Australian Government to develop an economically, legally and operationally rational framework to enable shared use of mining-related infrastructure, including rail, ports, power, water, and internet and telecommunications (ICT). The framework was obtained by distilling best practice principles from infrastructure developments around the world to guide resource rich African governments in promoting shared use of mining-related infrastructure. Three in-depth case studies, namely Liberia, Sierra Leone and Mozambique, were chosen to apply the findings to country specific circumstances and refine the framework.

The draft of each infrastructure framework was presented at the "Shared Use of Mining-Related Infrastructure" workshop held at Columbia University on November 15, 2013, at which 31 experts from academia, development organizations, the private and public sectors provided feedback and recommendations.¹ The feedback has been integrated in the framework accordingly.

The importance of the question of shared use

The concept of "shared use" or "open access" relates to finding ways to leverage extractive-industry-related infrastructure investments in developing countries for the broader benefit of the national and regional community. According to the Africa Infrastructure Country Diagnostic conducted by the World Bank, Sub-Saharan Africa faces an annual infrastructure funding gap of US\$31 billion.² Leveraging extractive-industry-related investment could help narrow this gap. Moreover, the McKinsey Global Institute has come to the conclusion that resource-rich countries have infrastructure of a poorer quality than that in non-resource rich countries. The infrastructure gap of the next 17 years (until 2030) is believed to be four times higher than that of the past 17 years, and 10% of the gap relates to developing the mineral resources in these countries (with 7% amenable to multi-user- and 3% to multi-purpose infrastructure).

¹ See Annex A for the agenda of the expert workshop and the participant list.

² Established in 2006 for 10 years.

To be beneficial for a country’s development, non-renewable resource extraction needs to be leveraged to build long-term assets, such as infrastructure, that will support sustainable and inclusive growth. This can be achieved, for instance, by capitalizing on the resource taxation potential and reinvesting the tax revenues in all-weather roads but it can also be done by requiring shared use of the resource infrastructure.

The challenge in relation to achieving shared use lies in the fact that natural resource concessionaires have traditionally adopted an enclave approach to infrastructure development, providing their own power, water, ICT, and transportation services to ensure that the basic infrastructure needed for their operations is reliably available.³ Hence, large investments in physical infrastructure are often uncoordinated with national infrastructure development plans. The country therefore misses the opportunity to promote shared use of the infrastructure and to take advantage of potential synergies.

Shared use can be considered multi-user where several mining companies in a region use a particular infrastructure, or multi-purpose where non-mining users have access to it (for example forestry concessionaires sharing mining-related power infrastructure, or passengers being transported along a mining-related railway line). Both should be promoted, as the former may lead to economies of scale among mining companies thereby reducing the operating costs of the mines and increasing tax revenues to the government, and the latter could lower the costs of water supply, energy, transportation, and ICT services to other users, which may promote economic development in a region.

As the World Bank’s report on Liberia states: “the interface with national infrastructure planning is not well developed (...) the contracts do not give the sense of the concessionaires operating within or accommodating themselves to a pre-existing national plan.”⁴

If companies and governments consider the potential of shared use infrastructure through the expansion of the private sector’s planned investments at the design phase, the incremental capital cost on the economy and the environment could be minimized, while the beneficial impact on sustainable development would be optimized. Moreover, shared use can also foster social trust in the potential contribution of mining to development.

The potential of leveraging infrastructure investments in extractive industries for national and regional development is gaining prevalence among policymakers. The World Bank, the African Development Bank and the African Union, along with various other development agencies, have endorsed the concept, recognizing that private sector involvement is required to meet the vast infrastructure funding gap in developing countries.⁵

³ See H. Singer, “The distribution of gains from trade and investment—revisited,” 11(4) *Journal of Development Studies* 376 (1975), pp. 376–382.

⁴ World Bank, “Infrastructure Policy Notes: Leveraging investments by natural resource concessionaires,” (2011).

⁵ See Masuma Farooki, “The infrastructure and commodities interface in Africa: Time for cautious optimism?,” 24 *Journal of International Development* (2012), p. 216.

The challenges to successfully implementing the concept of "shared use"

1 - The negotiation package and its trade-offs

Governments and companies negotiate over the allocation of the economic rent – which is the estimate of excess returns over the required return to the investor and, in theory, this rent should be allocated to the owner of the resources, the government. In practice, this rent is the object of negotiations that will take the form of a package of economic demands on mining companies. This package is made up of fiscal obligations and non-fiscal obligations, such as local content and shared use of infrastructure.

Depending on the priorities of the government, it can therefore negotiate higher demands in one particular area (such as building its infrastructure at excess capacity and allowing multi-purpose access), but if this comes at a significant cost to the company, the government should be prepared to be more lenient on another negotiation point (such as, for example, fiscal receipts). This choice will depend on whether the government believes that it can use fiscal revenues to create greater social welfare than from requiring shared use of the infrastructure.

Within the government, there are likely to be different views on what aspects should be prioritized in negotiations with mining companies. The Ministry of Finance is likely to view tax revenues as the single most important negotiation point. The Ministry of Industry, on the other hand, more likely to be concerned with local content provisions and domestic processing, whereas the Ministry of Transport will be looking to negotiate shared use of the mining-related transport infrastructure. Prior to entering negotiations all relevant government actors should agree on the negotiation tactics, on the key issues that are of importance and on the possible trade-offs and compromise.

If a government wishes to implement shared use of mining-related infrastructure, it needs to assess whether requesting shared-use from a mining concessionaire is worth the “price” – that is, the tax revenues it would have to forego to incentivize the investor to accommodate such shared use on some of its infrastructure. This price will be high if implementing shared use is an expensive undertaking, as can be the case with opening up access to railways. The price can also be minimal when the business case for shared use is easily made, as with ICT.

Moreover, from a macro-economic perspective, the higher the cost of the infrastructure, the higher the need for a substantive demand for the infrastructure developed for public use which is not easily achieved in undeveloped economies. Thus, shared use in the context of expensive infrastructure such as rail, ports and power is worth the price of foregone revenues if (1) there are significant economies of scale or scope so that the provision of extra capacity is inexpensive and (2) a real market for that marginal low-cost capacity exists. If there are substantive economies of scope and scale to benefit from, the business case for shared use and its associated savings will be improved by economic pressure related to the decrease in commodity prices.

In the opposite case where the business case is not easily made and economies of scale and scope are minimal or non-existent, social benefits might be greater if the investor pays a smaller amount to ensure cell phone and drinking water capacity to the surrounding communities, and governments retain higher tax revenues and takeover rights in relation to the railway lines at the end of the mining concession.

Negotiating this package is a complex undertaking, particularly in the context of long-term mining contracts where circumstances may change over the course of the concession/ lease. Generally, governments suffer from a great deal of asymmetry of information in relation to the cost of developing and operating such infrastructure, as well as the impact on the projected cash flow of the different scenarios. Given the potential capital expenditure involved in implementing shared use on the part of the mining company and the price paid by the government in terms of foregone tax revenues and establishing a regulatory authority to enforce the shared use on the mining-related infrastructure, governments should prepare a detailed cost-benefit analysis of the negotiation package, with external assistance if necessary. This negotiation should be framed in the context of a broader planning effort for infrastructure expansion and public-private coordination. Adjusting the requests for shared use to the level of present and future demand, as well as profitability of the project, is even more important in times of falling commodity prices.

2- The competitive nature of the mining business

The competitive nature of large mining companies should not be underestimated. Even if rational economic decision-making would suggest shared investment and multi-use of a particular infrastructure project, rival mining companies may be unwilling to do so without strong regulatory requirements and clear policy guidelines. This may be due to several reasons: (i) large multinational mining companies compete to supply different grades of ore to their consumers. If a second mining company offers a product with similar characteristics, which is likely to be the case of nearby concessions (candidate for sharing the same infrastructure) the first mining company can lose its competitive advantage in the market; (ii) negotiation outcomes may be a result of corporate level strategies rather than project specific discussions when multinational companies are involved in several locations; (iii) mining companies can use their monopoly power on the infrastructure in the region to acquire further regional concessions at a lower price if these are not viable without infrastructure access; (iv) large-scale mining projects can have an impact on market prices. It may therefore be in the interest of the leading mining company to restrict regional production to receive higher prices for its product.

3 - The strategic quality of mining-related infrastructure assets

Two factors will determine the willingness of mining companies to share/ open up access to their infrastructure:

1. The more costly and strategic the infrastructure, the less willing mining companies will be to sharing it. In relation to the infrastructure types examined, this means that mining companies are more likely to accept sharing internet and telecommunications (ICT) infrastructure, followed by water and then power. Rail and port infrastructure are considered to be the least amenable investments to shared-use models, given the vertically integrated logistic chain from mine-to-rail-to-port operations.
2. The higher the potential of economic development associated with multi-purpose access to infrastructure, the more inclined mining companies will be to cooperate to save their social license to operate. For instance, a community perception that a mining company's operations are consuming available water resources, or contaminating/altering the flow of underground, or surface waters can lead to social unrest and operational disruptions. In such a scenario, a mining company is more likely to consider increasing the quantity of clean water available to the community.

The recent fall in commodity prices and declining profit margins in the mining sector could also incentivize mining companies to consider share infrastructure among each other to minimize costs.

4 - The dilemma of implementing shared use

If a government is determined to implement shared use, ownership of the infrastructure concession becomes a decisive factor.

On the one hand, the government could incentivize shared use of mining-related infrastructure by requiring a separation of ownership between the mine and the infrastructure concession. A third party would therefore be required to operate the infrastructure, often with the mine as the anchor project, but with the objective to maximize its profit and therefore design and operate the infrastructure at maximum capacity – an objective that should lead naturally to shared use. It however means that the infrastructure is a profit center for the infrastructure operator and in the absence of competition, the infrastructure services are likely to be expensive – a feature that can be worsened in the context of politically risky environments where there are no sovereign risk guarantees.

On the other hand, user-concessions (whereby the miner-user also owns the infrastructure) allow for lower hurdle rates in politically risky and low demand environments and make the infrastructure a cost center, which results in an infrastructure project being less costly for both the owners and users. Of course in this context, user-concessions bear the danger of the mine exerting its monopoly power and thus a strong regulatory system is needed to guarantee shared use and ensure that the infrastructure is designed with additional capacity to accommodate such shared use.

In short the dilemma can be summarized as follows:

1. **Separation of ownership between the mine and the infrastructure:** reduced risk of monopoly, higher price of access to the infrastructure for the anchor project.
2. **Integration of ownership between the mine and the infrastructure:** higher risk of monopoly and difficult to regulate, lower price of access to the infrastructure for the anchor project.

To contain the price of access in alternative 1, it is advised to design a third party entity that can be financed by the mine or by an off-take agreement with the mine but with the government or a non-profit entity managing the infrastructure (the management can in turn be outsourced to a third party).

To contain the monopoly power in alternative 2, it is typically recommended to have a well functioning and independent regulatory system. Less commonly recommended but highly suggested is that, in the context of railway lines, pipelines, power lines, and fiber optics, the government retains the right of way (or servitude) to the underlying land in order to create a corridor of infrastructure, leveraging economies of scope.

Moreover, irrespective of a successful implementation of shared use under alternatives 1 or 2, all user-concessions should at a minimum contain an option to be granted on a Build–Operate–Transfer (BOT) basis so that, after a contractual period of 15-30 years, the infrastructure is transferred back to the host government. At the end of this term, other industrial and non-industrial demands would have

finally materialized, and the government will be able to make the project attractive for bidding by third-party infrastructure concessionaires. Finally, all mining companies should be required to bid on infrastructure plans in addition to the typical bidding criteria for a mine.

5 - The objective of this framework and its audience

Given the complexity of the issue highlighted above, CCSI has developed a framework, distilling best practice principles from infrastructure developments around the world.

The framework, presented here, aims to provide guidance to policy makers on how to approach the question of shared use, highlighting the operational models that are necessary for implementation, the key success factors, the enabling conditions, and considerations on how to ultimately better coordinate major investments in physical infrastructure by privately-owned natural resource concessionaires with national infrastructure development plans. The framework will also equip policy makers with a set of questions that should help conduct the negotiations on shared use with companies. The goal of the framework is to include shared infrastructure use as part of the planning and negotiation stages of extractive industry investments.

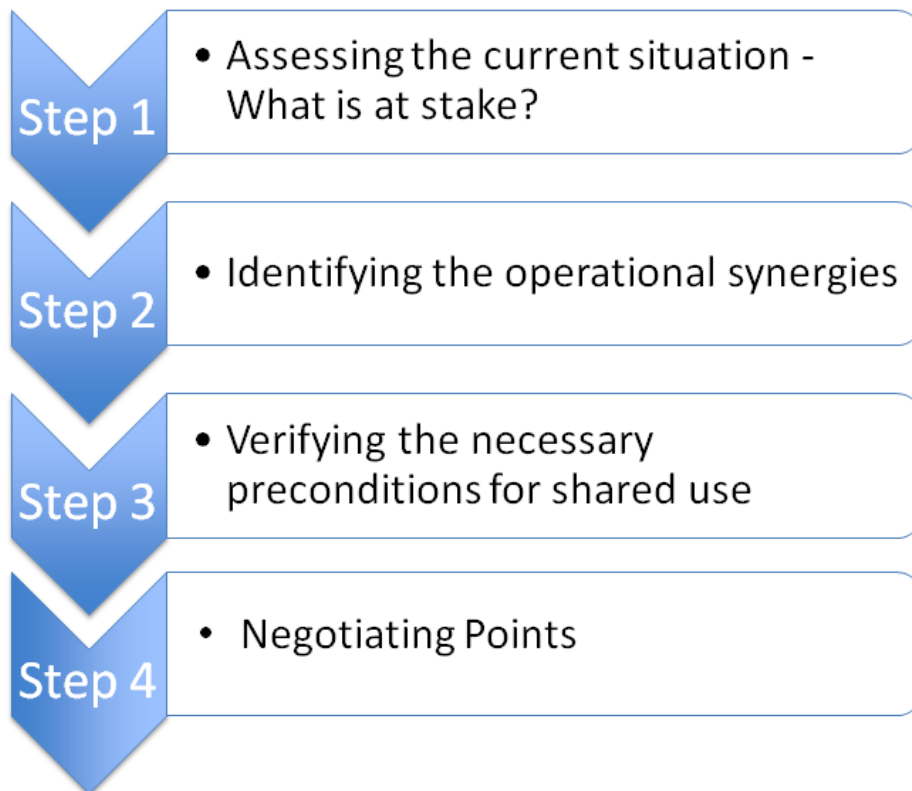
The framework aims to support the governments of resource-rich countries that suffer from an infrastructure gap and have the opportunity to implement shared use on mining-related infrastructure. It can also help civil society understand the policy-making trade-offs of shared use and inform mining companies of their role to support sustainable development in the host countries.

6 - The scope of the framework

As seen above, the frameworks cover five types of infrastructure, namely railway lines and ports (dealt with together as logistics infrastructure), power, water, and ICT. These infrastructure types are considered to embody the greatest potential to fill the infrastructure gap, even though they pose significant shared use implementation challenges. In the context of railway lines, we also consider road infrastructure as a valuable alternative. The frameworks are presented in order from the most challenging infrastructure type to achieve shared use (railway lines and ports) to the least challenging type (ICT).

The frameworks have been informed by the African infrastructure context, both in terms of resource wealth and the infrastructure gaps, but also draw on lessons learned from other continents. The frameworks target large-scale mining investments.

Each framework sets out the steps that need to be considered by governments in order to plan for and negotiate shared use.



Given the potentially large net costs associated with the implementation of shared use in the context of rails and port infrastructure, the rail and port framework includes a cost-benefit analysis as step 2. The frameworks of the other infrastructure types highlight that some shared-use projects in which the economies of scale and scope are potentially limited will also require a cost-benefit analysis on a case-by-case basis.

7- The key definitions to understand

Brownfield versus Greenfield investments: a brownfield investment is an investment in existing infrastructure, whereas a greenfield investment leads to the construction of new infrastructure asset

Different mining players: the mining industry is not uniform and is composed of junior mines and senior mines with the junior ones, mostly private companies, being the risk-seekers mainly interested in reselling their license to the more established mines.

Economies of Scale: the economies that occur when the cost per unit of output diminishes with increasing scale of the project as fixed costs are spread out over more units of production.

Economies of Scope: in the context of a mining operation, such economies of scope arise when the outputs of one type of infrastructure can be used as the inputs of another type of infrastructure.

Infrastructure assets: the physical infrastructure - for instance the railway lines connecting the mine to the coastal loading point for export, ICT infrastructure, power plants and their associated transmission lines, and waste water treatment plants and distribution lines.

Infrastructure services: the service delivered by the infrastructure asset- for instance the rail freight carriage and/or ship loading/unloading using the *infrastructure assets*.

Mine Investor: This is the party wishing to make the new mine development.

Multi-purpose infrastructure: an arrangement where the infrastructure asset is shared between different uses with different characteristics (for example farmers and miners).

Multi-user infrastructure: an arrangement where the infrastructure asset is shared between different users with similar characteristics (for example bulk miners).

PPP or public private partnership: a term used to describe a long term agreement between a government entity and a private company, under which the private company provides, or contributes to the provision of a public service, such as the construction and/ or operation of an infrastructure asset, in exchange of a revenue stream generated by a government budget allocation, user fees, or a combination of the two.

Right of way / Servitude: a type of easement granted, or reserved over the land for transportation purposes.

Shared use: the provision of *infrastructure services* to both *the mining investor* and other parties. These other parties can be either mineral users or non- mineral users.

Special purpose vehicle (SPV): a separate legal entity created to fulfill a narrow, specific, or temporary objective. SPVs are typically created by companies engaging in major infrastructure projects to ring fence the infrastructure assets from the assets of the company.

Third party access: the provision of *infrastructure services* by a party other than the owner of the *infrastructure asset*.⁶

Each infrastructure type will have its own additional concepts that will be defined in each specific section.

⁶ The user of the services being then either the services provider or a customer of the services provider.

Framework 1

Shared Use of Rail and Port Infrastructure

Introduction

Increasing world demand for mineral resources has created renewed interest in mineral deposits that were previously perceived as too risky, or insufficiently profitable to warrant investment. The high-grade iron ore deposits in Western and Central Africa, and the large-scale coking coal deposits in Eastern Africa need major rail and port infrastructure investments to transport the ore from mine to market and make these projects viable. With the limited financial capacity of host governments, mining investors are expected to fund the infrastructure, which can be as much as three times more expensive than the costs associated with the development of the mining project itself. For the investor willing to pay for the transport infrastructure (henceforth the “leading mining company”), the incentive is to build rail and port capacity that will maximize its profits, is in line with its project implementation timeline and results in a competitive advantage over other potential mining companies in the region (henceforth the “subsequent mining companies”). Profit maximization can provide a sufficient incentive for industry participants to reach a commercial agreement for expediting shared investment and shared use. However, the competitive nature of the industry and uncoordinated timelines of mining projects may result in an enclave model whereby the leading mining company designs, builds and uses the rail and port infrastructure exclusively for its own project. From a welfare perspective this can lead to a sub-optimal outcome if other potential users that are willing to pay⁷ for the infrastructure and services are denied access. The economies of scale of rail and port infrastructure provide scope for additional capacity at a reduced cost. The incremental cost for additional capacity is significantly lower than the construction of a separate railway line and port facility. The right-of-way associated with railway lines, also provide significant opportunities for economies of scope for other types of infrastructure to be integrated or built next to the rail tracks.

The government has a key role to play to correct the market failure when it arises, and this section addresses the necessary steps that need to be considered to promote shared use in rail and port infrastructure. Port and rail infrastructure have been combined, as the capacity of these two infrastructure developments needs to be designed in parallel to provide a viable logistics solution for the mining projects. Furthermore, there are cross-cutting regulatory and operational multi-user and multi-purpose issues that are relevant for both infrastructure investments. Unless specified, the regulatory and operational frameworks therefore apply to both rail and port infrastructure.

⁷ This willingness to pay might be based on subsidized access to the infrastructure for non-miners.

Key Definitions

Above rail: Rolling stock and rolling stock related infrastructure such as maintenance yards and train stations.

Below rail: Track facilities, including rail, sleepers, ballast, platforms, tunnels and bridges.

Options analysis: Comparison of benefits and costs of different rail and port investment options.

Port infrastructure: Infrastructure used by all types of vessels, such as access channel, dredged port basin and breakwater.

Port superstructure: Infrastructure used for a particular cargo type, including terminals, storage facilities, stackers and reclaimers.

Dry port: Inland terminal that is connected to rail and/or road infrastructure where cargos are consolidated and stored, and where custom clearance services can be provided.

Leading Mining Company: Large-scale mining company that is the first mover in the region and has the financial backing to build rail and port infrastructure to transport the cargo from mine to market.

Subsequent Mining Company: Mining companies that invest in the region following the leading mining company.

Step 1: Assessing the current situation - What is at stake?

Prior to deciding on the importance of open access for a particular railway line and/or port facility, a government should understand how the mining and infrastructure projects align with the country's long-term objectives and priorities. It will also need to understand the number of players and interests involved, as well as the importance of timing of the shared use discussions.

a) Putting the infrastructure project into perspective

The government should first determine the strategic importance of the railway and port infrastructure by assessing how the proposed developments align with national and regional infrastructure plans. For this purpose, the government needs to assess the potential future demand for the infrastructure in question. If, for example, the leading mining company is proposing to build an integrated railway line and port facility that runs through a deserted and sparsely populated region with no or little prospects for future mining projects and/or other economic projects that could benefit from the infrastructure, the weight associated to the benefits of open access is much lower than if the corridor connects a resource-rich region where several mining companies are developing heavy ore or coal mining projects and/or the railway runs through an unconnected and highly fertile region where agriculture projects are likely to be developed as a result of access to rail and port services. For this analysis it is important to bear in mind that only a limited amount of goods are suitable for rail transport. These tend to be high-volume and non-perishable. The vast majority of rail transport in the world is made up by coal & coke, other high volume and low cost minerals, iron & steel, oil & petroleum, cement, chemicals, lumber, fertilizers, cereals & grains and soybeans.⁸ Furthermore, transport distance plays an important role. Short distances are better suited for road transport, but as distances increase, railway transportation becomes more attractive. In West Africa the World Bank

⁸ World Bank, "Freight Transport for Development Toolkit: Rail Freight," (2009), available at: http://siteresources.worldbank.org/EXTRAILWAYS/Resources/515244-1268663980770/rail_freight.pdf.

found that “railways still offer the most economical solution to transporting non-time sensitive bulk freight on distances over 500km.”⁹

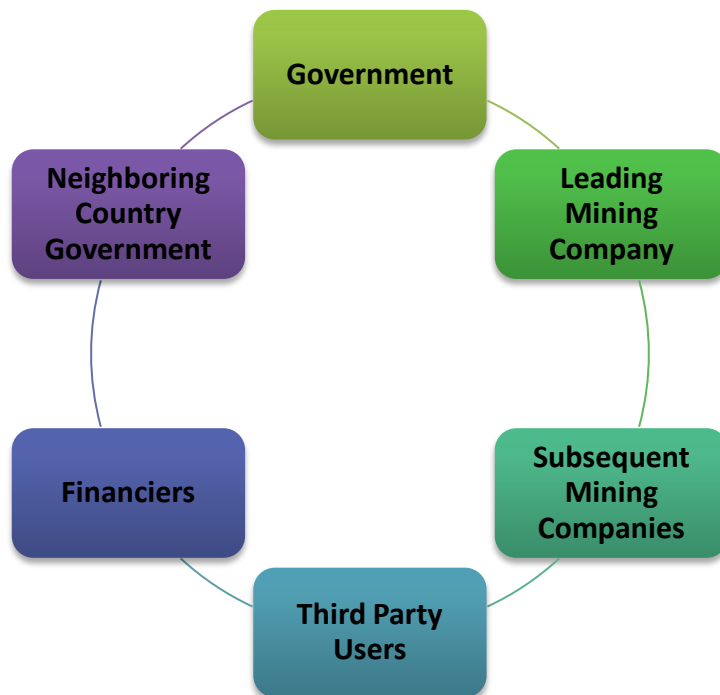
The potential demand for multi-use/ multi-purpose infrastructure will closely relate to the infrastructure already in place. Competition in the railway sector could come from alternative railway systems or the road sector. For ports, the potential demand largely depends on the services that nearby ports offer. If, for example, the leading mining company proposes to build a dedicated finger tip terminal nearby an existing multi-user/multi-purpose port with potential to expand, it may not be cost effective to impose multi-purpose access to such port and build the necessary infrastructure, but rather expand the existing port.

The infrastructure in place will also determine the competitiveness of the access tariffs. A large rail and port network will provide users with alternative transport route options. If the operator increases the tariffs, users can choose an alternative route (provided that this route is not managed by the same operator). If, however, only a single railway line connects two regions, there is no pressure by the rail operator to keep transit tariffs low. Competition from the road sector will depend on the quality of the road network and the competitiveness among road haulage companies. Government subsidies for diesel are further going to increase the competitiveness of road haulage.

b) Understanding the Players/Interests

Various players have opposing interests in open access discussions, which make negotiations complicated. The government needs to map out each player’s interests and play a mediating role to achieve the best possible outcome from an economic welfare perspective. The likely players and interests can be summarized as follows:

Potential Players Involved in Open Access Negotiations



⁹ World Bank, Review of Selected Railway Concessions in Sub-Saharan Africa (2006), available at: <http://www4.worldbank.org/afr/ssatp/Resources/WorldBank-WorkingPapers/ESW-RailwayConcessions.pdf>.

