

## THE DEMOCRATIC REPUBLIC OF CONGO AND ZAMBIA: A GROWING GLOBAL 'HOTSPOT' FOR COPPER-COBALT MINERAL INVESTMENT AND EXPLOITATION

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### ABSTRACT

Given the high-grade copper-cobalt mineralisation of the Central African Copperbelt and the scale of available ore bodies, the DRC and Zambia are fast becoming the global 'hotspots' for international mining investment and exploitation activities. Against surging demand for copper and cobalt supplies, this paper considers the role that the region will play over the next decade in fulfilling global requirements. Key copper-cobalt producer activities in both countries are reviewed and some of the challenges facing mining companies in harnessing growth opportunities are highlighted. Overall, despite the high commercial risks involved in investing in the Copperbelt, Africa is forecast to proceed close behind South America as a leading source of mine production and refined metal in the medium- to long-term.

**Keywords:** Investment, DRC, Zambia, Copperbelt, copper-cobalt

### INTRODUCTION

The mineral endowment of the Democratic Republic of Congo (DRC) and Zambia are well known, especially for their historical copper and cobalt production. In colonial times, and well into the years after independence (1964 for Zambia and 1965 for DRC), copper together with other base and precious metals helped sustain these economies, especially Zambia. Declining copper prices in the 1980s and into the 1990s, together with aging and increasingly derelict equipment, political unrest, unfavourable international opinion and resulting decline in economic activity led to a significant reduction in mineral exploitation as well as exploration for new deposits<sup>1</sup>.

Renewed investor interest in the past ten years or so, together with surging stock and commodity markets, supported by significantly calmer internal politics has allowed for a regeneration of the mineral economies of these two countries. The upturn in international commodity prices from the end of 2003 until the middle of 2008, supported by legislative and political changes in DRC (a new mining code in 2003 and the first democratic elections in 2006) and a favourable (at the time) tax and royalty regime in Zambia, sparked a revival of interest in both re-establishing existing operations and exploring for and developing new mines in both countries. Although the industry experienced a significant setback following the drop in copper prices in the wake of the global recession, the sector is currently experiencing a turnaround and the future outlook looks favourable. Unlike the political turmoil of earlier decades, the crisis appears to have left the Copperbelt mining sector a lot more resilient than before and set for revival<sup>2</sup>.

Against this background, this paper reviews the revival and intensification of copper-cobalt mining activities in DRC and Zambia and the re-emergence of the Copperbelt as a global ‘hotspot’ for international investment and exploitation. The paper commences with a discussion of the global push factors shifting international investment flows towards Africa, specifically the Copperbelt, as a source for copper and cobalt. Investment trends within Zambia and DRC are then unpacked and notable producer activities highlighted. The paper concludes with a consideration of the overall business environment within the DRC and Zambia and some of the challenges facing investors.

## **MARKET TRENDS IN THE COPPER-COBALT MARKET**

The growing importance of the DRC and Zambia as a ‘hotspot’ for copper and cobalt resources has been significantly influenced by changing demand and supply trends for the metals at the global level.

### **Demand Trends**

The knock-on effects of the 2008 financial crisis triggered a wave of plant shutdowns, curtailment of investment plans, retrenchments and bankruptcies across the global mining sector. However, as fears of a ‘double dip’ started to recede and metal prices started to rise in the first quarter of 2009, confidence amongst producers began to increase and investment programmes and production activities resumed over the course of the year<sup>3</sup>. One of the primary factors contributing to this earlier than expected demand recovery, particularly for commodities such as copper, was the strong reliance demonstrated by emerging economies and their continued growth over the period, albeit at a much slower rate. This uneven distribution in recovery is projected to continue over the short-term; with advancing economies adopting a cautious approach to growth and investment, and emerging and countries growing rapidly and aggressively, positioning themselves in global commodity chains as far as possible<sup>4,5</sup>.

Global consumption of refined copper reached 19.3 Mt in 2010 and is expected to exceed 20 Mt in 2011. Given its properties as a conductor of heat and electricity, resistance to corrosion and recyclability, copper and copper-based alloys find extensive application across the manufacturing, construction, automotive and power sectors. Over the next fifteen years, one of the most significant drivers for increased copper consumption will be the efforts by emerging economies to address domestic infrastructure deficits. In the short-term, such demand will be highest in China and India<sup>6</sup>.

The Chinese government’s has set itself the goal of having 65 per cent of its population urbanised by 2050. In order to achieve this, a massive programme is underway focused around improving social housing, expanding the national power grid, building new road and rail networks, and modernising the industrial infrastructure base<sup>7,8</sup>. In 2010, China accounted for around 38 per cent of global copper demand. This contrasts with demand from Europe, Japan and the United States, which combined, accounted for just 30 per cent. In 2011, a 6 per cent growth rate in copper consumption is envisaged for China, amounting to 7.3 Mt. Since China’s per capita use is still ten years behind the average developed Asian economy, as the country matures, copper consumption is projected to rise above 20 Mt per annum<sup>9</sup>.

In India, consumption of copper is highest in the electrical, electronic products and telecoms sectors. Massive government investment around improving logistic and power infrastructure and expanding the automotive and telecoms industries are forecast to drive copper demand in the country over the next decade. Domestic demand amounted to 600 000 t in 2010 and is projected to exceed 800 000 t by 2014, reaching 2.4 Mt by 2020 – making it the second largest global consumer. India currently exports between 100-50 000 t of copper per annum. This is expected to change over the medium- to long-term as the country becomes a net importer of copper concentrate to meet its expanding domestic requirements<sup>10,11</sup>.

In established markets, the increasing global push for environmentally-friendly transportation and electrification applications will contribute to the surge in copper demand. The distribution systems required to manage low-carbon sources of electricity require approximately four to ten times the amount of copper to those produced via centralised, fossil-fuel driven power plants. A hybrid passenger vehicle contains 50 kg of copper for the electric motor, energy storage and transfer system, while each high-speed train requires 10 t of copper components, plus 10 t in the power and communication cables per kilometre of track<sup>12</sup>.

In terms of cobalt, over the past decade there has been a very distinctive shift in the regional concentration of demand from the United States and Western Europe to Asia. Demand in Asia has increased by nearly 80 per cent, with China's expanding production of high-tech manufactured goods providing the main impetus. Future demand is expected to be led by the increased use of cobalt in chemical applications, particularly as an additive in rechargeable lithium-cobalt batteries and catalysts. In 2010, 14 400 t of cobalt was used in lithium-ion batteries for use in environmental and renewable energy systems and technological applications. Super alloys with cobalt are used in applications where corrosion resistance and high operating temperatures are necessary. These properties are required in many strategic applications. Given the lack of substitutes, demand for cobalt super alloys in the aerospace industry has increased by more than 29 per cent since 2005. Given that a high-bypass jet