- **Government**

The government’s aim is to maximize the benefits of the extraction of its resources. However, as set out in the introduction, different ministries within the government are likely to have varied views on how to achieve this. While the Ministry of Finance may want to maximize tax revenues and hence prefer the integrated logistics solution, the Ministry of Transport is likely to pursue multi-user and multi-purpose access to achieve its mandate of improved transport infrastructure access for the country. Prior engaging in the negotiations with the mining company, the government should agree on the importance that is placed on the open access discussions.

- **Leading Mining Company**

The leading mining company’s objective is to maximize the profits of its operations. If rail and port infrastructure with sufficient capacity exist, the company will aim to access this infrastructure at the best possible access charges and tariff rates under a long-term take or pay agreement, which guarantees that it is allocated sufficient capacity for its mining operations. If there is a lack of infrastructure in place and the mine site is profitable enough to warrant the infrastructure investment, the leading mining company is likely to build the infrastructure. It will optimize the design of the railway line and port terminal in line with the mining operation and will manage the operations under a vertically integrated model.

There may be scope for shared infrastructure investments with another mining company if this does not interfere with its own operations and if there is no competitive rivalry between the two investors. The competitive nature of large mining companies should not be underestimated as explained in the introduction of the framework. This is especially the case for transport infrastructure. If the leading mining company is successful at denying other miners access to the rail and port infrastructure and the alternative logistics solution is significantly more expensive or not viable, the value of the nearby concessions are going to fall. This may allow the leading mining company to acquire these concessions at a lower price than they would have had to pay if there were a logistics solution in place.

- **Subsequent Mining Companies**

Subsequent mining companies can be divided into large-scale players that have the financial capacity to invest in alternative infrastructure of their own to make a mining project viable, and smaller (“junior”) mining companies that do not have the financial means for such investments. The smaller mining companies will want the infrastructure to be built at excess capacity to ensure that they can use the infrastructure when needed. Depending on the financial resources of the mining company in question and timeframe of the project, some may be interested in gaining an equity share in the infrastructure investment if this guarantees them capacity on the railway line and port terminal. Mining companies without the resources to acquire an equity share in the project will look to pay user fees once the investment is completed. To reduce the power of the leading mining company in the operation of the infrastructure, subsequent mining companies prefer a third party managing the rail and port operations.

A subsequent large-scale player may be interested in sharing the infrastructure investment or building its own logistics solution. Depending on the route of the proposed alternative transport corridor, the government will need to assess whether it should push for a shared infrastructure solution or multiple corridors. A single solution may benefit the government in terms of revenues from the combined mining projects, due to the economies of scale associated with the construction of one high volume railway line and port terminal as opposed to two with lower capacities. However,

the alternative logistics solution may reduce the countries' dependence of one export corridor in case bottlenecks arise, and/or the potential for broader economic development along both corridors if these are open access.

- **Third party users**

Third party users are the benefactors of multi-purpose access. In the African context, these are likely to be large-scale agriculture and forestry projects, and passengers. These do not have the financial resources to invest in rail and port infrastructure and rely on existing infrastructure and rolling stock. Passenger services, especially in developing countries, tend to be subsidized. These services do not generate sufficient revenues to cover the average costs of rail and port infrastructure and often do not even cover the marginal cost of these services. Hence these players rely on strong government intervention and cross-subsidization.

- **Financiers**

In the African context, it is unlikely that project finance from external lenders is going to be above 50% for large infrastructure projects.¹⁰ Financiers will assess the profitability of a project and the likelihood that the loan will be repaid in time. For this, the financiers will look at the project sponsor, the project economics, the risk allocation and mitigation, the performance standards on social and environmental sustainability and the other project parties that are involved in the project. The riskier the project, the higher the lending rates. At a certain threshold, financiers will not provide loans. Financiers prefer the leading mining vertically integrated rail and port infrastructure model, as it provides the most predictability. The second preferred option is where the leading mining company and subsequent mining companies have agreed to co-finance and use the rail and port infrastructure.

It becomes riskier when non-mining players are granted access to the infrastructure, as these do not have the same financial backing as the mining companies do, and because a multi-purpose operated railway line becomes more complicated with lower efficiency levels (and hence reduced profits to repay the loan). Risk is significantly higher when the users of the infrastructure are unknown at the point of financial close. Long-term take or pay commitments by the mining companies will provide some certainty over future incomes. If, however, excess capacity is built without knowing who will be using it, the danger exists that the demand might never materialize, thereby harming the returns on the investment. The worst possible scenario to raise finance for an infrastructure project is a multi-user and multi-purpose infrastructure project with unallocated capacity at the financial close.

- **Neighbouring country government (in case of cross-border infrastructure)**

Neighboring governments will seek access to the infrastructure in order to grant the right-of-way. To maximize the potential impact on its economy, it will push for multi-user and multi-purpose access. Transit fees are also likely to be charged.

c) The Importance of Timing

The timing of open access negotiations is crucial. If the leading mining company knows well in advance that it will need to provide open access on its infrastructure investments, it can take these aspects into consideration during the feasibility studies and project design phase. It is preferable to

¹⁰ IFC, "Fostering the Development of Greenfield Mining-Related Transport Infrastructure Through Project Financing" (April 2013), available at: <http://www.ifc.org/wps/wcm/connect/c019bf004f4c6ebfbd99ff032730e94e/Mine+Infra+Report+Final+Copy.pdf?MOD=AJPERES>.

negotiate open access in parallel with the remaining mining specific negotiations, as the investor will take all aspects into account when running its financial model that will contribute in the decision making process of whether to move ahead with a particular project.

Imposing open access requirements later on in the negotiations when key terms of the project have already been agreed on could harm the relationship between the government and the leading mining company, especially if the leading mining company has been expecting sole use of its developed infrastructure. This can have a negative impact on the perceived long-term political risk environment of the country. Upon completion of the construction of the railway line and port facilities it is most difficult to negotiate and impose open access, especially if the infrastructure is operating at full capacity.

Setting a precedent for open access negotiations is also of importance. If the leading mining company is allowed to build, own and manage a fully integrated single user transport system without any regulatory framework in place to allow for future discussions on open access, it will be difficult for the government to impose an open access regime on a second large scale mining operation that also requires its own rail and port operations. The general trend has shifted from allowing mining companies to build exclusive infrastructure projects to requiring open access. The Australian government is increasingly pushing for multi-user access in the Pilbara and African governments are increasingly following the recommendations of the African Mining Vision report, which highlights the importance of leveraging mining infrastructure for broader economic development.¹¹

Step 2: Cost -benefit analysis

A detailed cost benefit analysis is necessary for the government to decide on the importance of negotiating open access in a particular mining related rail and port project.

a) Potential benefits of shared use

- **Lower capital and operating costs for miners**

The realization of synergies and economies of scale decreases the transport unit cost. This in turn will increase profit margins of the companies, thereby resulting in higher tax revenues to the government.

- **Development of otherwise “stranded assets**

Enabling access to mining companies can facilitate the development of smaller, otherwise stranded mining concessions. The development of these assets will result in additional tax revenues, employment opportunities and linkages to the economy.

- **Non-mining development along the corridor**

With multi-purpose access to the rail and port infrastructure, projects in other sectors may become economically attractive. These could include large-scale agriculture, forestry and industrial projects. With cheaper transportation options available, existing projects are also likely to expand and increase production. This, in turn, will generate additional tax revenues and employment opportunities.

¹¹ Glen Ireland, “Mining Infra – Case for a New Approach,” in Project Finance International Middle East & Africa Special Report, *Latham Watkins*, September 2013, available at: <http://www.lw.com/thoughtLeadership/new-approach-african-mining-infrastructure>.

- **Back-haulage opportunities**

The return journey wagons of a mineral exporting railway line are typically empty and there may be scope to use this capacity for imports. The shipping costs are also going to decrease significantly if vessels carry cargo on both legs of the journey. However, back-haulage opportunities are limited to goods that can be carried in bulk cargo vessels and in open top hopper or gondola car wagons. An example of such synergies could be inland transportation of fertilizers.¹²

- **Regional integration**

With open access, cross border infrastructure projects servicing mining companies are going to increase trade opportunities with neighboring countries. Apart from the potential economic benefits of such trade, cooperation will lead to regional integration and reduced risk of political confrontation in the future. Furthermore, economies of scale can be achieved if infrastructure planning is made at the regional rather than at the national level.

b) Potential costs and risks of shared use

- **Capital expenditure (assuming excess capacity availability)**

The additional infrastructure and rolling stock costs associated with third party access on a railway line will largely depend on the commodity that the third party wants to transport. If it is a commodity with similar characteristics, the additional costs are limited to investments in a new railway spur to the mine site with loading facilities and additional rolling stock (locomotives and wagons). Higher incremental costs are associated with multi-purpose third party access. Additional railway spurs and specialized loading and offloading facilities will be needed to accommodate alternative goods such as forestry and/or agriculture products being transported on the lines. Disbursed general cargo projects may require dry ports where trains are assembled to guarantee sufficient cargo volumes for rail transport to be economically feasible. Furthermore, train wagons might also not be interchangeably used for mineral and the general cargo transportation.

Passenger services on freight lines represent a further cost, as safety standards need to be higher and stations need to be built that are separate from the freight loading and unloading facilities. Passenger services are also likely to stop at regular intervals and travel at higher speeds than the heavy haul railways. This makes management more complicated and can lead to a reduction of the overall capacity of the railway line.

At the port, no additional investments are needed if there is excess capacity and another mining company is allowed access to the terminal exporting the same commodity. The capital costs associated with multi-purpose access will largely depend on the terminal and its handling equipment. If the terminal is setup as a general cargo type terminal,¹³ other commodities could be handled if there is a clear separation that guarantees non-contamination.¹⁴ However, large-scale iron-ore and coal terminals will have specific loading superstructure in place with stackers, reclaimers and

¹² In practice back-haulage opportunities have not materialized, as mining companies that generally own the rolling stock, are not inclined to carry third party cargo. However, in Liberia there are discussions of transporting coal inland to supply the proposed JSPL thermal power plant, on the return leg of the trains servicing the iron-ore mines.

¹³ In Beira port, for example, JSPL and Beacon Hill are currently exporting via the general cargo terminal with a truck and skip system.

¹⁴ This is of particular importance when food commodities are handled at the same terminal as minerals as coal dust, for example, can contaminate the food.

conveyor belt systems reducing vessel-loading time. At such terminal, it is not possible to handle other types of commodities. For multi-purpose access in such situation, the construction of separate terminals will be required. Associated costs may include dredging to expand the basin, building berths, storage facilities and investing in new handling equipment. In extreme cases, the provision for multi-purpose access for a proposed greenfield port may require a completely different design of the port infrastructure with significant additional costs.

- **Costs associated with increasing the capacity**

Rail capacity is not a rigid, linear concept. If well-managed, occasional passenger and general cargo trains could run in between the larger mineral trains without disrupting the schedule or service. In such cases, capacity access may not pose additional costs (if the necessary rolling stock and infrastructure for these alternative services is in place). If the port in question has general cargo and passenger terminals, a small increase in port throughput is also not going to intervene with the mining operations.

Significant third party access allocation, on the other hand, will demand further infrastructure investments. On the railway line, costs could include increasing the number of loops and sidings, reinforcing the tracks and bridges and/or expanding the railway line to a double track system. At the port, increased capacity might be associated with the terminal expansion and the construction of additional terminals. This may also demand general port infrastructure investments such as dredging the port access channel in order to be able to handle larger vessels.

- **Efficiency loss**

Operating one vertically integrated customer from mine to rail to port to ship is easier than if several users need to be accommodated. For the Goonyella mine associated infrastructure, for example, O'Donnell estimates that operational efficiency of a multi-user rail and port system would be 10-20% below a single-user model.¹⁵ This efficiency loss is further increased when multi-purpose goods are granted access to the railway line. Passenger services, for example, generally travel at different speeds and stop at regular intervals. This multi-purpose efficiency loss is not necessarily observed at ports, as other commodities and passenger services will not be anchoring at the mineral terminal.

- **Access to Finance**

As outlined in the “Understanding the player/interests” section, it will be easier to access finance under the single-user model. Multi-user and multi-purpose access increases the difficulty to obtain financing, especially if the end-users are unknown at the point of financial close.

- **Delay of Negotiations**

The additional commercial complexity in negotiating with multiple users, and the additional technical design needed to accommodate more users risks delaying the project schedule.¹⁶ This, in turn, will delay government revenues from the leading mining company and could ultimately result in the cancellation of the project.

- **Costs of regulatory body to supervise shared use**

¹⁵ Stephen O'Donnell, "Goonyella Coal Chain Capacity Review - letter," July 29, 2007, available at: <http://www.tmr.qld.gov.au/business-industry/Transport-sectors/Rail-services-and-infrastructure/Goonyella-Coal-Chain-Capacity-Review.aspx>

¹⁶ Each additional major negotiating party will increase negotiation complexity.

Any government mandate for shared use beyond a mere facilitation role requires a regulatory body with an adequate operating budget. The box below outlines the tasks and characteristics of such regulatory body. The more interventionist the regulating body, the more important it is that it functions properly and is well funded.

Regulatory Body Tasks

Regulate tariffs: The operator needs to charge sufficiently high fees to recoup the investment, cover operational and maintenance costs, and make a reasonable profit margin. However, the operator should not benefit from excessive profits as a result of its monopoly power. A reference tariff could be published by the operator, which serves as a baseline for negotiations with users. After agreeing to the reference tariff, the regulatory body could impose margins, above and below which the operator cannot negotiate. The mechanisms and standards to calculate the reference tariff should be objective and transparent.

Guarantee non-discrimination: The leading mining company and financiers/guarantors of the infrastructure development will require priority access on a pre-agreed amount of capacity. However, there should be a level playing field as to how this capacity is allocated, be it among the existing infrastructure users or new entrants. Clear access conditions need to be established and adhered to, and the regulator will need to define the information that must be made available by the operator. Furthermore, transparent arbitration mechanisms should be established to ensure enforcement of the access allocations and to regulate disputes. The infrastructure operator and access seeker need to be aware of the procedures and guaranteed equal treatment in arbitrations.

Define access charges: In case there is a separation of the infrastructure operator from the infrastructure owner, the latter will require access charges for the use of its infrastructure (and in turn the infrastructure operator will charge tariffs to the end user). The calculation of access charges can be divided into marginal cost pricing, which covers the maintenance costs associated with the service, and average cost pricing, which also includes the original construction costs of the infrastructure. The regulatory body may impose different calculation methodologies for different services.

Guarantee infrastructure investments: The regulator should be able to require capacity expansion if there is sufficient contracted demand. The tariff and access charges should reflect such additional investments.

Standards: The regulatory body should ensure that the safety, environmental and technical regulations are adhered to by all rail users and owners of infrastructure.

Characteristics of regulator

Information asymmetry: The owner and operator of the rail and port infrastructure have a better understanding of the costs involved. These are not easily auditable. Therefore significant expertise and experience is necessary within the regulatory body to monitor tariffs and access charges. Governments that do not have the expertise should seek foreign expertise until the necessary capacity is built up.

Independence: The regulatory body should be independent from the government, mining companies and operators to guarantee neutrality and a fair judgment. Where such independence is not present, a transitional regulatory system is needed, which might have to rely on the juridical system and/or an international dispute settlement board. The level of intervention of the regulator should be

proportional to its maturity and independence.

Clear decision-making process: To guarantee independent, consistent rulings in disputes, and to gain the trust of the private sector, clear technical guidelines should be outlined upon which decisions are made.

c) Options analysis

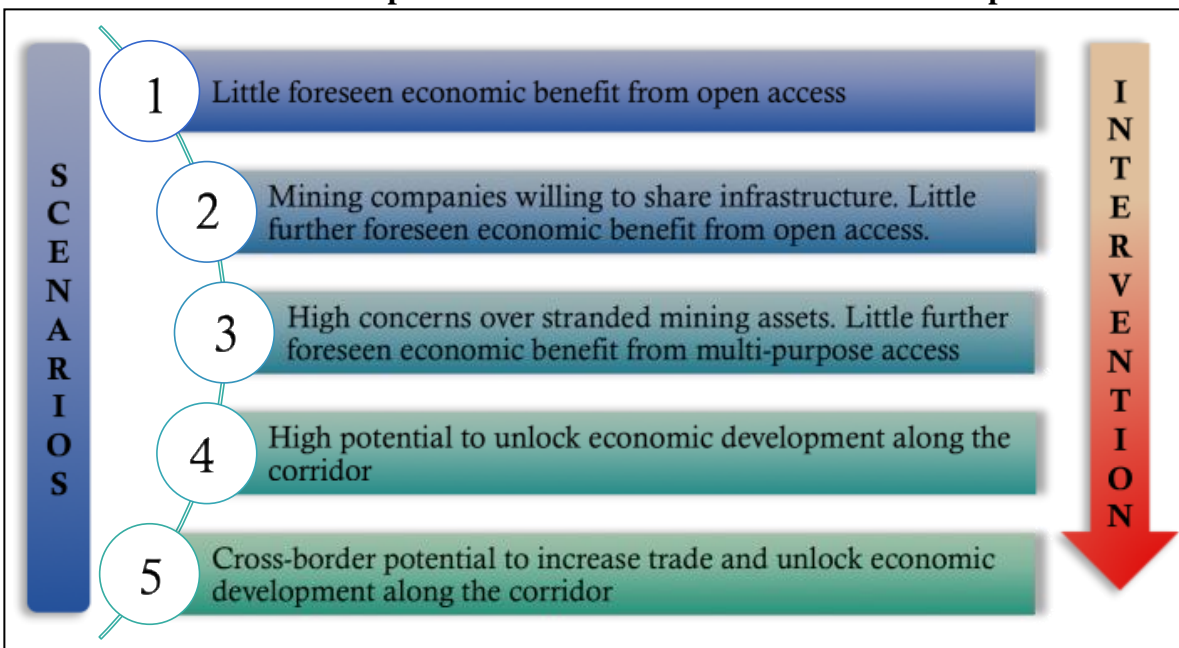
If several rail and port options are discussed, the government should make a cost-benefit analysis for each option. This options analysis should also include the possibility of investments in infrastructure that is unrelated to the mining project (for example, it might be more cost effective for the government to capitalize on higher tax revenues from the mining project and invest in a road alongside the railway track, or expand an existing multi-purpose port rather than insisting on the construction of a separate terminal at a proposed greenfield mineral port). The government should always keep in mind the impact that different routes and open access requests will have on the logistics costs for the leading mining company. Above a certain threshold the mining project itself might become unviable.

Step 3: Identifying operational synergies and verifying the necessary preconditions for shared use

There is no “one-size fits all” operational model for port and rail infrastructure. The strategic importance of the infrastructure projects in question will define the government’s initial stance on multi-user and multi-purpose access. By understanding the interests at play, the government will be able to gauge what the likelihood is that open access is achieved without significant intervention.

The figure below sets out a number of different scenarios that may arise from the above analysis. The red arrow indicates that with increasing benefits associated with open access and a larger number of players involved in the open access discussions, there is an increasingly important role for the government to play and intervene, as the market is unlikely to provide the socially optimal outcome.

Government intervention depends on the benefits/costs associated with open access



The remaining section will discuss each scenario and propose design and operational models, as well as the necessary regulatory framework and level of intervention that might be best suited for each to guarantee open access and non-discrimination.

1. Little foreseen economic benefit from open access

- **Design and Operational Model**

Such a scenario would result from no other present or future economically feasible mining projects being located in the region (even if these had access to rail and port services), little potential for projects along the corridor that could benefit from multi-purpose access, and the corridor being located in a sparsely populated area, thereby not generating potential use for trade or a passenger service. The economic benefit of imposing open access could also be limited if existing nearby rail and port infrastructure already provide multi-user and/or multi-purpose services and there is scope to increase capacity on this alternative infrastructure at a lower cost.

In such case it is best to **let the leading mining company finance, own and manage the vertically integrated rail and port infrastructure to maximize efficiency along the corridor.** The mining company may choose to operate the infrastructure facilities itself or contract a service provider for these purposes. The leading mining company will design and manage the rail and port infrastructure to maximize profits of its mining operation, which in turn will lead to higher corporate taxes being paid to the government.

- **Regulatory Framework and Level of Intervention**

Since there is little value added by imposing open access or insist on increased capacity on such infrastructure project and/or monitor the access and transport tariffs in the foreseeable future, the government should not intervene.

Instead, **the government should focus on regulatory provisions that would allow for renegotiations in case there is access demand for the infrastructure in the future.** Blanket open access regimes such as the one in Australia, encompass all sectors of the economy, but are only likely to be applied in key sectors that are of strategic significance and where monopolistic behavior and abuse of market power is likely to occur (such as in port and railway services). The regime sets out the conditions under which the government will consider breach to open access. Conditions in Australia include that (1) it is not economically feasible to duplicate the infrastructure in question, (2) access to the infrastructure in question is necessary to permit effective competition, (3) the infrastructure in question is of strategic national importance to the national economy, (4) the infrastructure in question can be used by the third party at an economically feasible cost without increasing health and safety risks, and (5) access is not already subject to an effective regime. Similar conditions can be included in industry specific access regimes, which are tailored for a particular sector. Such regulation should not only apply to competing companies (as is the case in the USA), but also to other sectors of the economy that might benefit from access to the infrastructure (as is the case in Australia). If the third party can prove the conditions set out in the access regime, the government can act as a negotiating facilitator between the infrastructure owner/operator and the third party. If these negotiations do not result in agreement, the government should be able to intervene to guarantee access under reasonable tariffs.

Blanket or industry specific regulatory regimes need to be clearly drafted on objective criteria in order to be effective. In the case of Australia, the “not economically feasible” creates room for interpretation and also imposes an unnecessary burden. If increasing the capacity on an existing

railway line or port terminal to guarantee multi-user access is less costly than building a separate line/terminal, this should be sufficient to impose multi-user access, even if it is economically feasible to build a second line/terminal. Furthermore, these regulations should not be softened or contradicted in the contract with the leading mining company. In the case of Australia, Rio Tinto has been able to deny third party access in Pilbara,¹⁷ because it argued that third party access would prejudice or interfere with its operations, which was a clause included in its contract.

If the leading mining company also concludes that there is no economic benefit from open access and therefore little risk of a third party aiming to acquire access to the infrastructure in the foreseeable future, it should not be deterred by such regulation. If, however, the company does voice concerns about the regulation, **the government could include an “access holiday” clause with an expiration date in the contract (also known as a sunset clause).** Such clauses guarantee that the infrastructure in question is not subject to any access regulation during an agreed timeframe. Both the Camrail and Sitarail concessions in West Africa contain such clauses for five and seven years respectively.¹⁸ The inclusion of such a clause could also be a clear signal that at the expiration date, third party access renegotiations are a possibility if the economic situation changes and there is a third party interested in accessing the railway line and port facility. The length of the access holiday could be linked to the profitability of the mining project. This would guarantee that the leading mining company recoups its investment prior potential third party access.

Even if the government grants the mining company ownership and management of the railway line, **the government should always retain the right-of-way**, as this reserved land on either side of the railway tracks should be considered a public good and can serve non-mining related infrastructure investments. For example, the right-of-way can be leveraged to lay power and telecommunication lines. The installation of such infrastructure along an existing rail corridor is significantly less than building it along a separate route and also maximizes the use of existing land reserved for transport/transmission infrastructure. If there is significant demand to use the right-of-way for non-rail infrastructure, the government could tender the management of the right-of-way to a third party with clear goals and targets.

2. Mining companies willing to share infrastructure. Little further foreseen economic benefit from multi-purpose access.

- **Design and operational model**

If there is a mutual net benefit for shared use of mining companies in the region and there is no foreseeable additional capacity needed on the line, the government should aim to avoid playing an interventionist role but rather act as an intermediary between the stakeholders. The mining companies may choose to invest in proportion to the capacity allocation.

To maximize the efficiency of the operations, the government could negotiate for **the rail operation to be managed by one entity under a haulage regime.** Under a haulage regime the operator not only manages the access to the tracks or ‘below rail’ logistics, but also provides the rolling stock to the mining companies and charges for the services accordingly. The haulage services could either be performed by the leading mining company or a third party operator. This decision should be left to

¹⁷ Perrine Toledano, “Leveraging Extractive Industry Infrastructure Investments for Broad Economic Development: Regulatory, Commercial and Operational Models for Railways and Ports,” (May 2012), Columbia Center on Sustainable Investment, Columbia University, available at: <http://ccsi.columbia.edu/files/2014/05/CCSI-Policy-Paper-Leveraging-Mining-Related-Rails-and-Ports-for-Development-May-20121.pdf>

¹⁸ World Bank, “Review of Selected Railway Concessions in Sub-Saharan Africa,” op.cit.

the negotiations between the mining companies. While haulage regimes have not been tested in practice (one is being considered in Mongolia to export coal to China),¹⁹ the advantage of such regime compared to the more common access regime where each mining company provides its own rolling stock, results from economies of scale in acquisition, lower maintenance costs and higher effectiveness in operations. It also reduces the operational risks of different operators on the line in case of rolling stock failure.²⁰ Higher efficiency in the rail operations may increase the bankability of the project.

- **Regulatory framework and level of intervention**

Unless there are complaints by one of the mining companies and there are no further players wanting to access the railway line and/or port terminal, the government should not intervene. As in the previous scenario, the legal framework should ensure that if the economic prospects in the region change and there is potential for further parties to claim access, there are mechanisms in place that could address such issues (clearly drafted blanket or sector specific access regimes).

Example: Mining companies willing to share infrastructure – Marampa-Pepel Corridor

African Minerals (AML) was awarded to mine the Tonkolili iron ore deposit in Sierra Leone in 2009. As part of the agreement, AML was granted a 99-year exclusive infrastructure lease to reconstruct, manage and operate the Marampa – Pepel railway line and Pepel port.

In 2012, AML signed a binding heads of agreement with Cape Lambert, which grants its Marampa Iron Ore subsidiary access to the infrastructure. The agreement foresees that Cape Lambert funds 33% of the costs of the Marampa-Pepel Infrastructure upgrade in return for an equal share in the project. This would guarantee Cape Lambert 2mtpa capacity allocation on the railway line (excluding rolling stock) and to the unloading, stockpiling and transshipping facilities at Pepel port.²¹ Cape Lambert’s exposure included a cap of \$45million. It has been reported that the service is to be at a cost plus 20% basis and Cape Lambert must design and construct its own 3km rail spur line to African Minerals rail line on its own.²²

3. High concerns over stranded mining assets without government intervention, but little further foreseen economic benefits resulting from multi-purpose access.

- **Design and operational model**

Given the competitive dynamics between mining companies, the emphasis of the operational model should lie on guaranteeing that the infrastructure is built to accommodate additional capacity and that tariffs are non-discriminatory. To guarantee the latter, the most effective mechanism available to the government is to **separate the ownership of the infrastructure from the mining companies**. This separation should include both rail and port infrastructure. In South Africa, the railway line to

¹⁹ IFC, “Fostering the Development of Greenfield Mining-Related Transport Infrastructure Through Project Financing,” (2013) op cit.

²⁰ Ibid.

²¹ “REG - African Minerals Ltd - Agreement on Marampa/Pepel Infrastructure,” *Reuters*, 16 July 2010, available at <http://www.reuters.com/article/2010/07/16/idUS125485+16-Jul-2010+RNS20100716>

²² “Cape Lambert Resources: Marampa update,” *Fat Prophets*, April 2012, available at: <http://www.fatprophets.com/Member%20Area/Product%20Landing/Report%20List/Report%20Page/Article%20Page.aspx?id=b07f54d5-1731-4f39-a008-0943c98926a7&product=Australasian%20Mining&pt=paid>.

Richards Bay is open access, but the coal terminal is company-owned. The latter has rejected allocating capacity to smaller mining companies seeking access,²³ which has made open access on the railway line irrelevant. To avoid such capacity and access problems, it is best for the same entity to manage both the railway line and port terminal. Apart from simplifying the access and tariff negotiations and ensuring that the same capacities are being allocated, this system will increase efficiency along the corridor. It will also be easier to obtain project financing for an infrastructure project with fewer players.

To separate the ownership, **a special purpose vehicle (SPV) could be setup, which owns and operates the rail and port infrastructure.**²⁴ To finance the investment, the SPV will have to be backed by long-term take or pay agreements at set tariff rates that the mining companies guarantee to pay. This will set out the flow of revenues to the SPV upon completion of the infrastructure. With such agreement in place, it will be easier to source project financing. As principal backing agency for the SPV through its take or pay commitment, the leading mining company is likely to require founding rights such as priority access.

With extensive mineral deposits known to be economically viable with access to rail and port infrastructure, the government can also explore the scope for **tendering and awarding the construction and management of the rail and port infrastructure concession to a third party.** As with the SPV arrangement, the third party will need long-term take or pay commitments to be able to raise the necessary capital for the infrastructure investments. However, awarding the rail and port concession to a third party (rather than to the leading mining company) could result in higher tariffs being charged to the users because: (1) hurdle rates are likely to be higher if the cost centers are separated, with uncertainty increasing for the mining company not having control over the export infrastructure and the infrastructure concessionaire depending on the mining company for the project to be viable in the first place, and (2) large-scale mining companies can rely on their balance sheets to either directly finance the infrastructure project or use it as a guarantee to access project finance at low interest rates, but third party logistics companies are unlikely to have such financial muscle. The associated increase in risk due to separation of ownership will further increase interest rates being charged to finance the project

Example: Tendering mining-related rail and port infrastructure project to a third party – Tete-Macuse corridor

To provide a logistics solution for the mining companies that have invested in coal concessions in Tete, the Government of Mozambique launched an international tender for the construction of the 525km long Zambezi corridor, which connects Moatize with a greenfield port at Macuse. The tender foresees the design, finance, construction, management and operation of the rail and port infrastructure and requires multi-user and multi-purpose access.²⁵ It has been reported that 21 companies applied for the tender and 6 preferred bidders were selected to submit full bids.²⁶ Italthai

²³ “Transnet CEO fumes over insufficient small guy access at Richard Bay Terminal,” *Mining Weekly*, 24 October 2013, available at : <http://www.miningweekly.com/article/transnet-ceo-fumes-over-insufficient-small-guy-access-at-richards-bay-coal-terminal-2013-10-24>.

²⁴ Glen Ireland, “Mining Infra – Case for a New Approach” Latham Watkins, 2013.

²⁵ Delmas Trade Watch, Issue 21, February 2013, available at: <http://www.delmas.com/static/communication/Attachments/Delmas%20trade-watch%20-%20Issue%2021%20-%20February%202013.pdf>.

²⁶ Agnieszka Flak, “Update 1: Rio Tinto among main bidders for Mozambique rail project,” *Reuters*, April 10, 2013, available at: <http://www.reuters.com/article/2013/04/10/mozambique-rail-riotinto-idUSL5N0CX4BT20130410>

engineering was officially announced to have been awarded the tender in December 2013²⁷ and will be seeking off-take agreements with the mining companies to finance the project. While the number of bids suggests that there is great interest for such PPP project, which is estimated to cost around US\$3.5bn, there have been concerns that the bidders have struggled to provide the bank guarantees that were demanded by the Government.²⁸

There may be scope for negotiations to build the rail and port infrastructure marginally above capacity to take into account potential operational inefficiencies. However, mining companies are not inclined to finance capacity that they will not use. If the SPV and/or third party can make a good case to financiers that additional capacity is needed, this could be a viable alternative to guarantee excess capacity. If the government is certain that excess capacity will be needed, it can provide funding itself. However, this is a risky strategy if the future mining projects do not materialize. Instead, the government could **require the infrastructure to be designed in such way that future capacity expansion is possible**. Such clause has been included in the Putu contract, where *“the railroad shall be designed so that it can be expanded on a commercially feasible basis to carry on a continuing basis twice as much traffic as is anticipated initially...”*²⁹ A similar design clause could be included for port infrastructure, which guarantees that the site selection offers potential to increase the capacity of the mineral terminal.

While the haulage regime has the potential to increase efficiency along the corridor as explained in the previous scenario, and it would also guarantee that smaller mining companies that do not have the financial means to purchase rolling stock have access to the railway line, the additional cost of the rolling stock will have to be carried by the SPV or third party.

- **Regulatory framework and level of intervention**

If the leading mining company is reluctant to allow multi-user access and there is a high likelihood of stranded assets, the government can play a lead role in requiring the players to come up with a shared solution. Softer pressures can be applied. The construction of port and rail infrastructure involves numerous areas where the government can assist, including, for example, access to land, resettlement approval and environmental permits. These can be granted upon agreement by the industry to cooperate on the infrastructure development.

Another option to increase the government’s influence on the port and rail infrastructure project is to **co-finance the investment by acquiring an equity stake**. This reduces the financial burden on the government compared to full state ownership³⁰ and provides it with influencing opportunities within the SPV/PPP. However, raising the financial resources for paying for the equity might be a challenge -for countries with small budgets and high political risk ratings. Resource-for infrastructure deals have been one methodology used by governments to raise finance for such large-scale infrastructure investments, but those deals require a detailed financial analysis to ensure that the resources are not given away for a below-market value.

²⁷“Terms of lease on Macuse port, railway agreed,” *Club of Mozambique*, December 5, 2013, available at: <http://www.clubofmozambique.com/solutions1/sectionnews.php?secao=business&id=30776&tipo=one>

²⁸ “Mozambique: Thai Company At Advantage in Bidding for New Railway,” *AllAfrica*, August 4, 2013, available at: <http://allafrica.com/stories/201308050439.html>

²⁹ World Bank, “Leveraging Investments by Natural Resource Concessionaires,” op cit.

³⁰ Full state ownership could be considered in countries with large budgets, but even there PPPs have been preferred in the past, as governments have not been very successful at managing large scale infrastructure projects.

The government could also require a golden share to influence the decision-making process in strategic public interest infrastructure projects. A golden share is a nominal share conferring special voting rights that are established by law. It is typically a single share granting its owner sufficient voting rights to block board decisions. It is not attached to dividend rights as opposed to the equity above. The rights of a golden share can vary in scope and duration and range from a limited veto right to the need to consent to everyday management decisions. The golden share allows governments a controlling interest despite limited investment. This can be an efficient policy tool to influence open access decisions of port and rail infrastructure, but the leading mining company may not be willing to invest in the infrastructure if it does not have managing authority over it upon completion.

With significantly higher risks of discrimination in access in this scenario, the government will need to focus its attention on **setting up regulatory mechanisms and/or an independent regulatory body**³¹ (apart from drafting blanket and/or sector specific access regulations). An independent regulator is preferable to relying on the judicial system, which is lengthier, less predictable, does not provide a long-term compliance monitoring, and relies on judges that are less likely to know about the rail and port sector.

While the tasks and responsibilities of the regulatory body should be set out in the legislation, the level of intervention should be adapted to the maturity of the regulator and the competitive nature of the railway line/port terminal. With vertical separation between the mining companies and infrastructure owners and only mineral commodities being transported along the corridor, the regulator should closely supervise and monitor, but not aim to intervene in setting access charges and tariffs. It will also need to arbitrate cases that are put forward by third parties. If, on the other hand, the leading mining company also owns the rail and port infrastructure, stronger intervention may be necessary to guarantee that multi-user access is adhered to.

Example: Setting up a regulatory authority for railways - Mozambique

On August 12, 2011, the Government of Mozambique approved the National Surface Transport Regulator (INATTER), which has the mandate to regulate the rail and road transport. For the railway sector, the regulator has the competency to:

- i. Propose railway related legislative and regulatory measures to be approved by the government
- ii. Regulate the railway infrastructure construction and ensure that access of operators is non-discriminatory
- iii. Monitor that applicable regulatory laws, licenses and concession agreements are adhered to
- iv. Determine the introduction of technical improvements to increase the safety and efficiency of rail transport
- v. Analyse complaints by rail operators and arbitrate accordingly
- vi. Regulate the access to rail infrastructure and arbitrate accordingly
- vii. Guarantee and monitor the rights and interests of railway users

While INATTER creates a mechanism for third parties to be able to seek access to rail infrastructure,

³¹ The decision of whether to create a new institution or regulate through existing government entities will depend on the country context, particularly whether there is expertise to staff the new entity and whether the independence of the entity can be guaranteed (see box on the Regulatory Body Tasks).

the fact that it is an entity within the Ministry of Transport and Communications, where the Minister appoints key personnel, poses uncertainty for the infrastructure owners that the arbitration process will be neutral and based on an independent assessment. It also remains to be seen whether INATTER has the political backing and technical capacity to impose its regulatory authority on the powerful state owned rail company, which has been in charge of setting tariffs on rail traffic in the past. The UK Department for International Development (DfID), which has supported the Ministry of Transport and Communications in setting up INATTER, has recognized these challenges and views “turning INATTER into a robust and independent regulatory body as a medium to long term endeavour.”³²

4. High potential to unlock economic development along the corridor

- **Design and operational model**

As set out in the cost benefit analysis (step 2), multi-purpose access to rail requires additional infrastructure investments such as dry ports, loading and off-loading facilities, and is likely to make the corridor less efficient. Similarly, greenfield ports that are required to cater for additional non-mineral terminals will require significant additional investments. These will not be voluntarily financed by the mining sector and therefore the government will need to either finance the additional investments directly, through a loan with the investor, through a financier, an international development agency, or through tax offsets.

While agriculture and passenger services are unlikely to take up significant amounts of capacity compared to the mineral cargo that makes the construction of a railway line feasible in the first place, **double track rail systems can decrease the operational bottlenecks.** In case there is sufficient capacity to warrant such investment, the government should push for a double track rail system or require it in the tender. Double track avoids the operational complexities of having to carefully coordinate inbound and outbound trains. This will result in trains being able to haul more wagons, travel at higher speeds and lower operational costs. The construction of a double track system is estimated to be 24% cheaper in the case of the Buchanan corridor in Liberia if 36mtpa of iron-ore were to be transported on a double track railway system compared to two single-track lines.³³ Such system also allows for higher travelling speeds for passenger services.

In case multi-purpose access comes at a significant cost and there is a lack of road infrastructure in place, the government could also **negotiate for the service road of the railway line to be designed and built to accommodate road haulage and passenger transport.**

- **Regulatory framework and level of intervention**

To guarantee multi-purpose access on a railway line that is built to service the mining sector, the government will not only have to monitor and ensure non-discriminatory access, but will also have to **define the tariff setting mechanism.** This is especially the case for more price sensitive cargoes such as agriculture products and passenger services. Public Service Obligation (PSO) schemes have been used in Africa in the past to warrant for passenger services. These involve the government subsidizing passenger rail services. However, the track record of these agreements is unstable, due to

³² DfID, “Mozambique Regional Gateway Programme Review,” (March 2013).

³³ World Bank, “Leveraging Investments by Natural Resource Concessionaires,” op.cit

governments not paying out the subsidies in practice. This has created a system where even if the government were to guarantee the subsidy during the negotiations, the investors are wary that this agreement might not be upheld due to the lack of long-term credibility.³⁴

An alternative in such circumstances could be to contractually **require price discrimination and cross-subsidization between the higher-profit mining industry and the price-sensitive agriculture sector/passenger services**. For example, price-sensitive services could be charged at marginal cost, which will cover the operations of the service, but not the infrastructure investments; whereas the mining related services are charged at average cost plus the difference of the price-sensitive services.³⁵

To ensure that tariffs are set by the operator in such a way that guarantee price-sensitive goods and passenger services to be transported on the railway line, the government could impose a more interventionist monitoring system whereby the **regulator needs to pre-approve the tariffs that the operator wants to charge**. This system has been adopted by EFVM railway in Brazil. However, as highlighted above, such system should only be considered if the regulator is independent and has the capacity to be involved in such an interventionist manner.

5. Cross-border potential to increase trade and unlock economic development along the corridor

• Design and operational model

Apart from requiring negotiations with the leading mining company, cross-border infrastructure projects will also require negotiations with the neighboring country government. These negotiations involve political, managerial and technical decision-making.

On the technical side, the governments and the mining companies need to agree on the design of the railway infrastructure. If the railway line is purely designed for high volume ore/coal transportation, wider gauges (distance between the inner surfaces of the rail) might be the preferred choice by the mining company, as this setup can carry heavier loads while travelling at faster speeds. However, if the proposed project is meant to connect to the existing rail networks in the region, it makes sense to build the railway gauge accordingly. Different gauge settings between the two countries could lead to a significant increase in transport costs with transshipping or gauge changes becoming necessary at the border.

On the managerial front, governments need to agree on the border management system. Long delays at the border due to lengthy customs controls, predatory officials, and/or the necessity to change crews and locomotives at borders will result in inefficiencies. It is therefore recommended that an **integrated border management system is put in place and that customs procedures are streamlined**.

An additional stakeholder in the negotiations and the associated increase in political risk due to cross border transportation is likely to result in increased difficulties to source funding. For regional integration projects, multilateral agencies such as the World Bank and/or the African Development Bank can be considered to help with the financing.

³⁴ Paul Collier, “Building an African infrastructure”, 48(4) *Finance & Development* (2011), available at: <http://www.imf.org/external/pubs/ft/fandd/2011/12/collier.htm>.

³⁵ Paul Collier, “Building an African infrastructure,” op cit.

- **Regulatory framework and level of intervention**

For the mining leading company to feel comfortable to invest in a cross border infrastructure project, it needs to be sure that political tensions between the countries will not result in disruptions to its services. **A tri-partite agreement that establishes the binding nature of the provisions that are agreed on should be signed.** This should include the type of goods that will be transported on the line, the principle of transit cargo and the open access rules. These agreements should be embedded in both domestic and international law. **An intergovernmental rail authority could help supervise the tariff structure and pricing mechanisms of non-mineral services.**

Example: Potential cross-country logistics solution – Guinea/Liberia

Liberia has significant iron ore deposits under development on the border to Guinea. ArcelorMittal is rehabilitating the 250km railway line from Yekepa to Buchanan and developing the iron ore terminal at Buchanan port to a capacity of 15mtpa. This corridor could also serve as a potential logistics solution for the iron ore deposits on the Guinean side, including the Nimba, Diake, Belekoyo and Simandou deposits.³⁶ The shortest route through Guinea for the Simandou deposit is Conakry, which is 800km away, as compared to 350km to the port of Buchanan in Liberia.³⁷ The World Bank estimates that that the cost savings of going through Liberia are roughly US\$1 billion over a twenty-year period (US\$3.49 per tonne via Conakry versus US\$1.22 per tonne via Buchanan) when the full lifecycle costs of running the two alternative railroads are taken into account. Furthermore, Vale states that the deep-sea waters (>28m), which are critical to the use of its Valemax vessels, are at a 2km to 3km distance from the Liberian shore in comparison to a 15km to 20km distance in Guinea.³⁸

While the Guinean Government has required Rio Tinto to export the Simandou deposits via Guinea, it has signed bilateral agreement with Liberia to allow companies mining the Nimba deposit to use the Liberian transport route. It has recently been reported that Sable Mining, a concession holder of the Nimba iron ore project in South-West Guinea, has been granted an export license authorizing the transport of iron ore through the Port of Buchanan.³⁹ The company is seeking to initially transport 5mtpa via the existing railway line of ArcelorMittal.⁴⁰

³⁶ Depending on which concessions are developed, it may be necessary to build an additional corridor, as iron-ore quantities would exceed what is feasible on a double track railway line.

³⁷ World Bank, “Leveraging Investments by Natural Resource Concessionaires,” op.cit

³⁸ BSR Resources: <http://www.bsgresources.com/mining-and-metals/iron-ore/>.

³⁹ Natalie Greve, “Nimba export license in line with Guinea Liberia Agreement – Sable,” *Mining Weekly*, October 11, 2013, available at: <http://www.miningweekly.com/article/nimba-export-licence-in-line-with-guinea-liberia-agreement-sable-2013-10-11>.

⁴⁰ “Sable Mining confident will export iron ore through Liberia” *Reuters*, September 18, 2013, available at: <http://uk.finance.yahoo.com/news/sable-mining-confident-export-iron-175800928.html> .

STEP 4: Negotiating points

Having understood the importance and potential impact of multi-user and multi-purpose access, the government will need to prepare its negotiating strategy. The strategy will highly depend on the particular set of circumstances it is confronted with. The table below provides a non-exclusive list of the key negotiation points depending on the scenarios addressed above.

Scenario	Preferred Operating Model	Regulatory Framework/ Government Intervention	Benefits	Risks	Key Negotiating Points
1. Single mine, little foreseen economic benefit from open access	<ul style="list-style-type: none"> Vertically integrated model from pit-to-port 	<ul style="list-style-type: none"> Blanket or sector specific open access regimes Non-interventionist 	<ul style="list-style-type: none"> Maximize efficiency of mining project and thereby government revenues 	<ul style="list-style-type: none"> Difficult to guarantee capacity and access to third parties in the future 	<ul style="list-style-type: none"> Access holidays Open access guarantee after termination of access holidays Reserve right-of-way
2. Joint agreed investment by mining companies, little foreseen benefit from open access beyond those users	<ul style="list-style-type: none"> SPV Haulage regime 	<ul style="list-style-type: none"> Blanket or sector specific open access regimes Non-interventionist 	<ul style="list-style-type: none"> Maximize government revenues from mining sector in the region 	<ul style="list-style-type: none"> Difficult to guarantee capacity and access to third non-financing parties in the future 	<ul style="list-style-type: none"> Access holidays Open access guarantee after termination of access holidays Reserve right-of-way Haulage regime by miner or third party
3. Danger of stranded mining assets, little foreseen benefit from multi-purpose access	<ul style="list-style-type: none"> SPV or third party operated infrastructure model (vertically separated) Haulage regime or access regime (depending on financing and maturity of regulator) 	<ul style="list-style-type: none"> Blanket or sector specific open access regimes Equity or golden share of government Independent regulatory body for monitoring and arbitration 	<ul style="list-style-type: none"> Unlocking the mining potential of the region Higher government revenues as a result of the development of smaller mining projects Additional employment opportunities and linkages to the mining 	<ul style="list-style-type: none"> Delay in negotiations with leading mining company Delay in government revenues from leading mining company Difficulty to negotiate financing for the project 	<ul style="list-style-type: none"> Reserve right-of-way Cooperation among mining companies Capacity for existing mining projects Capacity for potential future mining projects Capacity expansion design & priority access/ founding rights for leading mining

Scenario	Preferred Operating Model	Regulatory Framework/ Government Intervention	Benefits	Risks	Key Negotiating Points
			sector		customer • Double track design of railway
4. Danger of stranded mining assets, high potential for unlocking economic potential with multi-user and multi-purpose access	<ul style="list-style-type: none"> • SPV or third party operated model • Haulage regime or access regime (depending on financing and maturity of regulator) 	<ul style="list-style-type: none"> • Blanket or sector specific open access regimes • Equity or golden share of government • Independent regulatory body for monitoring, tariff-oversight and arbitration 	<ul style="list-style-type: none"> • Unlocking the mining potential of the region • Higher government revenues as a result of the development of smaller mining projects • Additional employment opportunities and linkages to the mining sector • Attract non-mining related investment along the corridor, which is likely to be more labour intensive • Increased trade along the corridor 	<ul style="list-style-type: none"> • Delay in negotiations with leading mining company • Delay in government revenues from leading and subsequent mining companies • Leading mining company abandoning project • Difficulty to acquire financing for the project • Loss of efficiency on the railway line • Uncertainty of whom will finance the non-mining related infrastructure 	<ul style="list-style-type: none"> • Reserve right-of-way • Cooperation with subsequent mining companies • Capacity for existing mining projects • Capacity for potential future mining projects • Capacity for non-mining projects • Double track design of railway • Open access to service road for non-mineral cargo • Financing of non-mining related infrastructure • Capacity expansion design & priority access for foundation customer • Cross-subsidization • Open access service road

Scenario	Preferred Operating Model	Regulatory Framework/ Government Intervention	Benefits	Risks	Key Negotiating Points
<p>5. Cross-border potential increase trade and to unlock economic development along the corridor</p>	<ul style="list-style-type: none"> • SPV or third party operated model • Haulage regime or access regime (depending on maturity of regulator) • Integrated border management system 	<ul style="list-style-type: none"> • Tri-party agreement that sets out the open access regime • Intergovernmental railway authority involved in tariff oversight 	<ul style="list-style-type: none"> • Unlocking the mining potential of the region • Higher government revenues as a result of the development of smaller mining projects • Additional employment opportunities and linkages to the mining sector • Attract non-mining related investment along the corridor, which is likely to be more labour intensive • Increased trade along the corridor • Regional integration • Lower capital and operational costs if cross border route is shorter than alternative 	<ul style="list-style-type: none"> • Delay in negotiations with leading mining company • Delay in government revenues from leading and subsequent mining companies • Leading mining company abandoning project • Difficulty to acquire financing for the project • Loss of efficiency on the railway line • Uncertainty of whom will finance the non-mining related infrastructure 	<ul style="list-style-type: none"> • Reserve right-of-way • Cooperation with subsequent mining companies • Capacity for existing mining projects • Capacity for potential future mining projects • Capacity for non-mining projects • Double track design of railway or service road utilization for non-mineral cargo • Financing of non-mining related infrastructure • Capacity expansion design • Cross-subsidization • Transit fee negotiation with neighbouring government • Integrated border management system

The table above shows what has been raised at the beginning of the rail and port section of the framework: The more players that are involved, the more points need to be addressed in the negotiations and the more complex they become. How strongly the government should/can push on each negotiation point will depend on the cost-benefit analysis, the viability of the mining project under a shared-use agreement, and on the willingness of the company to accept these conditions. The government should assess its leverage prior entering the negotiations. This will depend on the characteristics of the mining concession (quality and profitability), market conditions, the costs imposed on companies in competing mining jurisdictions, the likelihood that another mining company will buy the concession and build the infrastructure in question if negotiations fail, and the ease of finding a financier for the project. Ultimately, the legal arrangements of a mining related infrastructure agreement will be the reflection of what is financially doable, rather than the other way around.⁴¹ Any shared use agreement will require the government to provide the leading mining company with founding rights to guarantee its capacity is secured on the infrastructure for the length of the agreement.

⁴¹ Please refer to the IFC (2013): “Fostering the Development of Greenfield Mining-Related Transport Infrastructure Through Project Financing” report to get a better understanding of the viewpoint of financiers when it comes to provide funding for large scale rail and port infrastructure investments related to mining projects.

Framework 2

Shared Use in the context of Power

Introduction

According to the World Bank’s Africa Infrastructure Country Diagnostic, Africa’s largest infrastructure deficit lies in the power sector, whether it is measured in terms of generation capacity, electricity consumption or security of supply. The power generation capacity of the 48 countries of Sub-Saharan Africa (with a combined population of 800 million) roughly equates to the power generation capacity of Spain (with a population of 45 million). Power consumption, at around 124 kilowatt hours per capita per year is only a tenth of the consumption in other developing countries – it corresponds to one 100-watt light bulb per person for three hours a day.⁴² Only one in three Africans has access to electricity and the un-electrified depend primarily on kerosene or diesel. In this context, mining companies often choose to generate their own power to run their operations. This causes a deadweight loss for all parties:

- **for the mines:** although self-generation is often more reliable than the grid, it increases the operating costs of the mine considerably;
- **for the utility:** self-generation means loss of large-scale and anchor customers; and
- **for the country:** self-generation means a less profitable mining sector and reduced opportunities for linkages and sustainable development.

However, as this section explains, by capitalizing on the mining industry’s demand for energy, it is possible to develop the national power generation facilities and electricity transmission systems as well as increase access to electricity in remote areas where mining companies tend to operate. Effective coordination could even result in the mines benefiting from considerable cost-savings.

Key Definitions

Independent Power Producer (IPP): An IPP is an entity which is not a public utility, but which owns facilities to generate electricity for sale to utilities and sometimes end users.

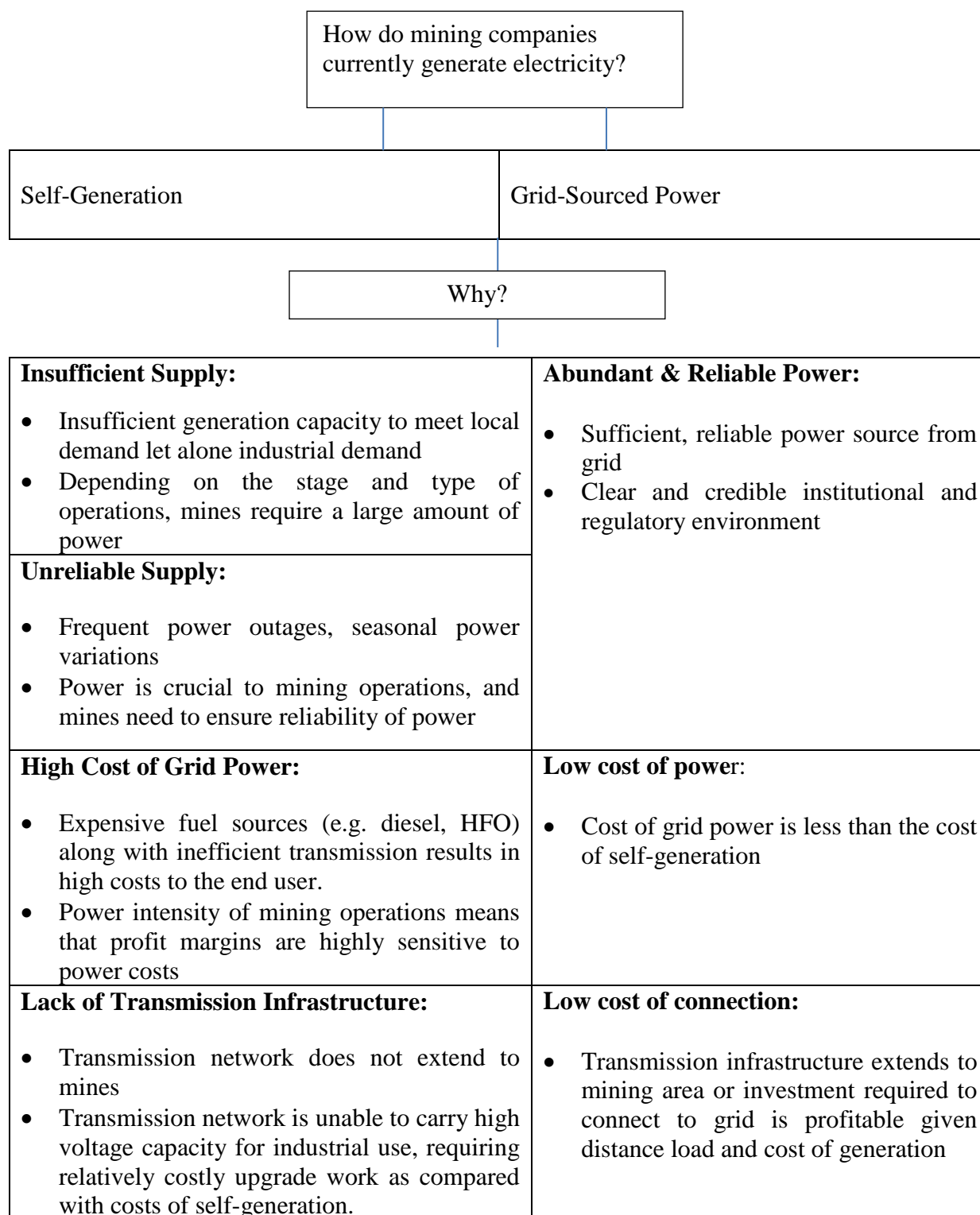
Power Purchase Agreement (PPA): Where capacity expansion is required, the investment costs must be recoverable and revenue streams sufficiently definite into the future to enable the owner to obtain financing on reasonable terms. Therefore, regulations often allow providers and customers to enter into long-term contracts called PPAs, whereby the customers (the utility or other users) commit to buying a minimum amount of capacity from the owner over a longer period. In addition to indicating who would buy the power, “a strong PPA details quantity and cost of power bought, dispatching of plants, fuel metering, interconnection, insurance, force majeure, transfer, termination, change of legal provisions, refinancing arrangements and dispute resolution mechanisms.”⁴³

⁴²World Bank, “Fact Sheet – Infrastructure in Sub-Saharan Africa,” available at: <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/0,,contentMDK:21951811~pagePK:146736~piPK:146830~theSitePK:258644,00.html>.

⁴³ Gratwick, K. N., and A. Eberhard, “An Analysis of Independent Power Projects in Africa: Understanding Development and Investment Outcomes,” Development Policy Review 26 (3), 2008.

STEP 1: Assessing the current situation - What is at stake?

An important first step is to assess how mining companies are currently powering their operations, and why they choose this particular arrangement. At the extremes, mining companies are either completely self-sufficient, or able to source their power from national infrastructure. An assessment of the country’s infrastructure situation and institutional gaps is important in order to identify the most realistic scenarios for power-mine synergies and the necessary steps to achieve them.



The type of power sourcing arrangement will also be influenced by the type of mining operation. Mining operations need more or less power depending on the commodity and even more on the processing involved. Aluminium smelting will be a power intensive operation whereas coal, iron-ore, platinum or gold mining will require small amounts of power. Power costs can constitute between 10% and 25% of operational costs and the more the operation is power-intensive, the more the mines will look to source inexpensive power.⁴⁴

STEP 2: Identifying the operational synergies

Leveraging the mining industry’s power demand and its capital investments in power infrastructure can facilitate the development of the national power system. From the situation where mines have to self-generate due to a lack-, or unreliability of national generation and transmission infrastructure, to one where mines can source power from a large-scale grid, there exists the potential for mining companies to help develop the national power sector. The figure below illustrates the wide range of possible potential power arrangements in the space between mine self-generation and grid supply.

Spectrum of Power Sourcing Arrangements

	1 A1	A2	B	C	D	E	F	3 G
Description	Mine produces its own power for its own needs	Mine provides power to community through mini-grids or off-grid solutions	Mine produces its own power and sells excess power to the grid.	The mine is first connected to the grid and is moving into own-generation when more economical (from G to A1)	Coordinated investment by a group of mines /producers/users in one large power plant off-site connected to the grid	Mine invests with government in new and or upgrading of power assets under different arrangements	Mine buys power from an Independent Power Producer (IPP) and serves as an anchor customer	Mine does not produce any power, but buys 100% from the grid
Generation Drivers	Hydro (52.7%) Oil (47.3%)	Hydro (100%)	Hydro (89.6%) Coal(10.4%)	Hydro(99.8%)	Hydro(100%)	Hydro(82.2%) Oil(14.3%) Coal(3.5%)	Hydro(100%)	Hydro(81.1%) Coal(12.2%), Oil(6.7%)
Presence	Mali and Guinea (Hydro) Sierra Leone, Liberia (Oil)	Guinea and Madagascar	Zimbabwe, Mozambique and Cameroon	DRC and Tanzania	Ghana	Niger and DRC	South Africa	Mozambique Zambia

Source: World Bank⁴⁵

This section explores a range of options between self-supply and grid supply.

a. Mines and Supply to Communities: Leveraging Mines for Rural Electrification

In the situation where there is no grid, or the grid is too remote from the mining area, mines will have little choice but to self-generate. In this case, opportunities exist for mines to supply power to surrounding areas. They could utilize off-grid renewable energy solutions – these

⁴⁴ Sudeshna Ghosh Banerjee, Zayra Romo, Gary McMahon, Perrine Toledano, Peter Robinson, Ines Pérez Arroyo, *The Power of the Mine: A Transformative Opportunity for Sub-Saharan Africa*. Washington, DC: World Bank (2015), available at <https://openknowledge.worldbank.org/handle/10986/21402> License: CC BY 3.0 IGO

⁴⁵ Ibid.

are becoming more popular among mining companies and more sustainable in terms of operational costs, health, or environmental impacts as compared to diesel-based solutions.⁴⁶ Another option is the development of a mini-grid that could also be based on renewable energy. Such an arrangement could involve the mining companies partnering with donors, NGOs and utilities. For example, the mining company could establish the mini-grid and the utility could be in charge of operations, management, tariff collection and any additional policy initiatives.

Example: Mini-grids in Tanzania and Guinea

One current illustration of a mini-grid initiative is a hybrid partnership between Tanzania's state-owned utility TANESCO and private stakeholders, supported by United Nations Industrial Development Organization (UNIDO). The project is called the 2012 Global Environment Facility (GEF4) project and its objective is to build mini-grids based on micro hydropower to improve rural electrification in Tanzania.⁴⁷

Another example is Rio Tinto and Infraco's planned initiative to electrify the town of Beyla, a town of 22,000 inhabitants expecting to grow given its proximity to Rio Tinto's Simandou mine. The project will consist of installing a 1MW hydro power plant on the Cessou river close to the village of Famoila, connecting the hydro plant to the town of Beyla by a 20 km 20kV transmission line and completing and expanding the existing distribution system in Beyla. The project is planned to be owned through an integrated electric distribution utility "Beyla Energy" with a concession to generate and distribute electricity within the prefecture of Beyla.⁴⁸

The 2011 World Bank Africa Infrastructure report notes that governments have been subsidizing the power sector in an effort to increase access to electricity to a wider segment of the population. However, rather than increasing access, the benefits of these subsidies have largely accrued to already connected rich and non-poor consumers, to the exclusion of the largely non-grid connected low-income households in these countries. Given that much of the population in these countries remains unconnected, the current power tariff subsidy system has had little effect on expanding access to power. Governments could consider re-directing public funds away from the usual, largely ineffective power tariff subsidies towards a more focused subsidization of mini-grid development, which could lead to a more sustainable strategy for collaboration with mining companies on rural electrification initiatives. Such initiatives could also increase a mining company's social license to operate in these areas, in addition to assisting the government in meeting their rural electrification goals.

b. Mines and Excess Supply: Leveraging Mines for Increased Power Generation

⁴⁶ For instance, there is a current effort by Semafo Inc, a gold mining company in Burkina Faso, to build a 20MW solar power plant under its subsidiary Semafo Energy, in partnership with the Burkinabe government. In addition, in 2012, Exxaro Resources which is South Africa's second largest coal miner, announced plans to generate clean energy through the establishment of 5 renewable energy projects- 2 solar and 3 wind projects- in a joint venture with an undisclosed third party (source: World Bank report - footnote 43)

⁴⁷ Oxford Policy Management, 2012.

⁴⁸ Infraco website, available at: <http://www.infracoafrica.com/projects-guinea-beylapowerproject.asp>.

Where local conditions have led mining companies to generate their own power, there may be situations in which mining companies can be incentivized to produce extra power capacity to be sold back to the grid.

Example: Excess Power Supply by Mines in Mozambique

In Mozambique, the presence of non-exportable low quality thermal coal in the Moatize deposits presents the opportunity for mining companies to build power plants both for their own consumption and to sell power generated from thermal coal deposits for local consumption. At present, four mining companies in the region have plans to construct coal-fired power stations, which use their thermal coal deposits for the generation of electricity. The power will be used in their own mining operations, and the excess will be purchased and distributed by Electricidade de Moçambique (EDM), or by members of the Southern African Power Pool. The most advanced of these plans is Vale’s Moatize plant. The initial phase would involve a net plant capacity of 270MW, of which the mine will consume 220MW, with the remainder to be sold to EDM, transmitted via the Northern Grid.⁴⁹

Given the capital expenditure involved in building self-generation and the large potential economies of scale in power investments, there may be a business case for mines to coordinate a joint-investment.

c. Mines as an anchor for IPPs: Leveraging mines for increased generation

Given their large power needs, mines can also be used as anchor customers for IPP generation investments. If the proposed generation investment promises cheaper power than their current self-generation arrangements on a reliable basis, mining companies could be incentivized to buy power from such projects under an offtake agreement, which provides demand guarantees to increase the bankability of the power investment.

The structure of such an arrangement can take a number of forms. For example, the mine could simply be the offtaker in an IPP project, or it could play a more active role in the IPP investment as part of a joint venture.

Example: Mine as an Offtaker in Sierra Leone

In Sierra Leone, the Government has signed a Heads of Terms with Joule Africa, an Independent Power Producer to develop Bumbuna II and the extension of Bumbuna I. They have completed a pre-feasibility study which reveals that the project could generate power of up to 372MW with a firm capacity of 112MW in the dry season. Interviews with London Mining indicate that they have expressed interest in being an offtaker for some of this power, under the right circumstances.⁵⁰

Example: Mines in Joint Venture Power Investment in Mauritania

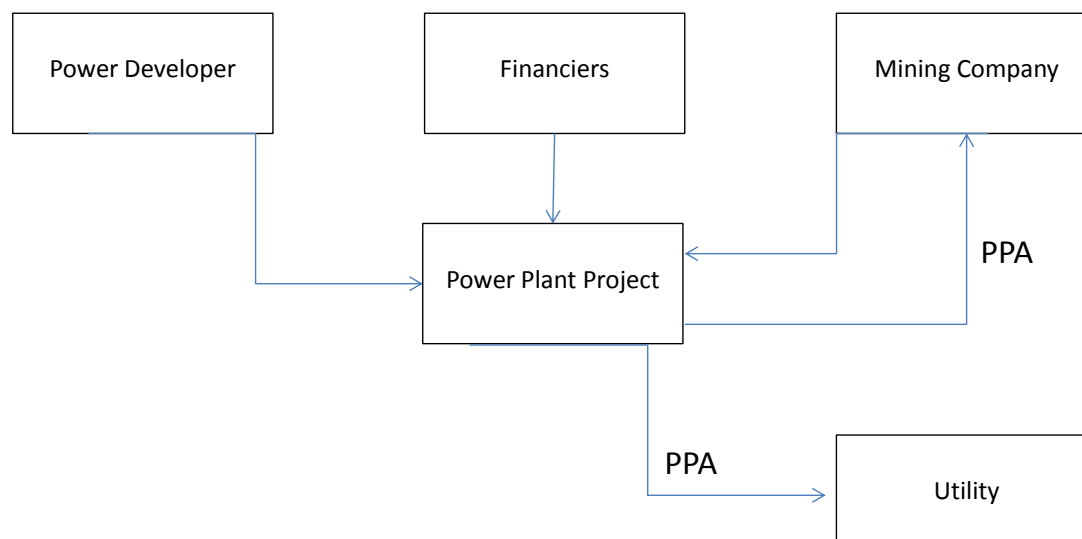
Under a PPP agreement, the government, the national power utility (40%), the state-owned mining company SNIM (26%) and Kinross Gold Corp. (34%) will develop a 350MW gas power plant using the Banda offshore gas field in Mauritania. The arrangement under this

⁴⁹ Nicolas Maennling , Alpa Shah and Sophie Thomashausen , “A Framework to Approach the Issue of Shared Use of Mining-Related Infrastructure: Case Study: Mozambique,” Columbia Center on Sustainable Investment, Columbia University, (2014).

⁵⁰ Ibid.

PPP is to set up a club of auto-producers with PPAs between the users and the shareholders: the goal is to make a minimum return out of the investment, keep the costs down (12 cts/kwh) and shareholder-users (such as Kinross) will still have to pay a user fee. As a result, the electricity will be used for mining activities, domestic Mauritanian consumption and could eventually be exported to neighbouring countries.⁵¹

Role of Mine in Mine-IPP Joint Venture



The mining company facilitates the investment as:

- **Investment Initiator:** The mining company would initiate/facilitate the investment in the first instance, and can bring in strong developers, EPC contractors, lenders, investors and advisers. The mining company's commercial incentives to keep costs down would facilitate the use of more competitive contractors.
- **Equity Investor:** The mining company, in the planned investments mentioned above, could contribute to meeting the equity requirements of the project.
- **Partial offtaker:** The mining company will offtake a certain proportion of the power. This will help with the bankability of the deal, as the mining company may be a credible off-taker, and the company's overall balance sheet and creditworthiness can help to underpin the deal. The credibility of the mine as an off-taker should be carefully assessed. For instance, some miners are junior companies with an undiversified portfolio. In this situation an IPP would be inherently taking on some country/project specific risk, without the cushion of a multinational balance sheet.

While it is preferable for a significant amount of power to be bought up by the government to be supplied nationally to end users, the state-owned public utility is often a significantly less credit-worthy partner and a guaranteed offtake from the utility would not ensure the bankability of the project. As public utilities generally also subsidize power tariffs, so that the full cost of financing the investment is unlikely to be reflected as a pass through in the tariff, lenders will require additional comfort that they will be repaid.⁵² The presence of the utility as an offtaker therefore necessitates a number of risk mitigation demands from financiers, such as sovereign guarantees, escrow accounts, letters of credit and Multilateral Investment Guarantee Agency (MIGA) insurance.

⁵¹ World Bank, "The Power Of The Mine: A Transformative Opportunity For Sub-Saharan Africa," op.cit.

⁵² Interview with Electricidade de Moçambique in Maputo, August 2013.

d. Mines source from Grid: Leveraging Mines for Increased Generation and Transmission Infrastructure

Finally, we can consider the case where there is sufficient and inexpensive power available through the national grid to supply the mines. In this case, it is important that the mine's power demand does not overburden the grid, or that mine supply is not prioritized over residential demand.

However, with the prospect of inexpensive access to electricity, such as in the case of gas-based or hydro-based grids, mining companies will generally be willing to work with utilities and sometimes competitors under various commercial arrangements to set up, or just upgrade generation, transmission and distribution capacity to meet their demand.

It is important to find commercial frameworks that lead to cost savings for the mining industry and allow the development of the country's power infrastructure. Several commercial frameworks are proposed below.

- **Mines extend transmission infrastructure:** Mining companies may have to pay some of the investment costs of transmission lines and substations to connect to the grid and get compensated.

A common arrangement between the mining company and the utility to improve the national grid is for the mine to both build the infrastructure and provide a 'loan' to the utility that can be repaid (with interest) in cash, or in kind through an off-set in the invoicing for power purchased by the mine, as is the case in Burkina Faso with Semafo and in DRC with Katanga Mining. The extension of transmission infrastructure to remote mining areas could then allow the connection of small-scale users of power in the area to be connected to the national supply, if the utility is able to install the necessary distribution, monitoring and enforcement infrastructure.

Example: Transmission Investments in Burkina Faso and the Democratic Republic of the Congo (DRC)

In October 2011 the Canadian-based mining company Semafo signed an agreement with the Burkina Faso Government for the electricity supply to its Mana mine through a transmission line estimated to cost US\$19 million and reduce the mine power costs by US\$40/oz. Sonabel, the national power utility, would receive half of the money from Semafo and repay it over eight years following commissioning. As a result of such an investment, energy costs for the mine will drop from \$0.31/kWh to \$0.18/kWh.

In the DRC, to avoid costly self-generation, Katanga Mining Ltd took over the upgrade of the national grid, and in March 2012 signed an agreement with SNEL, DRC's public utility, for a US\$283.5 million loan. US\$189 million will be reimbursed to the company by its affiliates at the mines of Kansuki and Mutanda which will utilize a substantial part of the new electricity produced, 10% of the power generated will be extra and sold back to SNEL and US\$261.8 million of this investment will be reimbursed through utility bill credits with SNEL paying interests on the loan.⁵³

⁵³ World Bank, "The Power Of The Mine: A Transformative Opportunity For Sub-Saharan Africa," op.cit.

To limit the number of loans incurred by the public utility, the potential for pooling resources between mining companies around shared transmission infrastructure should always be assessed. In some mining basin such as the coal basin in Tete province in Mozambique, mines might be close enough to be able to share the same sub-station and the transmission line.

- **Mines get priority access and either provide emergency generation capacity or pay a premium rate:** Energy crises are frequent in Africa and load shedding can generate higher costs of production for the mines; therefore mines are always interested in priority access to power supply. Since it can come at a cost for the rest of the country, there is an absolute need for a mutually beneficial compensation scheme in place:
 - Mines could invest in extra emergency power infrastructure
 - Mines could make available the idle capacity of their emergency generators
 - Mines could negotiate a premium access rate

Example: Mines get priority access

In Ghana, the 2006-2007 energy crisis led a consortium of four mining companies (Newmont Ghana Gold Ltd, AngloGold Ashanti, Goldfields Ghana, Golden Star Resources) to build an 80 megawatt dual fuel Thermal Plant at Tema. It was completed in 2007. As part of the agreement, the ownership was transferred to the public utility, the Volta River Authority, and the plant now serves as a back-up for the mines in case of another energy crisis.⁵⁴

In Zimbabwe, New Dawn Mining Corp.'s gold Turk-Angelus Mine is connected to the national power grid through an 88KVA line and has three generators that are used as a standby during any faults and that can supply 3MW of power. However, the Zimbabwe Electricity Supply Authority (ZESA) proposed the introduction of an uninterrupted electrical supply arrangement with power charged at a premium rate, which is still lower than the cost of operating the generators. Given that a suitable power line was available, the mine opted to enter into an agreement with ZESA and moved its generators to another location.⁵⁵

A last example comes from *India*: In 2006 the city of Pune in the state of Maharashtra, experienced load shedding for two to three hours per day due to an estimated shortfall of 90MW of generating capacity of the Maharashtra State Power Generation Company. At the same time, the top 30 industrial operators in Pune had unutilized captive capacity of 100MW. In this context, the Confederation of Indian Industries (CII), which comprises more than 9,000 companies, including mining companies and energy producers, proposed to the Maharashtra Electricity Regulatory Commission that the operators utilize more of their idle capacity and less of the grid power to meet the shortfall in exchange for compensation based on the difference between the grid high-transmission tariff and its generating cost. The compensation costs were to be borne by consumers in Pune, in return for no load-shedding.⁵⁶

⁵⁴ Ibid.

⁵⁵ Ibid.

⁵⁶ Perrine Toledano, "Leveraging mining demand to improve host country's power infrastructure," Columbia Center on Sustainable International Investment, Columbia University (September 2012), available at: <http://ccsi.columbia.edu/files/2014/05/CCSI-Policy-Paper-Leveraging-mining-industry's-energy-demand-to-improve-host-country's-power-infrastructure-Sept-20122.pdf>

- **Mining companies accept to pay higher tariffs if the investment is carried out by the utility:** Alternatively, by paying higher tariffs mines could increase the financial capacity of the public utility, allow the utility to reach cost–recovery level and as a result allow the utility itself to invest in generation and transmission. However the framework underpinning the mine’s purchase of power must allow the flexibility to increase prices, not only to account for inflation, but also to allow for the cost of wider infrastructure investments to be reflected in the tariffs. Given the mining companies’ need for certainty, and preference to lock in tariffs in long-term offtake agreements, the parameters for the inclusion of such costs should be pre-agreed.

Example: Mines pay higher tariffs to fund power sector investment in Zambia

In Zambia, the copper industry growth has been constrained by available electricity supply. At the same time, the electricity tariffs for the mines were the lowest in Africa and protected by a stabilization agreement between 2008 and 2011. Copperbelt Energy Corporation Plc, the independent power transmission group warned that industrial electricity tariffs would need to increase by 20-30% per year to reflect actual costs and support new investments in power generation. In 2011, with the tariff stabilization coming to an end and under approval of the regulator, Zesco, the public utility, increased by 30% its bulk supply tariff to CEC which was passed on to the mines.⁵⁷

STEP 3: Verifying the necessary preconditions

3A: What are the necessary preconditions for each potential power-mine synergy?

Solution	Necessary Preconditions
Mines + Rural Electrification	<ul style="list-style-type: none"> • Contractual requirement for mines to participate in rural electrification initiatives • Coordination between mining companies and donor/government/NGOs • Clear framework articulating responsibilities of each party • Capacity of each party to carry out their role • Presence of local government/utility in rural areas • Effective demand/willingness to pay for power in communities
Mines + Excess Supply	<ul style="list-style-type: none"> • Liberalized power market with clear legislative and regulatory framework for private sector auto producers of power • Excess capacity built in at design phase of power plant project • Commercially viable offtake agreement between company and utility • Credible state-owned utility, if acting as offtaker • Adequate transmission infrastructure to offtake and distribute power • Demand for excess power (national or as part of regional power)

⁵⁷ World Bank, “The Power Of The Mine: A Transformative Opportunity For Sub-Saharan Africa” op cit.

	pool)
Mines as an anchor for IPPs	<ul style="list-style-type: none"> • Liberalized power market with clear legislative and regulatory framework for IPPs • Sufficient IPP power supply to meet mining demand as well as excess supply for national grid • Sufficiently low cost and reliable power supply anticipated (vis-à-vis current self-supply arrangement) to incentivise mining company to act as offtaker • Power plant to be available to fit with mine’s planned timetable. Other mine logistics (rail, port) not likely to delay mining project and thus mining power demand • Investment in transmission infrastructure to supply power to mine site • Utility to act as a credible partial offtaker of power from IPP
Mines source from grid	<ul style="list-style-type: none"> • Sufficient and reliable national power supply to meet demand • Cost of power sufficiently low to dis-incentivize mining company from self-supply, but sufficiently high to enable utility to achieve cost recovery (covering capital and operating costs) • Transmission infrastructure in place to supply mine or extension as a manageable investment • Management of mine’s power demand so as not to saturate the national grid • Commercial frameworks in place to incentivize mines to participate in or fund upgrade of transmission infrastructure and development of national power generation capacity

3B: Are these preconditions in place?

a. Institutional, Legal and Regulatory Framework

Legal Framework

In order to realize these power-mine synergies, countries need to provide a sufficiently predictable environment to attract investments by mining companies and IPPs in the power sector. Until recently, the power sectors of many African countries have been monopolized by a vertically integrated state-owned utility. The national electricity sectors also need to be sufficiently liberalized to allow for the mining investments in power generation to supplement the public utility’s investments or for the mining demand to attract IPPs.

In most African countries, the purchaser under the PPA is the public entity as the sole buyer. If the system is structured as a wholesale market such as in Ghana, the PPA can be signed between the mining company and a large-scale user, or between the mining company and an IPP. A mining company may be incentivized to invest in extra-capacity where there is no

single-buyer requirement – if the utility’s financial capacity is limited, or it is uncreditworthy, then the mining company can count on the presence of large customers for excess generation. The challenge of this arrangement is that the excess generation would be “captured” by large-scale end-users, thus leaving the public utility with low levels of income.⁵⁸ This arrangement should therefore be carefully assessed against projections of power demand.

While liberalization efforts have begun or are in progress, in many countries legislation to allow private participation in the power sector is still in development. When the legal framework is ill-defined, many critical details such as the clear sharing of responsibilities between public and private parties, performance obligations, dispute resolution mechanisms and the ownership status of assets are left to negotiation and give little visibility to the investor. This approach of “regulation by contract” will only work with a supportive legal environment providing a clear and non-conflicting framework and which can ensure the enforceability of contracts. Its success will also depend on both the government’s capacity to negotiate a very complex contract and its commitment to transparency, given that contracts are often bilaterally negotiated behind closed doors.

Regulator

In addition, such a liberalized market must be well-regulated. Strong regulatory oversight is fundamental to attract IPPs to serve the mines or for the mines to act as IPPs by selling their excess supply.

The regulator must manage a number of responsibilities:

- **First**, the regulator must manage risks and monitor contractual obligations with IPPs. Regulators play an important role to enforce contracts, as well as to strengthen the position of utilities that cannot provide sovereign guarantees—this could be through mechanisms such as such as escrow accounts, profit repatriation, and guarantees against nationalization.
- **Second**, regulatory oversight of tariffs charged by the mining company selling under the PPA is necessary whatever the structure of the power market (vertically integrated with private participation, wholesale market or retail markets) to ensure the viability of the market for end-users.⁵⁹ Of course to incentivize companies to generate extra electricity, prices cannot be set too low. The regulatory institution must set cost-recovery tariffs to enable the utility and private companies to maintain equipment and make further capital investments. One method of price regulation is to have a light touch system whereby the regulator does not fix the prices, but reviews the prices that have been fixed by the parties, and issues comments on their reasonableness until they reach an adequate level, as is the case in Nigeria for instance.⁶⁰

⁵⁸ Toledano, “Leveraging mining demand to improve host country’s power infrastructure,” op.cit

⁵⁹ The cost of bulk power supply is generally 50 to 70% of the distributor’s total supply costs. In Sub-Saharan Africa it has been shown that the price charged by the 28 IPPs under a PPA, as of 2008, ranges from US\$ 0.04/kWh to 0.40/kWh. The upper bound is often unaffordable for Sub-Saharan Africa public utilities. (Source: John Besant-Jones, Bernard Tenenbaum and Prasad Tallapragada, “Regulatory review of power purchase agreements: A proposed benchmarking methodology” (Washington, DC: The International Bank for Reconstruction and Development/ The World Bank Group, 2008)).

⁶⁰ Toledano, “Leveraging mining demand to improve host country’s power infrastructure,” op.cit

- **Third**, there is a need to ensure that mining companies have access to the transmission network at non-discriminatory tariffs when they are authorized to sell power to third parties. This is particularly needed in a context where the utility might be tempted to increase its prices for competitors, and favour the electricity produced by its own generators.⁶¹

It should be noted, that the most appropriate regulatory system depends on the institutional context and the reforms being undertaken. It may be that an independent regulator is not necessarily essential to the reform process. If the institutional capacity of a country is limited, they could instead outsource regulatory functions to a third party or expert panel.⁶²

Questions:

- Is a clear legal and regulatory framework in place in the power sector?
- Does the regulatory body have enough capacity to perform its function?
- Can the framework and institutions be strengthened through capacity building to reach necessary levels?
- Are there other constraints aside from lack of capacity which might impede a well-functioning institutional environment (e.g. political economy considerations)?

b. State-Owned Utility

Under the arrangements described under Step 2, the utility will be the main partner of the mining company and associated IPPs, and therefore its financial health and creditworthiness is essential to such efforts, and will determine the range of possible arrangements which the mines and the private sector will be willing to engage in.

When acting as an offtaker of power, there should be enough credibility in the utility's ability to distribute this power to consumers with a sustained ability to pay for the power. For many African countries, participation in a regional power pool can help matters, reducing the financial risk to the utility and therefore such power investments because excess supply will have an immediate outlet for sale into the regional energy market.

Questions:

- Is the utility sufficiently robust, credible and creditworthy to act as a partner to the mines and associated IPPs?
- If not, what are the main constraints which are undermining the health of the utility?
- Is an adequate reform process underway to ensure the financial health and capacity of the utility in future?

c. Planning framework

Few countries have explicitly incorporated the power demands and investment plans of the mining sector into their power master plans for the country. This has led to inadequate national transmission grids. The grid may be insufficient with respect to its coverage, or its capacity to transmit power. Many mines operate in remote areas not reached by the grid

⁶¹ Ibid.

⁶² World Bank, "Africa's Power Infrastructure: Investment, Integration, Efficiency" (2011).

infrastructure which necessitates additional investment. Low and medium voltage systems are inadequate to transmit the high voltage power needed or sold by mining companies. Even where high voltage systems are in place, if these have not been well maintained, additional restoration work may be necessary before additional industrial supply can be managed. In Guinea, the lack of a strong, efficient transmission system explains why mines are self-generating. In the DRC, poor transmission links in the Katanga region led to collaboration between the mines and the public utility to upgrade the links.⁶³ Similarly, there are also situations whereby the transmission network is not adapted to carry the load that mines could sell back to the grid. For instance in Mozambique, Vale and Rio Tinto designed coal-fired power plants with a capacity to sell 100MW to the local grid and 290MW to the South African Power Pool but given the bottlenecks in infrastructure and the delay in construction of the backbone grid, only 50MW from those plants would be evacuated.⁶⁴

In many African countries, master plans are outdated, rigid, and do not reflect changes in price and availability of fuel and equipment and the resulting least-cost arrangements, let alone the mining synergies.

This situation might be improved under the following conditions:

- If the ministry of energy and mining are housed under the same ministry, as is the case in Tanzania, Mauritania and Cameroon.
- If the private sector is brought into partnership with the government to develop large hydropower and other generation projects through a specialised entity, such as the Office for the Promotion of Private Power Investment (OPPI) in Zambia.
- If the mines and other big users of power are involved in planning how best to exploit the country's hydropower resources, facilitated by the recently formulated Electricity Law, such as in Cameroon. The new legal framework requires private developers to compete for hydro sites, except where the site is to be allocated to a mine for the development of power for its own needs. In this case the law requires the generation of surplus electricity which is to be sold to the grid at cost recovery tariffs, all to be determined by the regulator as explained in the box below.

In a Policy Letter signed by the Prime Minister, dated February 17, 2012, the Government of Cameroon committed itself to develop all secondary legislation under the 2011 Electricity Law in consultation with stakeholders. In particular this secondary legislation will stipulate the principles to be used for determining the quantity of electricity allocated to the public grid and it will include i) domestic supply and demand projections, ii) preference for supply to domestic consumers ahead of industrial consumers or export of electricity, iii) existing arrangements between auto-producers and the public grid concessionaire, iv) the physical characteristics of the site and v) electricity demand of the auto-producer.⁶⁵

⁶³ World Bank, "The Power Of The Mine: A Transformative Opportunity For Sub-Saharan Africa," op cit..

⁶⁴ Ibid

⁶⁵ World Bank, "Project Appraisal Document: Lom Pangar Hydropower Project," (2012), available at: <http://siteresources.worldbank.org/INTCAMEROON/Resources/LPHP-PAD-Mar2012.pdf>

Such policy planning and sector coordination is especially required when:

- the government's intention is to attract IPPs using mining demand as an anchor for such investments, but with the objective of off-taking part of the IPP's power to also serve other user demand; and
- the government's intention is to tap into the high voltage bulk power lines that mines might build to access the grid: in this case, significant additional infrastructure would be necessary (substations, transformers) in order for the power supply to step down to a voltage level which can be used by small-scale industrial or agricultural users. In addition, for such smaller-scale users to access the grid supply, an active utility is required to install distribution infrastructure, monitor usage, and collect payments in these areas.

Given the exposure to risks and the capital expenditure involved in both of these undertakings, anticipation of and planning for potential demand is necessary.

Planning for power and mining synergies, however, is sometimes relegated to second place when the "pit-to-port" transport logistics of mining operations is a constraint. For example, in Guinea and Mozambique, the expansion of iron ore mining and coking coal exports is constrained much more by transport constraints than by electricity concerns.

Questions:

- Is the Power Master Plan integrating the growth of the mining demand for energy?
- Does the government have in place coordination platforms with the mining sector?
- Has the government anticipated the growth in energy demand and the possibility to meet this demand by leveraging generation and transmission infrastructure put in place to serve the needs of the mine?
- Are infrastructure constraints impeding progress in the realization of mine-power synergies? Can these constraints be overcome?
- For transmission infrastructure, is there a role for donors to play in funding transmission lines/reinforcement projects? (e.g. World Bank's Inga to Kasumbalesa transmission line reinforcement project in DRC⁶⁶)
- Does the necessary commercial framework exist for the mining companies/private sector to fund the transmission and recoup the investment?

⁶⁶ World Bank, "Project Southern African Power Market project and restructuring for the Southern African Power Market Program," (2012).

STEP 4: Negotiating points

	Necessary Preconditions	Negotiating Points
Mines +Rural Electrification	<ul style="list-style-type: none"> • Contractual requirement for mines to participate in rural electrification initiatives. • Coordination between mining companies and donor/government/NGOs. • Clear framework articulating responsibilities of each party. • Capacity of each party to carry out their role. • Presence of local government/utility in rural areas. • Effective demand/willingness to pay for power in communities. 	<ul style="list-style-type: none"> • Is this part of a mining company’s CSR initiatives or is it to be a contractual obligation (developing model concession agreements mandating the provision of electricity within a certain radius would increase certainty for investors, put all mining companies on an equal footing in their corporate social responsibility programs, and increase the accountability of government as the contract enforcement authority⁶⁷) • Which parties will be involved (government, utility, donors, NGOs)? • What are the responsibilities of each party? • How will the initiative be sustained after the mine leaves? • Is there a need to give a financial incentive to ensure a more sustainable initiative from the mine? If so, the subsidies currently used for social tariffs might be reoriented to support a mini-grid.
Mines + Excess Supply	<ul style="list-style-type: none"> • Liberalized power market with clear legislative and regulatory framework for private sector power producers • Excess capacity built in at design phase of power plant project. • Commercially viable offtake agreement between company and utility • Credible state-owned utility, if acting as offtaker, • Adequate transmission infrastructure to offtake and distribute power 	<ul style="list-style-type: none"> • How much excess power should be mandated e.g. a certain % excess power above the mines planned plant size? • Is there scope for coordination, resource pooling and joint strategy among the different mining companies operating in the region? • What are the terms of the Power Purchase Agreement (Power Price, Length of Agreement)? Power purchase agreement must be commercially viable for mining company as well as affordable to utility. • Is the public utility a viable partner? Mining company may

⁶⁷ Toledano, “ Leveraging mining demand to improve host country’s power infrastructure,” op cit..

	<ul style="list-style-type: none"> • Demand for excess power (national or as part of regional power pool) 	<p>demand additional security if utility is not sufficiently creditworthy (e.g. sovereign guarantee, MIGA insurance, escrow accounts, letters of credit)</p> <ul style="list-style-type: none"> • At what point does the offtake occur? Who is responsible for transmission and distribution of power? Is there sufficient demand for this excess power in the national/regional market? • If at negotiation/feasibility study stage, conditions are not yet in place to distribute power, can the power plant be designed and constructed so that it can be expanded on a commercially feasible basis? • What will become of the infrastructure when the mine ceases operations?
<p>Mines as an anchor for IPPs</p>	<ul style="list-style-type: none"> • Liberalized power market with clear legislative and regulatory framework for IPPs. • Sufficient IPP power supply to meet mining demand as well as excess supply for national grid. • Sufficiently low cost and reliable power supply anticipated (vis-à-vis current self-supply arrangement) to incentivise mining company to act as offtaker. • Power plant to be available to fit with mine’s planned timetable. Other mine logistics (rail, port) not likely to delay mining project and thus mining power demand. • Investment in transmission infrastructure to supply power to mine site. • Utility to act as a credible partial offtaker of power from IPP. 	<ul style="list-style-type: none"> • What structure will this investment take – will the mine simply act as an offtaker, or participate actively as a member of a joint venture in the IPP investment? • Is the timeframe for commissioning the power plant in line with the mining operations? What provisions will be made for delays in power availability? Have risk assessments and default possibilities been sufficiently taken into account? Are completion guarantees and operating guarantees necessary? • How much of the generated power will the mine offtake? (Balance between mining needs and supply to national grid) • What are the terms of the Power Purchase Agreement (Power Price, Length of Agreement)? Do the terms vary between mine and utility? • How will the PPA be structured i.e. single party PPA with complete offtake and redistribution by utility vs. multiparty PPA from IPP to individual end users? • Is the public utility a viable partner? IPP may demand additional security if utility is not sufficiently creditworthy (e.g. sovereign guarantee, MIGA insurance, escrow accounts, letters of credit)

		<ul style="list-style-type: none"> • Is the mining company a viable partner? If not a multi-national company and significant country/project risk IPP may demand additional security if utility is not sufficiently creditworthy (e.g. escrow accounts, letters of credit) • Who will be responsible for transmission and distribution of power, both to the mines and to the utility? • What provisions can be made for when the mine ceases operations?
<p>Mines source from Grid</p>	<ul style="list-style-type: none"> • Sufficient and reliable national power supply to meet demand. • Cost of power sufficiently low to disincentivize mining company from self-supply, but sufficiently high to enable utility to achieve cost recovery (covering capital and operating costs) • Transmission infrastructure in place to supply mine or extension as a manageable investment. • Management of mine’s power demand so as not to saturate the national grid. • Commercial frameworks in place to incentivize mines to participate in or fund upgrade of transmission infrastructure and development of national power generation capacity. 	<ul style="list-style-type: none"> • Who will be responsible for transmission and distribution of power to the mines? • If transmission infrastructure is financed by the private sector, will ownership be transferred to the utility? How will investment be recovered? • How can the transmission design ensure that minimal additional investment in distribution infrastructure can allow smaller users to tap into grid supply? • How will mines contribute to ensuring that their power demand does not overburden the grid? <ul style="list-style-type: none"> ○ In exchange for priority access in the event of load shedding, what can mines provide in terms of additional generation capacity to expand the grid supply? E.g. investment in extra emergency power infrastructure, making available the idle capacity of their emergency generators. ○ Can a margin be charged on the power tariff for the mines to facilitate the utility’s investment in additional power generation and transmission infrastructure?

Framework 3

Shared Use in the context of Water

Introduction

To meet the Millennium Development Goals (MDGs) of halving the proportion of people without sustainable access to safe drinking water⁶⁸ and basic sanitation by 2015, the African Infrastructure Country Diagnostic estimates that the 48 states in Sub-Saharan Africa would collectively need to have been spending approximately US\$16.5 billion on water infrastructure per year between 2006 and 2015. This far exceeds the current estimated annual spend of US\$3.6 billion.⁶⁹ While operational inefficiencies, poorly targeted subsidies and underpricing of water supply services account for part of the reason that the MDGs will not be met, the overall financing gap for the water sector is still huge at an estimated US\$7.8 billion a year.

At the same time, water is also of critical importance in mining. Large volumes of water are required at each phase of the mining process to suppress dust, process and mine ore, cool and wash mining equipment, manage waste tailings, and for consumption by mining communities. Without water, a mine cannot operate. Yet, mining companies increasingly find themselves operating in water stressed environments where there is a physical shortage of fresh water, or water availability for the mines is limited by regulation, and considerable investment in water infrastructure is required to ensure a reliable water supply for mining operations. Estimates suggest that the mining sector's total annual expenditure⁷⁰ on water-related infrastructure globally in 2011 was \$7.7 billion.⁷¹ The most important sectors responsible for this growth in expenditure are water supply, reuse, metals recovery and effluent treatment.

In addition, mines are frequently located in places where access to safe and reliable water services is inadequate to meet local community requirements. The perception that mines may be draining available water resources, or are polluting or altering the course of existing water

⁶⁸ **Access to safe drinking water** is “measured by the number of people who have a reasonable means of getting an adequate amount of clean water, expressed as a percentage of the total population. It reflects the health of a country's people and the country's ability to collect, clean, and distribute water. In urban areas “reasonable” access means there is a public fountain or water spigot located within 200 meters of the household. In rural areas, it implies that members of the household do not have to spend excessive time each day fetching water. Water is safe or unsafe depending on the amount of bacteria in it. An adequate amount of water is enough to satisfy metabolic, hygienic, and domestic requirements, usually about 20 liters (about 4 gallons) per person per day.” Source: World Bank's Development Education Program, available at:

<http://www.worldbank.org/depweb/english/modules/envirom/water/texta.html>.

⁶⁹ “Chapter 16: Water Supply: Hitting the Target?” in Vivien Foster and Cecilia Briceño-Garmendia eds., *Africa's Infrastructure: A time for Transformation*, World Bank, 2010.

⁷⁰ Whether the expenditure is public, private, by mining companies, or by third parties.

⁷¹ Sarah Thomas, “Water and mining: a love/hate relationship?,” 27(3) *Water World* (2012), available at: <http://www.waterworld.com/articles/wwi/print/volume-27/issue-3/regional-spotlight/latin-america/water-and-mining-a-love-hate.html>; and “Mining a rich seam for water companies,” 12(7) *Global Water Intelligence* (2011), available at: <http://www.globalwaterintel.com/archive/12/7/general/mining-rich-seam-water-companies.html>.

sources can result in considerable social tensions with surrounding communities and result in operational disruptions. Mining companies are also coming under pressure to minimize the environmental impact of their water usage and effluent discharge, where not properly doing so can incur substantial reputational, regulatory, and operational costs.

In this context, governments should ensure that mining-related investments in water infrastructure are aligned with the goals and interests of the communities in which they operate as well as to national development goals. On the one hand, this relates to water quality. Governments need to enact, monitor and enforce tight environmental regulations to require mining companies to minimize their ecological footprint. On the other hand, as [fresh] water sources become scarcer, whether as a result of climate change, low annual rainfall, water pollution, or increasing demands on available water sources, governments need to enact policies that oblige mining companies to minimize fresh water usage, maximize water re-use and recycling, and look to other water sources – such as seawater or sewage waste water, to meet their remaining water supply needs.

To protect against such regulatory limitations on water allocations requires mines to invest in more efficient water management systems and consider the scope for shared use schemes. This framework addresses the scope for synergies between the water infrastructure needs of mines and the water supply needs of surrounding communities.

Key Definitions

Acid Mine Drainage (AMD): a sulphuric acid that is formed when sulphur-bearing materials, such as pyrites in ground, come into contact with air and water. This often occurs in open pit mining when, for example, coal seams are excavated as well as from runoff or seepage from overburden or coal/ ore stockpiles. The presence of AMD increases the acidity (lowers the pH) of water and also has the ability to liberate heavy metals such as cadmium, antimony, arsenic, iron and dissolved solids such as calcium and sulphates, from the rocks it comes into contact with.⁷²

Beneficiation: the mechanical and chemical processes used to extract the desired product from ore (i.e. to improve its grade), the waste product of which is tailings.

Dewatering: The process of draining the water that collects in the open pits during the mining process. Water collects in the open pits when ore or coal is excavated below the water table, or from rainfall.

Open pit (or strip) mining: a type of surface mining to extract ore or coal that lies up to 200m below the surface.⁷³ In the case of coal, once the coal seam is exposed, it is drilled, fractured and systematically mined in strips.⁷⁴

Overburden: the soil and rock which are excavated from open pits to reach a coal seam or mine ore.

Surface run-off: runoff of waste water from the overburden due to rain or flooding

Tailings: the waste stream of ground rock and process effluents (including unrecoverable and uneconomic metals, minerals, chemicals, organics and process water) that are generated in a mine processing plant during beneficiation. Tailings are usually discharged, normally as slurry, to a final storage area commonly known as a Tailings Management Facility (TMF) or Tailings Storage Facility (TSF).⁷⁵

Water scarcity: Water scarcity relates to the availability of clean water. Water scarcity can occur even in areas where there is plenty of rainfall. Flooding, which is normally associated with excessive water availability, can also result in water scarcity to the extent it contaminates clean water sources or disrupts the treatment of water when waste water treatment facilities are overrun with water. How water is conserved, used and distributed in communities, as well as the quality of the water available, can determine if there is enough to meet the demands of households, farms, industry and the environment.

⁷² “Water Management: Waste not, want not,” *Mining Magazine*, July/ August 2010.

⁷³ I. Satyanarayana, “Basics of Open-pit mining”, March 13, 2012, available at www.slideshare.net/isnindian.

⁷⁴ World Coal Association website, “Coal,” available at: <http://www.worldcoal.org/coal/coal-mining/>.

⁷⁵ Tailings.info website, “What are Tailings – Their nature and production,” available at: <http://www.tailings.info/basics/tailings.htm>.

STEP 1: Assessing the current situation: what is at stake?

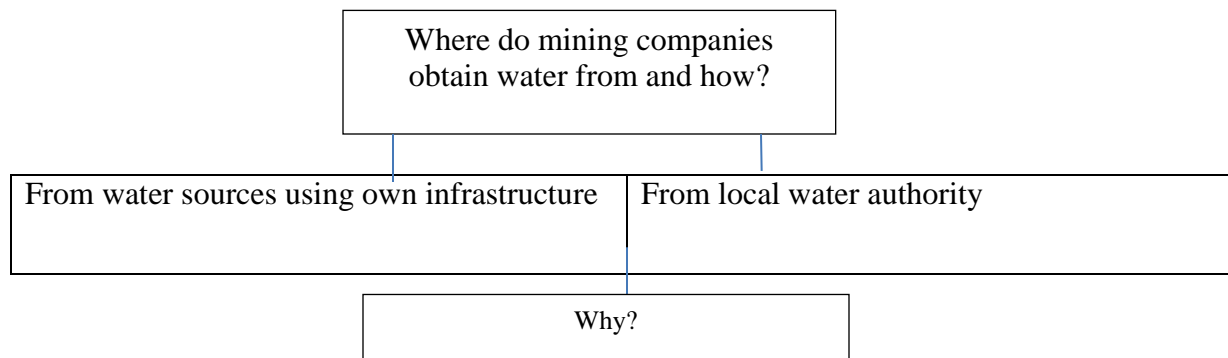
An important first step is to assess the availability of water resources and existing water infrastructure to supply water to - and treat water for the current and projected water users. In terms of *water resources*, information is required as to the available water sources and their renewability, i.e. the annual projected rainfall and/or recharge capacity of any underground aquifers, the current and projected demands on those water resources and the impact of the mining operations on those water resources in relation to their stated water requirements. In terms of a mining operation's fresh water dependency, at the extremes, mining companies either source all their water from fresh water sources (underground or surface water), or from other sources (recycled water, seawater, waste water etc.) when no fresh water is available, or no water license has been awarded for fresh water usage.

Questions to ask in relation to existing water resources and water infrastructure:

- What are the available water resources? What is their annual renewability? (annual projected rainfall and/ or recharge capacity of aquifers)
- Who are the current and projected water users (including the surrounding community and the mine)?
- How much water does the mining operation require and how is the mining company planning to obtain water for its operations?
- What is the existing water infrastructure?

In relation to the *water infrastructure*, an assessment of the existing water supply and treatment situation needs to be made and whether, to the extent such water infrastructure exists, it can or should support a mining operation's water requirements. At the extremes in relation to water supply infrastructure, mining operations are either completely self-sufficient in terms of having their own self-constructed or rehabilitated water infrastructure from which to source [and treat]⁷⁶ water, or are able to obtain water and/or have waste water treated by a local authority.

⁷⁶ Some mining companies interviewed did not treat water and imported bottled water for drinking purposes. Regulation is required to ensure mines are treating all mine waste water, including sewage and other domestic waste water from the on-site mining community.



<p>No, or limited existing water distribution infrastructure at location of mine area, or unreliable supply:</p> <ul style="list-style-type: none"> • Insufficient water infrastructure to meet local water supply demand, let alone industrial use. • Unreliable supply due to poor management of water infrastructure, or power outages (where electricity required to power water pumps).⁷⁷ 	<p>Good existing water infrastructure:</p> <ul style="list-style-type: none"> • Sufficient, reliable water supply from existing water distribution network. • Reliable [and creditworthy] water authority to supply water to the mine site and/ or treat residential waste water from mining community.
<p>Abundant water sources from nearby source without cost (or notional charge)</p>	<p>Low cost of water:</p> <ul style="list-style-type: none"> • Cost of sourcing water from and/or having waste water treated by public authority is lower than building own infrastructure to source water. • Transparent water tariff where pass through costs are known or fixed.
<p>Lack of distribution infrastructure:</p> <ul style="list-style-type: none"> • Distribution network does not extend to mines and the cost of extension is equivalent to, or greater than the cost of self-sourcing water. 	<p>Low cost of connection to existing distribution network:</p> <ul style="list-style-type: none"> • Distribution infrastructure extends to mining area, or investment required to connect to water supply which, on a cost-benefit analysis, is positive taking into account the distance to the water distribution network and cost of sourcing own water.
<p>No operational or credible water authority in the area.</p>	<p>Water authority as credible partner for offtake agreement.</p>

⁷⁷ Reliable water supply is crucial for mining operations – particularly for mining water-intensive commodities such as copper or gold.

Where mining companies source their own water for mining operations, the water source will depend on the water demand of the mine, the availability of water resources, government regulation, and corporate policies:

- a. **Water demand** – Some minerals tend to be more water intensive than others, as is illustrated by the table on the next page from a 2011 Frost & Sullivan study. However, with the increasing reliance on low-grade ores, harder-to-reach mineral deposits and the mining of tailings, mining is generally becoming more intensive in its overall water requirements.⁷⁸ This is because water use is a function of the volume of ore extracted rather than the weight of the finished product sold.⁷⁹ With a low grade product, to generate the same amount of finished product it is necessary to invest in more water infrastructure.⁸⁰
- b. **Availability of fresh water resources** – where water resources are abundant, and/or there is little or no regulation requiring otherwise, mining companies may obtain all, or a large part of their water from fresh water sources. By contrast, when water sources are scarce, or limited fresh water is available to the mining company, it will be required to limit its use of water and/ or to seek alternative water sources.⁸¹
- c. **Law** – Legislation plays an important role in regulating where companies source their water and how efficiently water is managed. Strict environmental regulations and a water licensing regime that only allocates limited water rights to fresh water sources to a mining company may require it to seek alternative sources, to re-use/ recycle water, and to implement more efficient water management systems that require less water in the mining process.
- d. **Corporate policy** – Large-scale mining heavy weights such as Vale, Anglo American, ArcelorMittal, and Rio Tinto have internal policies on water management and usage that are implemented to varying degrees across their global operations.









Water intensity of key mineral and Metals (Frost and Sullivan – 2011)


⁷⁸ “Mining a rich seam for water companies,” *Global Water Intelligence*, Vol. 12, Issue 7 (July 2011), available at: <http://www.globalwaterintel.com/archive/12/7/general/mining-rich-seam-water-companies.html#sthash.xCRPFkVx.dpuf>.

⁷⁹ “Mining a rich seam for water companies,” *Global Water Intelligence*, op cit.

⁸⁰ “Mining a rich seam for water companies,” *Global Water Intelligence*, op cit.

⁸¹ Even in water abundant countries like Liberia, Mozambique, and Sierra Leone, lack of adequate water storage, treatment, and supply infrastructure means that water sources are unevenly distributed and not always available throughout the country, particularly during the dry season. Potable drinking water is also limited.

Mineral/metal type	Water use
Coal 	
Copper 	
Diamond 	
Gold 	
Nickel 	
Iron ore 	
Platinum 	

Key:  High  Medium high  Medium low

STEP 2: Identifying the operational synergies

Across the spectrum from mines operating in an enclave and sourcing their own [fresh] water to mines fully integrated with the water infrastructure constructed and managed by a water authority, there is the potential to leverage the mining industry’s capital investments in water infrastructure for the development of water infrastructure at a local level to meet the drinking water needs of communities.

This section explores three scenarios for leveraging mining-related investments in water infrastructure for development: **First**, where a mining company expands the capacity of its infrastructure – either at the design phase, or during an expansion of its operations, to supply treated water to surrounding communities. **Second**, where a mining company acts as an anchor for investments in off-site water infrastructure which will then supply and/or treat both the water requirements of the mining company(ies) and other users. **Third**, where a mining company

sources its own water, but agrees to collaborate with other stakeholders to rehabilitate, extend, or construct required water infrastructure for surrounding communities.

a. Mines and excess supply of water: leveraging mines for increased drinking water

Alternative sources of water for mining operations can come from (1) dewatering, (2) desalination and (3) mine, or residential waste water.

Mines supply excess treated water from dewatering

As mining companies excavate deeper below ground water levels to extract ore and mineral deposits, water ingress poses an increasing challenge. For active mines, water that collects in the mine pits – whether it be from rainfall, mining activities, or ground water– needs to be drained (“dewatered”) and carefully stored to continue mining activities and ensure that mine waste in this water does not contaminate ground and surface waters. There is the opportunity to mitigate the costs of dewatering and treat dewatered water through collaboration with other mining companies, local authorities, or other water offtakers, at the same time supplying water to local communities.

Example: eMalahleni Water Reclamation Plant in South Africa

Anglo American’s Thermal Coal workings, located in the Witbank coalfields, located around the city of eMalahleni, contain approximately 140,000 megaliters of excess ground water that need to be drained from the excavation pits to continue mining. This water poses serious challenges to the active mines, but more so in closed mines, where without adequate management, the mine water can contaminate groundwater sources. At the same time, the region surrounding eMalahleni is a highly water stressed area with sporadic rainfall and flash flooding when it does rain. eMalhahleni local municipality (ELM) has also been struggling to meet the water needs of the local population.

After a decade of research and development, Anglo American partnered with BHP Billiton pursuant to a joint investigation agreement to commission the eMalahleni Water Reclamation Plant (EWRP) in 2007. The plant is owned and operated by Anglo American, treating water from three Anglo American Thermal Coal operations, while BHP Billiton procured a “right-of-use” of the EWRP to treat water from its South Witbank Colliery on the basis of shared operating costs. In addition, Anglo American negotiated with the ELM to deliver treated water from the plant into the local municipality’s drinking water system.

Using the latest in water purification technology, it is currently desalinating record production volumes of 23 megaliters of water to potable quality per day, 18 megaliters of which is pumped directly into the ELM’s reservoirs, meeting some 20% of its daily water requirements.

Additional water is piped to Greenside, Kleinkopje and Landau collieries as well as various nearby Anglo Coal service departments for domestic use and for mining activities, such as

dust suppression. These operations are now self-sufficient in terms of their water requirements, which eases the serious supply problems of the local municipality.⁸²

Given the capital costs associated with dealing with water ingress, there may be a business case for mining companies to collaborate in treating and re-using the water or supplying it to surrounding communities.

Mines supply excess desalinated water

Where mining companies are operating in highly water scarce areas, seawater may be the only viable option – even if it needs to be piped hundreds of kilometers to the mine site. This requires a huge capital investment from mining companies that includes not only a seawater desalination project, but also a high pressure conveyance pipeline to supply the seawater to the site and an energy transmission project to power the desalination plant, although solar-powered desalination technology is starting to be rolled out.

The direct cost for desalinated seawater supply has been estimated to vary between US\$1 to US\$4 per cubic meter of water, depending on the altitude and distance of the mining operations from the coast.⁸³ This can represent between 3% and 20% of the total direct operational costs of a mining operation, providing a financial incentive to mines both to minimize their water requirements and to investigate joint collaborations to offset some costs.

A scenario where a mining company is required to construct a desalination plant also presents the opportunity for it to provide potable, desalinated water to surrounding communities in partnership with a local water authority. The incremental marginal cost of expanding the capacity of a desalination plant to provide additional water to communities may be relatively small to the mining company compared with the capital investment of financing the construction of a desalination plant. In some cases, such as with the mining company Areva's former operations in Namibia, the Namibian government also required Areva to provide water.

Example: Areva's operations in Namibia

After obtaining a mining license for the Trekkopje uranium mine in northwestern Namibia, Areva was required to construct a seawater supply and desalination plant to provide the mine with water given strict restrictions on water extraction from coastal aquifers. During this process, it collaborated with NamWater, the Namibian water authority, to distribute excess water from the desalination plant to the water short Erongo region.⁸⁴

⁸²WCA Case Study, "eMalahleni Water Reclamation Plant: South Africa," World Coal Association, 2008, available at <http://www.worldcoal.org/resources/case-studies/emalahleni-water-reclamation-plant/>.

⁸³ Raymond Philippe and Hubert Fleming, "Unearthing Efficient Mining Water Solutions," Water World, op cit.

⁸⁴ International Council on Mining & Metals (ICMM), "Water management in mining: a selection of case studies" (2012), available at: <http://www.icmm.com/www.icmm.com/water-case-studies>.

Mines supply excess treated waste water

Mining companies may be able to meet water needs by recycling their own waste water for re-use, or, more innovatively, the organic waste/ sewerage water of neighboring communities after some primary treatment, and then providing excess treated potable water back to communities. An example of this is the Cerro Verde copper and molybdenum mining operations of Freeport-McMoRan Copper & Gold in Arequipa, Peru, where a large wastewater treatment facility is under construction to meet the mining operation's increased water needs when it expands its operations, while at the same time supplying excess water to a surrounding community.⁸⁵

Example: Waste water treatment plant for Arequipa – Cerro Verde expansion⁸⁶

Copper mining requires water to concentrate copper and to process it into cathode copper. The Cerro Verde expansion project, which will triple the mining operations' extraction and processing of sulfide ore, will require an approximate 85% increase in its water requirements.

In 2011, after conducting feasibility studies to evaluate the possibility of constructing a wastewater treatment plant to meet its additional water needs following the expansion of its operations, Cerro Verde entered into discussions with the Regional Government of Arequipa, the national government, SEDAPAR (the local utility) and other local institutions to allow Cerro Verde to finance the engineering and construction of this treatment plant as part of its mine expansion plans. The plant will be operated by SEDAPAR and is expected to treat wastewater from the city of Arequipa, improve the water quality of the Rio Chili and provide a clean supply of water for the agricultural sector in the region. Construction began in 2013.

b. Mines as an anchor for investment in water supply, storage and treatment infrastructure: leveraging mines for increased water supply

Local governments or water authorities can use mining companies as anchor customers to attract investment for water infrastructure investments given the generally large water requirements of mining operations. From a government perspective, a long offtake agreement with a credible and credit-worthy mining company may help to secure financing where (1) the local government is institutionally weak, (2) subsidized water tariffs mean that cost recovery is negative, and (3) it is difficult to obtain reliable data to project consumer demand:

i. Weak institutional capacity of local government/ water authority

⁸⁵ International Council on Mining & Metals (ICMM), "Water management in mining: a selection of case studies" (2012), available at: <http://www.icmm.com/www.icmm.com/water-case-studies>. See also: "Cerro Verde Facts: Cerro Verde Expansion," Freeport-McMoRan Copper & Gold (July 2011), available at: www.fcx.com; and Greta Bourke, "Freeport expects to start construction of US\$4bn Cerro Verde expansion in 2013", *BNAmericas*, July 19, 2012.

⁸⁶ *Ibid.*

Where the local government entity/ water authority is weak, financiers may be reluctant to provide the necessary financing without some comfort that it is sufficiently capable of managing the water supply or treatment services in a manner that maximizes cost-recovery and minimizes operational inefficiencies and losses.

ii. Water tariff

Financiers require some certainty that the net revenues of the water authority will be sufficient over the tenor of the loan to repay them. This may not be the case where the water tariff is below the cost recovery level due to water subsidies. In such a scenario, financiers may be unwilling to provide financing, or will require some form of guarantee or credit support to become comfortable with the country risk they are taking in relation to the water subsidy. Such guarantees can be expensive for governments to source, particularly when they have a low country rating.

iii. Consumer demand

Financiers require reliable data on water consumption in relation to the water infrastructure they will be financing.⁸⁷ Such data may be a challenge to obtain in a developing country context, particularly where census figures are not regularly updated, there is a high economic and social mobility, and many future users of water infrastructure may presently be obtaining their water directly from boreholes and other underground or surface water sources.

Securing a mining company as an offtaker with predictable annual water requirements could mitigate each of these challenges by providing an anchor demand for water supply projections and improving cost recovery where the subsidies charged to (poorer) residential consumers are offset by the higher, unsubsidized water tariffs charged to the mining company.

In turn, *mining companies* will consider entering into offtake agreements with a water authority in anticipation of an upgrade/ expansion/ extension of existing water infrastructure if the proposed water infrastructure: (1) reduces the cost of constructing water infrastructure in an enclave model or sourcing water elsewhere, (2) a reliable water supply can be guaranteed, and (3) they have certainty of the tariff they will be charged:

1. Reduces costs

There may be cost savings to be had if mining companies collaborate with a local authority and/ or other stakeholders to upgrade/ expand/ extend existing water infrastructure.

2. Reliability of supply - step-in rights

⁸⁷ This includes estimates on the size of the population, the coverage area and the average water consumption of the population, which is obtained from data on household water consumption based on population census information relating to the number of members in a household, the size of the house and the number of toilets and showers etc. Source: Interview with Bigen, South Africa, September 30, 2013.

Step-in rights may address mining companies' concerns about the water authority's ability to provide a continuous and reliable water supply. These rights provide a mechanism by which the mining company is allowed to step into the shoes of the water authority and take over the water supply where certain pre-agreed supply parameters are not met. These step-in rights would need to be negotiated with both the local government/ water authority as well as any financiers, given that the latter also generally require step-in rights where they are providing financing on a project-finance basis.

3. Certainty of water tariff

Mining companies strongly resist attempts to include a variable pass through charge for *unrestricted* capital investments in water infrastructure over and above the existing water infrastructure. A transparent pass through variable, capped as a percentage or otherwise indexed, can alleviate these concerns and therefore allow local authorities to leverage their off-take agreements with mining companies to cross-subsidize the capital and operational charges of supply water to low-income households up to a certain level. Donor-funding could also be sought for any scheme to extend and upgrade the water infrastructure and distribution network.

c. Mines and supply to communities: leveraging mines for provision of potable water to rural communities

- Constructing piped water supply, treatment and storage infrastructure for communities where such water infrastructure is not required for the mining company's own operations

In the situation where mines are sourcing their own water and/ or have no need for an on-site water treatment facility,⁸⁸ but surrounding communities have limited access to safe drinking water, opportunities exist for rehabilitating, expanding, or replicating the self-supply options to surrounding peri-urban or rural locations. Such water infrastructure investment could also be mandated in the mining concession itself, or be negotiated as part of a CSR program.

Example: Rio Tinto upgrading and rehabilitating water supply systems in Fort Dauphin, Madagascar

Fort Dauphin in Madagascar has a population of around 50,000 people, but its water infrastructure is in disrepair and around 90% of the population does not have ready access to potable water. The water requirements for Rio Tinto-owned QMM Madagascar Minerals SA (QMM)'s mineral sands project, and the expected growth of the town due to the project development cannot be supported by the existing infrastructure.

While QMM is able to contribute funds and engineering expertise to the upgrade and improvement of Fort Dauphin's water infrastructure, it is not a sustainable solution for the region

⁸⁸ Some mining companies provide bottled water to mining communities rather than treating water to meet drinking water standards. Such mines generally have low water requirements for their processes (See Section D).

for it to perform the role of a water service provider to the town. QMM therefore initiated a consultative process resulting in a collaborative partnership with the World Bank and JIRAMA, the local service provider, to upgrade and extend the town supply and reticulation.

Under the agreement the town supply line is being replaced, with a new treatment plant being constructed by QMM. The World Bank will assist with both financing and engineering to upgrade the town's reticulation and distribution network, and operation by JIRAMA has been formally agreed. QMM will also assist with the training and management of the treatment facilities.⁸⁹

- Providing self-contained, small-scale water supply and treatment solutions as part of a CSR program

Where water supply infrastructure is non-existent or defunct, mining companies may be more inclined to provide low cost water technology solutions where they can fund the initial capital cost of the water supply or treatment system, but do not need to operate or maintain, or necessarily commit to financing the operation and maintenance of the system.

- **Investment in low-cost water supply technologies such as boreholes with hand pumps and wells**

Mining companies operating in Liberia, Sierra Leone, Mozambique and other sub-Saharan African countries regularly supply low cost water supply technologies such as boreholes with hand pumps and wells to local communities, in collaboration with such communities, as part of their CSR programs.

Three concerns have been identified with such programs, which need to be addressed:

- **Water quality** – monitoring of water required to ensure it is not contaminated with mine waste or, in the case of wells, high in bacteria and other pathogens that are harmful for human consumption.
- **Maintenance of technology** – community capacity must be built to be able to own and maintain the technology. Experience from London Mining in Sierra Leone shows that such technologies can fall into disrepair if the community buy-in and capacity is not there to maintain the technology.
- **Seasonal variability of water sources** – water may not be available from such water points throughout the year. Mining companies need to ensure that the availability of ground sources has been considered, preferably in collaboration with the relevant water authority or NGOs providing water services in the area, before boreholes and wells are constructed.

- **Self-sufficient water treatment facilities**

⁸⁹ Rio Tinto, "Rio Tinto and Water," available at: www.riotinto.com/documents/reportspublications/rtandwater.pdf.

Innovative water treatment solutions that can be carried out in a stand-alone and sustainable manner are also being developed that can be implemented in collaboration with local government or private sector partners or NGOs. For example, the NGO Waterhealth International⁹⁰ has developed the technology to provide water treatment systems that, once the initial capital cost of the infrastructure has been made, can be run sustainably for around 25 years on the basis of a water tariff that comprises the operating and maintenance costs of treating the water.

Any CSR program for the supply of water points or treatment facilities should be done in collaboration with communities and local partnerships with NGOs, donors, and local authorities to ensure that such schemes have community buy-in, are sustainable without continued involvement of the mining company beyond the initial capital investment, and fit into local and national development goals for the provision of safe drinking water.

Such a strategy would increase the company's social license to operate in these areas, and assist the government in meeting their goals of drinking water supply in rural areas.

STEP 3: Verifying the necessary preconditions

The following pre-conditions need to be addressed or progressed to facilitate synergies between mining companies' water – and water infrastructure - needs and national water development goals.

a. Legal and regulatory framework

Environmental and water regulations should enforce a zero tolerance policy on environmental waste and discharge of mine effluents, and limit the quantities and sources of fresh water that mining companies can extract, in order to prevent a strain on available fresh water sources or contamination and alteration of the course or flow rate of existing water sources.

i. Strict environmental regulations – international standards, strict penalties

Strict environmental regulations are required that hold mines to best environmental practices in relation to effluent discharge, tailings storage, ingress water, the use of chemicals in mining processing, and mine closure. There should also be strict penalties for environmental degradation and contamination of water sources, both during the mining operations and for a period of time after mine closure.

ii. Water licensing regime

⁹⁰See Waterhealth International website: <http://www.waterhealth.com/>.

There needs to be a clear legal and regulatory framework for the allocation of water rights among competing users. Mining companies should be required to apply for a water license that is separate from the land that forms part of a mining concession. The allocation of water should be made on the basis of clear and transparent criteria, with the overriding objective of minimizing a mining company's fresh water usage and incentivizing the mining company to maximize water recycling and re-use.

At a minimum a water rights regime should:

- I. clarify how water will be allocated among competing users;
- II. ensure that water allocations to mines take into account (1) the availability of water resources, (2) the cumulative effect of water use in space and time, and (3) the mining operations' ability to minimize its water use by implementing more efficient water management systems and recycling water;
- III. provide for a transparent system of granting and evaluating water licenses, including how the water tariff is calculated; and
- IV. provide for a mechanism to adjust the allocation of water rights over the life of the mining concession with a built in review mechanism.

b. Ensure institutional setting that enforces and monitors water rights is in place

It is fundamental to ensure that an institutional setting that enforces and monitors water rights is in place.

i. Clear information

To make informed decisions, the following types of information are required:

- Hydrological data on the location, variability, and renewability of existing water resources to properly understand the existing water sources, any seasonal fluctuations in water availability, and anticipated climatic changes during the life span of the mine
- User demands in relation to existing water resources
- Analysis of cumulative effects of water users on water source during the life of a mine
- Baseline study of water quality from which to monitor changes in water

In some cases, the mining company may take the initiative to increase investments in technology to improve monitoring and transparency. Investment in infrastructure to monitor water quality may avoid contamination and future liabilities and can improve the relations of the company with local communities.

ii. Coordination among government ministries and agencies

In order to build the institutional setting, one of the most important requirements, but also one of the biggest challenges faced by governments, is the coordination

of different specialized agencies, authorities and ministries. Mining companies negotiating large-scale mining projects involving the building of water infrastructure must coordinate with the ministries/authorities responsible for the following:

- allocating water among competing users;
- financing the construction of, owning and operating & maintaining water infrastructure;
- providing drinking water & sanitation; and
- the environment,

to ensure that mining-related investments in infrastructure are aligned with, and leverage, national and local development goals in relation to ensuring a reliable and potable source of drinking water to communities.

iii. Institutional capacity to monitor water usage and compliance with environmental best practices

The relevant ministries/agencies need to have a workable level of human and financial capacity to monitor a mining company's water and environmental footprint.

iv. Institutional presence and capacity to supply water

A credible local government authority is required for any sustainable public private partnership to occur in relation to shared use water infrastructure. In the absence of a local water authority, a mining company may be able to partner with an NGO or private sector water supplier to provide low cost water supply solutions that are community-led. However, it will be difficult to scale up such initiatives, or to leverage mining-related water investments in piped water infrastructure in such a scenario.

Example: The Sierra Leone Water Company (SALWACO)

SALWACO is responsible for the provision of water supply and water infrastructure outside of Freetown. However, its operation is currently limited to certain provincial capitals and secondary towns and is largely unreliable. A mining company is unlikely to consider relying on SALWACO, or a local authority where SALWACO is absent, to obtain or treat its water. Mines require certainty of water supply and cost, neither of which can be guaranteed under the current set up.

c. Full cost recovery reflected in water tariff

For any mining company initiative to be viable and sustainable a water tariff must be payable. While full cost recovery may not always be feasible, given that certain

segments of the population are unable to pay, at a minimum, the water tariff should include the cost of operating and maintaining a water system.

d. Sustainability of water infrastructure

A mining company is unlikely to consider sharing any water infrastructure if it must carry out the operation and maintenance of a water system outside of the mining site once it has financed and/or procured the construction of water supply or water treatment facilities. In such a scenario, the only scope for the provision of water supply services by a mining company would be as part of its CSR policy, i.e. by financing low cost water supply and treatment technologies.

Example: In Liberia, with the exception of the former mining towns such as the LAMCO town in Yekepa which has an old water piping system, no area outside of Monrovia has a water treatment and distribution network, let alone a functional one. In the absence of a credible water authority or local partner able to operate and maintain water infrastructure, it is unlikely that a mining company would invest in a piped water supply system or an off-site water treatment facility.

The sustainability of any mining-related water investment needs to be considered and addressed, particularly where the infrastructure needs to be operated and maintained. Three ways to promote stability are:

- I. Ensuring community buy-in** – Any water infrastructure investment made for the benefit of a community must be carried out in continued consultation with representatives of the target community and other local stakeholders that have an interest in the provision and treatment of potable water in that community.
- II. Partnership with representatives from local government, or the water authority legally responsible for provision of water in that area** to help build the institutional capacity to operate and maintain the water facility after mine closure.
- III. Community-led initiative to maintain and operate the facility** – In the absence of a credible water authority, a local community could appoint a committee or local representatives to oversee the operation and maintenance of the water supply/ treatment system and collect a water tariff for water delivered that at a minimum covers the cost of operating and maintaining the system, or is otherwise subsidized by donor funding.

Some NGOs and donor-led water and sanitation programs operating in rural areas build capacity in local communities to manage water supply and treatment systems.

STEP 4: Negotiating points

This section considers points that may be raised during the negotiation of collaborative water arrangements between mining companies, the government, and/ or an NGO or private sector water utility. The list is not exhaustive, but sets out some initial questions to consider.

Step 4: Negotiating Points	Pre-conditions	Negotiating Points
Mines Excess Supply +	<ul style="list-style-type: none"> • Excess capacity built in at design phase of desalination plant/ distribution network/ waste water treatment plant • Commercially viable off-take agreement between company and water authority. • Clear regulatory framework for agreement between mine and water utility • Water utility/ local authority as a credible off-taker • Adequate distribution infrastructure to supply water 	<ul style="list-style-type: none"> • How should minimum deliverable quantity of excess water be determined? • How will reliable supply of guaranteed amount of water be secured? • What will be the water charge that the public authority pays to the mining company for the water? • Who will own the infrastructure? • Who will operate and maintain the infrastructure? • Is the local/ water authority a viable partner? The mining company may require step in rights to seek comfort regarding reliability of service, or a guarantee that the local authority will pay for the provision for water services. • Who is responsible for the financing, construction, and maintenance of distribution network? • When the mine ceases operations what becomes of the infrastructure?

<p>Mines as anchor for water demand to encourage investment</p>	<ul style="list-style-type: none"> • Mining company as a creditworthy offtaker • Water demand and consumption data for geographical area • Sufficient water supply to meet mining demand and domestic demand of surrounding communities. • Certainty of pass through costs (variable components) in the water tariff • Feasible investment for mining company to extend distribution infrastructure both to mine site and to surrounding communities previously not connected to water distribution system within a defined radius. • Legislation for public-private investment 	<ul style="list-style-type: none"> • Is the local/ public authority a creditworthy partner? If not, what kind of credit support will be required? Step in rights? • Is the timeframe for commissioning the water supply and distribution system in line with the mining operations? • What provisions will be made for delays/stoppages in water availability? • Who will construct distribution lines to the mine site? • If distribution, storage, and/ or water treatment infrastructure is privately financed, will ownership be transferred to the public authority? • Water tariff: What is the water tariff charged to the mining company? What are the pass through elements of the tariff? Mining companies will want certainty as to water costs. Will the full financing costs be reflected in the water tariff to the mining company? Financiers may also require debt service and financing costs to be treated as a pass through in the water tariff
<p>Mines CSR +</p>	<ul style="list-style-type: none"> • Partnership between mining companies and government/donor/NGOs • Motivation for mines to take part - contractual requirement or part of CSR initiative • Clear framework articulating responsibilities of each party 	<ul style="list-style-type: none"> • Is this part of a mining company’s CSR initiatives or is it to be a contractual obligation?⁹² • Do CSR proposals align with national development goals in relation to water and sanitation? • Which parties will be involved: Government (national/ local authorities, or water agency), donors, NGOs, private sector water provider?

	<ul style="list-style-type: none">• Capacity of each party to carry out its role• [Presence of local government/utility in rural areas]⁹¹• Effective demand/willingness to pay at least the operational and maintenance costs for water in communities	<ul style="list-style-type: none">• What are the responsibilities of each party?• What is the geographical area for which the CSR program will be provided?
--	---	--

⁹² Developing model concession agreements mandating the provision of potable water within a certain radius would increase certainty for investors, put all mining companies on an equal footing in their corporate social responsibility programs, and increase the accountability of government as the contract enforcement authority.

⁹¹ Where a mining company is providing small scale water supply or treatment technology, a local government partner or water authority may not be required.

Framework 4

Shared Use in the context of Information and Communication Technologies

Introduction

The contribution of Information and Communications Technologies (ICT) to national development is widely recognized. While ICT products directly contribute to wealth creation, their use also contributes indirectly to economic development by empowering individuals to take advantage of new opportunities in sectors such as agriculture, health and education.⁹³ For instance, farmers use ICT to obtain information on prices for their produce and purchases. Yet, despite a positive general trend, estimates suggest that 1.1 billion households around the world are still unconnected, primarily in developing countries.⁹⁴ As many as 16 of the 24 countries in Sub-Saharan Africa (accounting for 86% of the continent's population)⁹⁵ lack access to a submarine cable.⁹⁶

ICT infrastructure is employed in all phases of a mine life because it increases efficiency and improves cost savings for the mining company. This can be through better logistics, allowing virtual operations, ore grade optimization and better exploration analyses. Instantaneous access to video, voice and data communications also provides the mining company with the ability to use materials and human resources more effectively, minimizing waste and time delays and strengthening logistical coordination. Finally, ICT can also help mitigate security risks and improve the safety of a mining company's employees.⁹⁷ In the absence of ICT infrastructure, mining companies would be subject to communication delays and reliant on costly satellite phones.

However, as this framework explains, by capitalizing on the mining industry's demand for ICT services, it is possible to both develop the national ICT infrastructure and increase coverage in remote areas where mining companies tend to operate. Effective coordination could even result in mining operations benefiting from considerable cost-savings.

⁹³ Panos London Policy Briefing: "ICTs and development in Zambia: challenges and opportunities," October 2010.

⁹⁴ International Telecommunication Union (ITU) Press Release, "ITU releases latest global technology development figures," February 2013.

⁹⁵ Vivien Foster "Africa Infrastructure Country Diagnostic - Overhauling the Engine of Growth: Infrastructure in Africa," (2007) available at: http://siteresources.worldbank.org/INTAFRICA/Resources/AICD_exec_summ_9-30-08a.pdf.

⁹⁶ Undersea cables carry most of international ICT traffic. The reasons are that their reliability is high and their carrying capacity is in the terabits per second, while satellites generally offer only megabits per second and display higher latency.

⁹⁷ Perrine Toledano and Clara Roorda, "Leveraging mining demand and investment in ICT for broader needs." Columbia Center on Sustainable Investment, Columbia University (June 2014) available at: <http://ccsi.columbia.edu/files/2014/05/CCI-Policy-Paper-Leveraging-Mining-Related-ICT-Infrastructure-for-Development-June-20141.pdf>

Key Definitions

ICT infrastructure: refers to the types of network, such as telecommunications towers, antennae and fiber optic cable networks through which telecommunication is conveyed.

ICT services: any form of signal or data transmission by means of a telecommunication network by a telecommunication company (e.g. wireless signals, telephone services, broadcasting).

Broadband: refers to the medium of wide bandwidth which can facilitate high-speed data transmission of multiple data signals simultaneously. Broadband technology can be used across a large range of frequencies and data types.

Different Internet Technologies used by the Mines

Satellite: In remote areas, the cost of terrestrial solutions can be very high. Satellites provide an attractive option as they are able to cover a large geographic area at a relatively low and fixed cost. However, they also have less transmission capacity than terrestrial options such as fiber optic cables. The large distance between the satellite and users on earth can result in delays known as latency. Communications with the satellite take place via an earth station or individual antenna, the size and strength of which depends on the frequency being used. Large antennas are typically installed for high-bandwidth applications. Smaller antennas, such as Very Small Aperture Terminals (VSAT) are more commonly used to satisfy lower-bandwidth requirements.

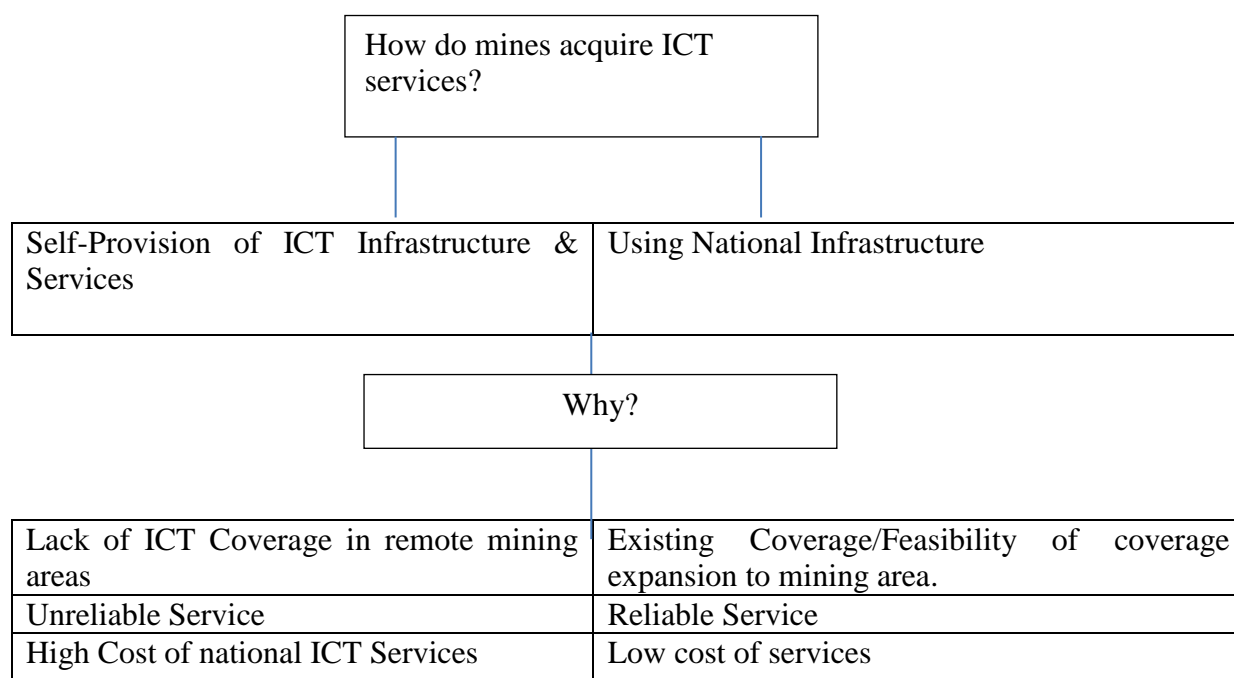
Microwave: Microwave systems use frequencies of between 6GHz and 38GHz), and involve point-to-point or point-to-multipoint broadband transmission. It is usually used to transport broadband data signals over relatively short distances (40–70 km, depending on the exact frequency used). A typical microwave system would involve the transmission of microwave communications between antennas placed on a series of telecommunications towers, using line of sight microwave radio technology.

Fiber optic cable: Compared with the other technologies, fiber optic cable has a much higher capacity, providing very large bandwidth at very high transmission speeds. Fiber optic can also be used over great distances without electromagnetic interference, meaning it can be laid next to power-distribution cables.

Copper: Copper wire is also used for long distance transmission, particularly where it is too expensive to replace copper cables with fiber optic. While, copper wire offers less capacity and slower transmission speeds than fiber optic cable, it can often be sufficient for low-traffic routes.

STEP 1: Assessing the Current Situation - What is at stake?

An important first step is to assess the ICT arrangements which mining companies currently have in place, and why they chose this particular arrangement. At the extremes, mining companies are either completely self-sufficient, or their operations are fully integrated into the national ICT infrastructure. Arrangements in between these two options would involve a hybrid of national and self-provided infrastructure.



An assessment of the country’s infrastructure situation and institutional gaps is important when identifying the most realistic scenarios of ICT-mine synergies and the necessary steps to achieve them.

STEP 2: Identifying operational synergies

ICT service provision in remote areas where mines are often located is a challenge for telecommunications companies as the cost of building infrastructure and providing services to a small number of customers can be very high. As a result, in these areas of relatively low demand, infrastructure investment and service provision does not make economic sense for a private company. It is in this backdrop that creating ICT -mine- synergies through the mines’ demand for ICT services becomes critical. These synergies can be realized whether the mines build their own infrastructure or not.

Potential ICT-Mine Synergies

Situations	Categories
1 - Mines build their own infrastructure	a) Telecommunications company adds capacity to mine infrastructure to serve the communities.
	b) Mines build/facilitate additional telecommunications

	capacity.
2 - Mines do not build infrastructure	a) Mines as an anchor demand for telecommunications companies.
	b) Construction/utility companies build required infrastructure to serve mines (e.g.: power, pipeline and railways) and add telecommunication capacity at a lower cost.
	c) Government, telecommunications and mining companies coordinate efforts and investments.

Category 1: Mining companies build their own ICT infrastructure

It is important to note that in the context of ICT, due to the complexities of service provision, it is unrealistic to expect mines to provide both the infrastructure and services as part of a voluntary CSR initiative. While a mine could fund the capital cost of a satellite antenna for nearby communities, for example, it would remain necessary for telecom providers to then provide telecommunication services to the communities. Thus, the options below either present a commercial opportunity for the mines to benefit from the arrangements, or a need for regulations to mandate that the mines engage in shared access (to its ICT infrastructure) arrangements.

a. Telecommunications company adds capacity to mine infrastructure

In the situation where there is no reliable ICT infrastructure in the area in which a mining operation is located, mining companies may choose to provide their own infrastructure. In this case, opportunities may exist for expanding access to this infrastructure to enable telecommunications companies to provide ICT services to nearby communities at a lower cost.

In remote and sparsely populated areas, it may not be economically viable for telecommunications companies to construct towers themselves, due to insufficient demand and high operational costs. For example, with regard to fiber optic networks, a study by the Organization for Economic Co-operation and Development (OECD) indicates that around 68% of the costs in the first year of extending the fiber optic network to the premises are related to civil works.⁹⁸

In these contexts, mining companies often install radio signaling systems or fiber optic networks along their grids, railroad tracks, or pipelines to improve the monitoring, efficiency and safety of their ICT infrastructure. This requires the mine to fund all, or a significant part of the installation costs of telecommunications towers or fiber networks. It then becomes economical for telecommunications companies to add telecommunication capacity to this infrastructure. While such a scenario has not been found in Africa to date, it is becoming more common on other continents. For instance, in Peru, Compañía Minera Antamina (Antamina) built a US\$2 million fiber optic network to carry information along its 304km copper and zinc concentrate slurry pipeline system to provide information and detect disturbances on the pipeline at every point along its length. Realizing that the optical fiber would make it easier to service the Huaylas and Conchucos areas with telecommunication

⁹⁸OECD, “Public Rights of Way for Fibre Deployment to the Home,” April 2008.

services, Antamina partnered with Telefonica del Peru to provide ICT services to nearby communities at a reduced cost.⁹⁹

In the example above, the mining company was willing to allow access to its infrastructure by a telecommunications company, perhaps driven by a motivation to maintain its social license to operate. Government policies of co-location, which prohibit the duplication of telecommunications infrastructure where existing infrastructure can co-host other operators, can mandate such infrastructure sharing arrangements, recognizing that mining companies may not always be willing to allow access to their infrastructure (see Section 3 and regulation on co-location from Liberia below).

b. Mines Build Additional Telecommunications Capacity and Lease to Telecommunications

Another possible situation is one where mining companies not only allow access to their infrastructure, but add extra telecommunication capacity to the infrastructure and lease it to a telecom company.

There may be commercial motivations for the mine to do this, as leasing additional telecommunication capacity would create another source of revenue for its operations, at limited additional cost. In some cases, the prospect of high revenue has led mining companies to also enter the telecommunications market. Once again, examples have not been found in Africa but on other continents. For instance, in 2001, Companhia Vale do Rio Doce, a Brazilian mining company had a plan to create a new company, RailCom, that would offer telecommunications infrastructure through dark fiber optic cables along 10,000 km of rail lines in the Southeast and Northeast of the country at an investment of US\$100 million, and lease it to telecommunications companies. Although this involved a large capital outlay, Vale expected a financial return of US\$300 million in five years.¹⁰⁰

In most cases mining (and oil) companies have opted to partner with telecommunications companies, instead of building a new venture, to share costs and synergies. An illustration from the oil sector in Malaysia shows that the national oil company Petronas and the main telecommunications company of the country, Celcom have together built Celcom Petro Network to install a fiber optic network along the national gas pipeline to address the telecommunication needs of Petronas and lease the spare capacity to other mobile operators and corporate customers.¹⁰¹ Similar schemes are expected for the cable that will be installed along the planned Nigeria-Algeria pipeline.¹⁰²

While in many cases mining companies are driven by commercial motivations to lease telecommunications capacity, or enter the telecommunications market themselves, one should recognize that this may not always be the case. In many cases, a mining company may not be inclined to provide a service that falls far outside of the scope of its core activities. In this case, governments may opt to mandate an obligation for the provision of excess ICT capacity in the terms of the mining company's concession agreement.

Category 2: Mines do not build infrastructure

⁹⁹ Toledano, Roorda, "Leveraging mining demand and investment in ICT for broader needs," op.cit.

¹⁰⁰ Ibid.

¹⁰¹ Ibid.

¹⁰² "Fibre Optic Infrastructure: Using the Valuable Resource for Multiple Tasks," *ICT Africa*, Jun 2013, available at: <http://www.ictafrica.info/FullNews.php?id=9592>.

a. Mines as an anchor demand for telecommunications companies

When there is a mining operation in remote, sparsely populated and unconnected areas, the mine could provide a sufficient level of guaranteed demand for ICT services to justify investment by telecommunications companies.

Example: Mozambique – when mines serve as anchor demand

In Mozambique, Ncondezi Coal entered into an agreement with Vodacom whom it considered to be the most reliable provider, for the provision of mobile phone service around its site. Vodacom constructed a telecom tower and installed a satellite, based on a minimum guaranteed demand from Ncondezi. This allowed Vodacom to expand its footprint in the area, enabling access by users in a 10km radius around the tower, and has generated 3000 additional contracts with users who otherwise had extremely limited or no mobile phone coverage.¹⁰³

Under this arrangement, companies will sign a contract that will cover the telecommunication company's costs of building and/ or extending the requisite ICT infrastructure. The cost may be split among the companies with the percentage depending on the amount of services being provided to the mining company and the potential additional market for the telecommunication company in the area.¹⁰⁴ This arrangement would enable the mining company to receive essential ICT services and the telecommunication company to expand its subscriber base, all at a lower cost to both parties than if they had decided to do so on their own.

In the event that the mine's demand is not sufficient to generate a commercially viable deal, the government could take measures to strengthen the anchor demand. This might involve adding its own demand, or providing subsidies to subscribers in a remote, low-income area. Local governments could also coordinate demand from public administration institutions, local schools and health care facilities in order to create sufficient anchor demand.

b. Utility/Construction companies building required infrastructure to mines (e.g. power, pipeline and railways) add telecommunication capacity at a lower cost

Economies of scope exist when a range of products can be produced or services provided together at a cheaper price than each product is produced or service is provided on its own. In the context of a mining operation, such economies of scope will arise when the outputs of one type of infrastructure can be used as the inputs of another type of infrastructure. Therefore, it is important to recognize that sharing should be encouraged not only within the ICT sector, but also together with other infrastructure industries (such as power utilities, water and sewage pipelines, and railways). For example, as mentioned above, since a large part of the costs of building a fiber optic network are related to civil works, joint infrastructure

¹⁰³ Nicolas Maennling, Alpa Shah and Sophie Thomashausen, "A Framework to Approach the Issue of Shared Use of Mining-Related Infrastructure: Case Study: Mozambique," Columbia Center on Sustainable Investment, Columbia University, (2014).

¹⁰⁴ Toledano, Roorda, "Leveraging mining demand and investment in ICT for broader needs," op.cit.

construction – such as laying ICT networks along railway tracks or water pipeline -- can result in important savings for the telecommunications companies.

In remote mining areas, the cost savings of such infrastructure sharing may be significant enough to make telecommunication services economically viable. For example, in Canada the power utility FNEI was only able to provide telecommunication services to nearby communities at an affordable cost after a De Beers mine agreed to let the company use its electricity grid infrastructure to build a fiber optic cable.¹⁰⁵

Example: Zambia – Capitalizing on power lines for ICT services

In Zambia, power utility company Copperbelt Energy Corporation (CEC) has installed fiber optic cables on its power lines to increase the quality of its ICT infrastructure. The company has approximately 500km of optical fiber network connecting Zambia’s mines in the Copperbelt region. Significant spare capacity existed on this network, and as a result CEC asked for a license which allowed it to lease excess capacity to other entities. As a result, in 2005 CEC became the first company in Zambia to offer broadband optical fiber services.¹⁰⁶

In order to ensure that such economies of scope are realized, the government will play a key role in identifying opportunities, as well as facilitating negotiations between telecommunications companies and mining companies/ mining infrastructure providers to allow access to the relevant infrastructure. For instance, as seen in Step 3, the government could pass regulations on mandatory access to “passive infrastructure” or could set up online information sharing platforms to inform stakeholders about opportunities for shared access.

c. Government, telecommunications and mining companies coordinate efforts and investments

Another possibility for an ICT-mine synergy is a situation where the mine demand in a remote region is sufficient to attract a government program to finance and facilitate ICT infrastructure provision. In Australia, the government is building ICT infrastructure across the country and selling wholesale services to internet and telephone providers. In particular, it is prioritizing the connection of remote areas where significant demand of mining operations may attract service providers.¹⁰⁷

However, the government may not always have the budget to provide ICT infrastructure, especially in developing countries. In addition, the timeframe of government investments in this sector might not be in line with that of the mining companies, who may want to expedite the construction of the infrastructure necessary for the commencement of their operations. In this context, there is scope for the government, the telecommunications company and the mining company to coordinate efforts to build the infrastructure together. It would enable the government to connect remote communities, a mining company to connect its mine and a telecommunications company to expand its subscriber base. This would be at a lower cost to all parties than if they decided to do on their own.

¹⁰⁵ Ibid.

¹⁰⁶ Ibid.

¹⁰⁷ Ibid.

STEP 3: Verifying the necessary preconditions

3A: What are the necessary preconditions for each potential ICT-mine synergy?

Depending on the situation, the type of policy needed to incentivize the buildup of ICT infrastructure will vary. This section sets out the necessary legal, institutional and regulatory conditions, and then goes on to suggest a number of policy considerations which might facilitate the sharing of mines’ ICT infrastructure, and the use of mines as an anchor demand for investments by telecommunications companies.

Necessary Regulatory Framework for ICT- Mining Synergies

Situations	Categories	Pre-conditions	Necessary regulatory framework	
1. Mines build their own infrastructure	a) Telecommunications company adds capacity to mine infrastructure to serve the communities.	Comprehensive and independent regulatory system.	Open Access (possibility for third parties to use an existing network infrastructure) - Co-location	
	b) Mines build/facilitate additional telecommunications capacity.		Licensing facilitation and infrastructure sharing	
2. Mines do not build infrastructure	a) Mines as an anchor demand for telecommunications companies.		Collaborative environment between private and public stakeholders (mining company, telecommunications companies, government agencies).	Long term agreement and guarantee mechanisms. Government financial support if needed.
	b) Construction/utility companies build required infrastructure to serve mines (e.g.: power, pipeline and railways) and add telecommunication capacity at a lower cost			Open access and Infrastructure Sharing Framework.
	c) Government, telecommunications and mining companies coordinate efforts and investments.	PPP enabling environment.		

3B: Are these preconditions in place?

a. Legal, Institutional & Regulatory Framework: Setting the Basis for ICT-Mine Synergies

i. Liberalized Market and Open Access Policy

A prerequisite to effectively leverage the ICT demand of mining companies is a competitive telecommunications sector. Many countries in Sub-Saharan Africa still have a monopoly over certain segments of their telecommunications sector (e.g. the mobile phone market in Ethiopia, or the international gateway in Sierra Leone).

The trend in recent years has been the unbundling of the ICT services and liberalization of the market to encourage competition from private participants. Without a competitive market, the mines would be unable to enter to extend services to a wider coverage area and would be forced to coordinate with potentially inefficient monopoly partners, limiting the incentives to leverage ICT infrastructure.

In addition, a policy of open access available on transparent, non-discriminatory terms, and at fair prices is a necessary pre-condition for sharing infrastructure.

ii. Regulatory Framework: Encouraging Mine Participation

Regulatory Capacity: For private participants to be incentivized to participate, such a liberalized market must also be well-regulated with respect to quality of service, as well as the tariffs in the market, to ensure that company price-setting is competitive. Mining companies will only be incentivized to demand services from national telecommunications companies (under the Category 2 options) if they can ensure a lower cost and more reliable service than self-provision.

In addition, in the context of open access, an important challenge faced by regulators is maintaining sufficient competition in the market as well as incentives for investment in new infrastructure. Mining companies that build the infrastructure may reduce future investment in additional capacity if their facilities are open to telecommunication service providers at low rates, particularly in remote areas where the economic rationale for building additional infrastructure is weak. However, if access prices are too high, telecommunications service providers either will not enter the market or will choose to install their own networks, resulting in inefficient duplication of infrastructure. In this case, the government should implement a regime where other companies seeking to access the infrastructure have access on reasonable terms. A solution is often a light-touch regulatory solution letting the parties negotiate first, with the regulator stepping in only in case of disagreement.

The regulator must also manage risks, monitor contractual obligations with telecommunications companies and effectively regulate access. It should be noted that the most appropriate regulatory system depends on the institutional context and the reforms being undertaken. It may be that an independent regulator is not essential to the reform process. If the institutional capacity of a country is limited, it could instead outsource regulatory functions to a third party or expert panel.¹⁰⁸

¹⁰⁸ World Bank – Africa Infrastructure 2011.

Licensing and Spectrum Management: Efficient, clear, affordable and flexible licensing processes are important to allow, and to incentivize, mining companies to expand their ICT services, which are already outside of the scope of their main activities. The categorization of licenses can impact incentives significantly. Traditional licensing has typically required different and separate licenses for different technologies as well as for different types of services. To increase efficiency and incentives for companies, governments are increasingly allowing flexible use, particularly through technical and service rules by adopting technology and service neutrality.¹⁰⁹ In order to increase flexibility in the licensing process, regulators have also begun to adopt even more unified frameworks to reduce the number of authorizations needed to carry out a number of activities (mobile phones, internet, broadcasting, etc.). Botswana, Ghana, Kenya, South Africa, Tanzania, and Uganda, are some of the countries that have already implemented technology- and service-neutral licensing frameworks.¹¹⁰ If it becomes clear that licensing is a barrier that reduces the potential to leverage the use of mining operations' ICT infrastructure, regulatory agencies may consider a license exemption in certain cases.

In addition to adopting licenses that increase flexibility of the technology and service use, it is also important to adopt licensing processes that maximize the use of spectrum. The spectrum extends from low frequencies used for radio communication, to high-frequency, short wavelength gamma radiation used for very high technology science.

New technologies enable multiple services to be provided using the same spectrum, which increases the need of regulators allocating spectrum rights more efficiently. To facilitate involvement of mining companies in the ICT sector, there must be a system of equitable access to spectrum for telecommunication carriers and industry.

An illustration of the problem comes from Australia, in the Pilbara region, where the emergence of 4G technologies has led to a growth in demand for access to the 1800MHz spectrum band in remote areas. For mining operations, 1800MHz spectrum band is increasingly being used to support safety and operational systems on mine sites and is expected to increase to support communications systems and automated equipment technologies. So far, however, access to this appropriate spectrum has not been readily available to non-telecommunication carrier entities in the Pilbara region.¹¹¹

b. Encouraging and Regulating Shared Access to Mine Infrastructure

Shared access to mine - related infrastructure underpins the Category 1b and Category 2b options set out under Step 2. This sub-section explores conditions that would be conducive to shared infrastructure access in the ICT context.

Infrastructure sharing aims to extend networks to areas where service provision is commercially viable if several operators share the costs of infrastructure. As mentioned under Step 2, there is scope for sharing ICT infrastructure within the sector (between mines' own infrastructure and telecommunications companies), as well as across sectors, particularly

¹⁰⁹ Under technology neutrality, operators should be allowed to use whatever technology or equipment standard they wish in order to meet market demands, subject to technical limitations. Under service neutrality, operators should be allowed to provide whatever services their technology and infrastructure can deliver (Toledano, Roorda, "Leveraging mining demand and investment in ICT for broader needs", op.cit.)

¹¹⁰ Article 3 of the Electronic and Postal Communications Act, 2010, available at: <http://www.tetra.go.tz/policy/epoca>.

¹¹¹ CCSI, "Leveraging mining demand and investment in ICT for broader needs," op.cit

those infrastructure sectors which are serving the mines (e.g. power utilities, railways, pipelines). However, in order to facilitate synergies across these sectors, a clear model for infrastructure sharing is necessary. This will enable services to be made available in a timelier and more cost effective way, and to manage and reduce the risk undertaken by investors. In addition, while mining companies could be contractually obliged under their concession agreements to enter into ICT infrastructure sharing arrangements, there are a number of ways in which government could otherwise incentivize them do so.

The following principles might apply when thinking about facilitating shared access to infrastructure in the ICT context¹¹²

i. Efficient use of resources

Towers, ducts and rights of way can be shared for installations that serve a similar purpose, allowing for optimal use. Regulators could increase incentives for additional investment in infrastructure by making such resources and rights of way readily available, especially in public property. They might take measures such as limiting the fees charged and simplifying the legal process involved.

The coordination of resources in this way can avoid duplication and wastage of capital expenditure. For example, several uncoordinated national broadband fiber optic networks are under construction in Zambia: one is being developed by the fixed telecommunications operator ZAMTEL, while separate networks are being built by the country's power utility ZESCO and the Copperbelt Energy Company. Neither the government nor the telecommunications regulator has required coordination between them.¹¹³ Similarly in Zimbabwe, the Postal and Telecommunications Regulatory Authority (Potraz), has been criticized for not enforcing infrastructure sharing regulations¹¹⁴ which resulted in duplicated work and high prices. On the contrary, Liberia is requiring *co-location* in its telecommunications law.

Example from Liberia

41. Co-location¹¹⁵

“(1) If not otherwise addressed in interconnection or access terms determined pursuant to Sections 34 to 38, and subject to any regulation, rule or order issued by the LTA, service providers with existing telecommunications network facilities shall allow other service providers to co-locate their telecommunications network facilities on those existing facilities, including central office premises and other equipment locations, land and roof tops, mast sites, towers, conduits, poles and underground facilities, where such co-location is technically and economically feasible and where no significant additional construction work is required.

¹¹² Adapted from Global Symposium for Regulators GSR 2008: “Best Practice Guideline on Infrastructure Sharing,” International Telecommunication Union, (2008), available at <http://www.ictregulationtoolkit.org/en/toolkit/docs/Document/3463>.

¹¹³ Panos London Policy Briefing: “ICTs and development in Zambia: challenges and opportunities,” October 2010.

¹¹⁴ “ICT sector chaos: Lack of co-operation blamed.” *The Standard*, June 2012.

¹¹⁵ Section 41 of the Telecommunications Act of 2007, available at http://www.mopt.gov.lr/doc/telecom_act_2007.pdf.

(2) The party requesting co-location shall compensate the party required to provide co-location for such an amount as the parties may agree or, where the parties are unable to agree, as may be determined by the LTA.

(3) Where the parties are unable to agree on the terms and conditions of co-location, either or both of the parties may submit the matter for dispute resolution pursuant to Section 73. "

ii. Access to Passive Infrastructure

It is possible for regulators to instate formal rights which allow carriers the right to access to passive infrastructure that are owned by a non-carrier, i.e. players such as public utilities companies, that provide passive network elements but which do not compete for end users.¹¹⁶ In this sense, if a mining company, or the owner of the mining railroad is not a licensed carrier, then a carrier may use their infrastructure to add optical fiber at a lower cost. This might make the realization of synergies between the mining companies and service providers more straightforward.

Example from Australia: In Australia, the government enacted legislation (Part 20A of the Telecommunication Act) enabling carriers looking to install optical fiber to seek access to passive infrastructure which is owned by a non-carrier. Where non-carrier companies are developing fiber optic networks as part of their development, they must now give the carrier access to the facility if this is requested. As a result, if a mining company is not a licensed carrier, then a carrier may use its infrastructure to add optical fibers at a lower cost. Access to the infrastructure is negotiated between parties involved, but if they cannot agree then an arbitrator, such as the Australian Competition and Consumer Commission, is appointed to determine the conditions.¹¹⁷

Many developing countries have enacted laws that address infrastructure sharing, but they often fail to yield the expected results as neither the telecom operator nor the regulator has legal authority to enforce these shared use laws. Similar to the obligation for *co-location* in Liberia, the obligation for infrastructure sharing will often only be enforced if it is technically and economically feasible without significant additional construction work.

In Mozambique, however, the National Regulator, INCM has recently issued a proposal for “Regulations on the Installation of Telecommunications Infrastructure in Building and Public Works,” that sets out detailed provisions for the rights of way on other infrastructure, including railroads. The level of clarity of the obligations of the parties and of the regulator, as well as of the conditions for access and denial access should enhance the enforceability of such regulations (see box below).

¹¹⁶ Adapted from “Global Symposium for Regulators GSR 2008: Best Practice Guideline on Infrastructure Sharing,” International Telecommunication Union, op cit.

¹¹⁷ Toledano, Roorda, “Leveraging mining demand and investment in for broader needs,” op.cit.

Example - Mozambique: Chapter 3 - Art. 10 of proposed regulation on right of access to public infrastructure¹¹⁸

1. Operators and providers of telecommunications services have the right of access to infrastructures suitable for the accommodation of telecommunications networks owned or operated by the state, municipalities, the entities related to the areas of roads, bridges, railways, electricity, gas and petroleum products.
2. The access referred to in the preceding paragraph shall be provided on terms of equality, transparency and non-discrimination through tariffs that reflect costs.
3. The procedures for obtaining the right of access should be timely, transparent and advertised, and cannot exceed the maximum period of 30 days after receipt of the demand for access.

The following nine Articles under this Chapter stipulate the prohibition of exclusive use of public infrastructure, the conditions for the denial of access to public infrastructure, the procedures in the event of denied access, the obligations of the entities owning or managing public infrastructure, the fees for access to and use of public infrastructure, the procedures and conditions for access and use of public infrastructure, the details of the request for access to public infrastructure, the conditions of use of public infrastructure and co-location.

In addition to a regulatory framework mandating shared access, governments could also offer financial incentives. Many countries have a Universal Access and Service Fund (UASF) to provide financial incentives to operators to close the access gap. Infrastructure sharing could be made a pre-requisite for receiving UASF for mining companies building infrastructure in new areas.

iii. Price setting mechanism and dispute resolution mechanisms

It is important that implementation of shared ICT infrastructure takes into account the necessity of protecting the value of existing investment in infrastructure and services. However, it is important that price, terms and conditions of access do not prevent the implementation of sharing.¹¹⁹ In that context, regulators should also have in place the necessary enforcement tools and their associated dispute resolution mechanisms to ensure compliance with infrastructure sharing regulations.

iv. Transparency and establishing an infrastructure sharing one-stop-shop

Transparent processes will be a key element in facilitating infrastructure sharing; market players need to know what is available for sharing under clearly established terms and conditions to be able work on synergies and mutually beneficial arrangements. Regulators could require publication on websites of the details of existing as well as future infrastructure

¹¹⁸ Source: Article 10 of the “Proposta de Regulamento sobre Instalação de Infra-Estruturas de Telecomunicações em Edifícios e Projectos de Obras Publicas,” Ministério dos Transportes e Comunicações (May2013), available at http://www.incm.gov.mz/c/document_library/get_file?uuid=88429f5e-129e-4ee0-a52a-e52b0addabb9&groupId=10157. Translation is authors’ own.

¹¹⁹ Adapted from “Global Symposium for Regulators GSR 2008: Best Practice Guideline on Infrastructure Sharing,” International Telecommunication Union, op cit.

installations available for sharing by mining companies and other service providers, such as “the availability of space in existing ducts, planned deployment or upgrading works and interconnection.”¹²⁰

For instance, in the proposed regulation on the installation of ICT infrastructure on buildings and public works in Mozambique, the infrastructure owner is required to inform the Regulatory Authority on infrastructure suitable for shared use, to prepare the registration with geo-referenced information infrastructure suitable for shared use, develop and publish procedures and conditions for access and use of such infrastructure, and respond to requests for information on - access to these infrastructures.¹²¹

Transparency could be facilitated by the creation of a one-stop-shop institution for infrastructure sharing to promote the coordination of civil works between telecommunications companies, as well as between telecommunications companies and utilities/mining-related construction companies.¹²² For example, Sierra Leone and Liberia are currently seeing the development of their mining railroads as well as planning the laying of their fiber optic cable around the country, suggesting that the government could play a valuable role in coordinating possible sharing of civil works necessary to build both types of infrastructure. Brazil is currently discussing a new telecommunication sector policy that will require from railway concessionaires to construct fiber optic cables along their rail network.¹²³ In countries with strong local governance systems, local authorities could play a role in coordinating infrastructure sharing in their regions.

v. Setting the basis for cross border infrastructure sharing

With the possibilities for cross-border mining transport routes and regional power lines, cross-border infrastructure sharing in the ICT context could also be an imminent reality. In order to prepare for this, regulators might look to ensure an appropriate level of regional harmonization. Regional organizations have an important role in ensuring that best practice regulatory policies on sharing are widely spread, since a national regulator alone would not be able to resolve significant cross-border issues. The Southern African Power Pool, for example, is now requiring that new power lines include optical ground wire that has the additional use of providing telecommunications services.¹²⁴

¹²⁰ Ibid

¹²¹ Article 14 of the “Proposta de Regulamento sobre Instalação de Infra-Estruturas de Telecomunicações em Edifícios e Projectos de Obras Públicas,” Ministério dos Transportes e Comunicações (May2013), available at http://www.incm.gov.mz/c/document_library/get_file?uuid=88429f5e-129e-4ee0-a52a-e52b0addabb9&groupId=10157. Translation is authors’ own.

¹²² Adapted from “Global Symposium for Regulators GSR 2008: Best Practice Guideline on Infrastructure Sharing,” International Telecommunication Union, op cit.

¹²³ Toledano, Roorda, “Leveraging mining demand and investment in ICT for broader needs,” op.cit.

¹²⁴ Ibid.

Step 4: Negotiating points

This section considers points that may be raised during the negotiation of collaborative mine-ICT arrangements between the government, mining companies and telecommunications companies. The list is not exhaustive, but sets out some initial questions to consider.

Situations	Categories	Negotiating Points
	Telecommunications company adds capacity to mine infrastructure to serve the communities	<ul style="list-style-type: none"> • In the absence of open-access, or a co-location framework, will the mine give access to its infrastructure voluntarily? If not, there will be a need for a contractual obligation. • What are the conditions of infrastructure access? These include price and non-price factors, such as the length of the access agreement. • How will access to mine infrastructure be allocated? Competitive bidding/auction by regulator? Negotiation with mining company? • What are the rights and responsibilities of the parties with respect to maintenance of infrastructure? • What provisions can be made for when the mine ceases operations? • What are the dispute resolutions mechanisms that will be used in the event of a disagreement?
Mines build their own infrastructure	Mines build/facilitate additional telecommunications capacity and lease it to telecommunication companies	<ul style="list-style-type: none"> • Is this to be a contractual obligation of the mining company as part of its concession agreement? In the case where the mine does not see a commercial opportunity, there might be a need for a legal requirement. • How will additional capacity be allocated? Competitive bidding/auction by regulator? Negotiation with mining company? • On what terms will the capacity be leased? Terms should be reasonable to attract companies, but also not so low as to discourage mine from future investment in additional capacity. • Are there financial incentives available to the mining company to encourage building of additional capacity? <ul style="list-style-type: none"> ○ E.g. UASF contributions for mining companies building additional

		<p>capacity in new areas, tax breaks, subsidies.</p> <ul style="list-style-type: none"> • What provisions can be made for when the mine ceases operations? • What are the dispute resolution mechanisms that will be used in the event of a disagreement?
	<p>Mines as an anchor demand for telecommunications companies</p>	<ul style="list-style-type: none"> • What are the responsibilities and obligations of each party under the agreement? • What are the key terms of the offtake agreements e.g. the amount of services being provided to the mining company, length of agreement, price to be charged? • If the mine is sharing in the capital cost, on which basis will each party contribute? • Is the mine offtake a sufficient anchor demand? If not, is it necessary for measures to be taken by government to create an additional anchor demand? • Do additional financial incentives need to be provided to the telecommunications company e.g. UASF contributions? • In the event of service going down, does the mine get priority access? • What provisions can be made for when the mine ceases operations?
<p>Mines do not build infrastructure</p>	<p>Construction/utility companies build required infrastructure to serve mines (e.g.: power, pipeline and railways) and add telecommunication capacity at a lower cost</p>	<ul style="list-style-type: none"> • Which parties will be involved? This will depend on the resources and rights of way to be used by the telecommunications company (public vs. private property)? In case of no access to passive infrastructure regulations – can it be a contractual requirement? • If multiple telecommunications companies are looking for access to the infrastructure, how will rights be allocated? Competitive bidding/auction by regulator? Negotiation with mining company? • Under what terms will access to infrastructure be granted?

		<ul style="list-style-type: none"> • What are the rights and responsibilities of the parties with respect to maintenance of infrastructure? • In the event that the original infrastructure is damaged or negatively affected, how will this be compensated? • What are the dispute resolution mechanisms that will be used in the event of a disagreement?
	<p>Government, telecommunication and mining companies coordinate efforts and investments</p>	<ul style="list-style-type: none"> • Which parties will be involved? • What are the responsibilities and obligations of each party under the agreement? • What are the key terms of offtake agreements e.g. the amount of services being provided to the mining company, length of agreement, price to be charged? • If the mine is sharing in the capital cost, on which will each party contribute? • Is the mine’s offtake a sufficient anchor demand? If not, is it necessary for measures to be taken by government to create an additional anchor demand? • In the event of restriction of services, does the mine get priority access? • What provisions can be made for when the mine ceases operations?

ANNEX A

EXPERT WORKSHOP AGENDA AND PARTICIPANT LIST



Columbia Center on Sustainable Investment

A JOINT CENTER OF COLUMBIA LAW SCHOOL
AND THE EARTH INSTITUTE, COLUMBIA UNIVERSITY

The Shared Use of Mining-Related Infrastructure

Expert workshop

November 15, 2013
Columbia University

PROGRAM

With support from:



About the Columbia Center on Sustainable Investment

The Columbia Center on Sustainable Investment (CCSI), a joint center of Columbia Law School and the Earth Institute at Columbia University, is a leading applied research center and forum for the study, practice and discussion of sustainable international investment. Our mission is to develop and disseminate practical approaches and solutions to maximize the impact of international investment for sustainable development. The CCSI's premise is that responsible investment leads to benefits for both investors and the residents of host countries. Through research, advisory projects, multi-stakeholder dialogue and educational programs, the CCSI focuses on constructing and implementing a holistic investment framework that promotes sustainable development and the mutual trust needed for long-term investments, that can be practically adopted by governments, companies and civil society

About the Natural Resource Charter

The Natural Resource Charter is a manual of best practice aimed at governments and citizens of resource rich countries. It provides practical policy advice to support decision-making that can best harness the economic potential of resource extraction, including leveraging resource-related infrastructure for sustainable development.

The Natural Resource Charter is delighted to support this project as it seeks to address an identified gap in knowledge and good practice principles around shared-use infrastructure. A key pillar of the Natural Resource Charter is helping countries leverage investments associated with resource extraction to benefit the wider economy and raise the welfare of citizens. The development of this framework by CCSI is an important step towards this goal. Lessons from the survey of worldwide experience will help inform Charter recommendations on this topic as well as the design of the Charter's country benchmarking tool, which is now being deployed in various resource rich countries.

About the Sustainable Development Solutions Network

The Sustainable Development Solutions Network (SDSN) mobilizes scientific and technical expertise from academia, civil society, and the private sector in support of sustainable development problem solving at local, national, and global scales. This Solutions Network accelerates joint learning and helps to overcome the compartmentalization of technical and policy work by promoting integrated approaches to the interconnected economic, social, and environmental challenges confronting the world. The SDSN provides expert advice and support to the various international processes working on the post-2015 development agenda; identifies, vets, and promotes solutions that accelerate progress towards sustainable development; and develops and disseminates online education material for sustainable development

The Network is structured around thematic groups of global experts that work to identify common solutions and highlight best practices. Thematic Group 10 is on the Good Governance of Extractive and Land Resources.

Background

To be beneficial for a country's development, non-renewable resource extraction should be leveraged to build infrastructure that will support sustainable and inclusive growth. This is especially critical for countries facing an infrastructure-funding gap (in Africa alone there is an estimated annual infrastructure funding gap of US\$31 billion according to the World Bank's Africa Infrastructure Country Diagnostic.) While this can be achieved by capitalizing on resource taxation potential and reinvesting the tax revenues in public infrastructure, it can also be accomplished by requiring shared use of the infrastructure built by/for the mining sector to expand infrastructure coverage and access. However, the potential for leveraging mining-related infrastructure for broader development is often not realized.

Mining companies have historically adopted an enclave approach to infrastructure development, providing their own power and transportation facilities to meet their "pit-to-port" infrastructure needs. Major investments in physical infrastructure are also generally uncoordinated with national infrastructure development plans. Hence, opportunities are missed for promoting shared use of the infrastructure and taking advantage of potential synergies.

In 2013, CCSI was granted an project from the Australian Department of Foreign Affairs and Trade to develop an economically, legally and operationally rational framework to enable shared use of mining-related infrastructure, including rail, ports, power, water, internet and telecommunications. The framework builds on a worldwide survey of regulatory, commercial and operating models of shared use of rail, port and power infrastructure previously conducted by CCSI. It has been obtained by distilling best practice principles from infrastructure developments around the world, guided by expert opinion. It has most recently also been refined through in-depth case studies in Liberia, Sierra Leone and Mozambique, although its principles aim to be of general relevance to all resource rich African countries.

The framework aims at providing guidance to policy makers on how to approach the question of shared use, highlighting the operational models that are necessary for implementation, the key-success factors, the enabling conditions and how to ultimately better coordinate major investments in physical infrastructure by privately-owned natural resource concessionaires with national infrastructure development plans. The framework will also equip policy makers with a set of questions that should help conduct the negotiations on shared use with companies. The ultimate goal of the framework is to include shared infrastructure use as part of the planning and negotiation stages of extractive industry investments

This workshop is designed to get feedback on the framework from mining-related infrastructure experts from academia, companies, governments, and donor and to discuss ways on how it could be improved.

7:45am – 8:30am: *Registration and breakfast*

8:30am – 8:45am: *Opening remarks*

The opening remarks will introduce the framework and provide answers to the following questions:

- What is the framework for and how will it be used?
- What is the timeline to deliver the final product?
- How is this going to change the way things have been done previously?

8:45am – 9:15am: *Keynote speaker – Jeffrey Sachs*

9:15am – 10:00am: **Building power and mining synergies**

- What are the different power sourcing arrangements for mining operations?
- What are the pre-conditions to enable synergies?
- What points need to be addressed at the negotiation table to enable such synergies?

10:00am – 10:15am: *Coffee Break*

10:15am – 11:15pm: **Round-table discussion on the findings**

11:15pm – 11:45pm: **Minimizing the water footprint of mining and increasing access to [potable] water supply for communities**

- What are the models for supplying excess/ treated/ potable water to communities?
- Are there operational roadblocks?
- What type of regulations best minimize a mine's water footprint and maximize its engagement with communities on water supply?
- How do you ensure sustainability of water supply and treatment facilities after mine closure?
- What should be the questions to ask at the negotiation table?

11:45pm – 12:30pm: **Round-table discussion on the findings**

12:30pm – 1:30pm: *Lunch*

1:30pm – 2:30pm: **Enabling shared use in rail and ports**

- What are the models best suited to promote multi-use and multi-party access to rail and port infrastructure?
- Under which regulatory, commercial and operational conditions?
- What is the scope for brownfield renegotiations to enable shared use?
- What points need to be addressed at the negotiation table to enable shared use?

2:30pm – 3:45pm: **Round-table discussion on the findings**

3:45pm – 4:15pm: *Coffee break*

4:15pm – 4:45pm: **What are the opportunities for increased ICT coverage in response to mining demand and investments?**

- Where should the efforts be focused?
- What regulatory structures best promote mine-related investments in expanded ICT coverage in areas surrounding mining operations?
- What should be the questions to ask at the negotiation table?

4:45pm – 5:30pm: **Round-table discussion on the findings**

5:30pm – 5:45pm: *Closing Remarks*

Participant List

Loren Ambinder, Legal Director, EleQtra (InfraCo)

Joseph Bell, Of Counsel, Hogan Lovells US LLP; Founding Board Member, International Senior Lawyers Project

Rodwell Cloete, Manager: Logistics Strategy, Anglo American

Jim Cust, Head of Data and Analysis and NRC Lead, Revenue Watch Institute / Natural Resource Charter

Natty B. Davis, Former Chair, National Investment Commission, Liberia

David Doepel, Chair, Murdoch University's Africa Research Group

Ray Finkelstein, Ex-Judge of the Federal Court of Australia

Tanneke Heersche, Partner, Fasken Martineau

Jose Gomez Ibanez, Derek C. Bok Professor of Urban Planning and Public Policy, Harvard University

Glen Ireland, Partner, Latham & Watkins

Craig Johnson, Vice President and Director of Operations - International, Stanley Consultants

Geoff Jolly, Head of Rails and Ports - Global, ArcelorMittal

Paul Jourdan, Resource-Based Development Consultant

Ing. Mustapha K Kargbo, Presidential Advisor, Energy & Infrastructure, Strategy and Policy Unit, Office of the President, Sierra Leone

Richard Keck, Partner, Macmillan Keck

Bryan Land, Extractive Industries Practice Leader (Africa), World Bank

Todd Malan, VP, External Affairs, USA, Rio Tinto

Joseph Matthews, Head of Government and Community Relations, ArcelorMittal

Vijay Modi, Professor of Mechanical Engineering, Columbia University

Eve de la Mothe Karoubi, Manager, UN Sustainable Development Solutions Network

Miguel Peres, Managing Director, Odebrecht Mozambique

Miguel Enrique Santillana, Consultant for Diverse Institutions and Private Sector, ESAN

Victoria Salem, Senior Associate, Latham & Watkins

Marcio Senne de Moraes, Corporate Affairs Head for Europe and North America, Vale

Alpa Shah, Consultant, Columbia Center on Sustainable Investment

Michael Stanley, Sector Manager of the Sustainable Energy Department, World Bank

Jeffrey Statton, Project Manager, Bechtel

Sophie Thomashausen, Legal Researcher, Columbia Center on Sustainable Investment

Lou Wells, Herbert F. Johnson Professor Emeritus, Harvard Business School

Eric Werker, Associate Professor of Business Administration, Harvard University

Jeffrey Wood, Retired Partner, Debevoise & Plimpton; Volunteer, International Senior Lawyers Project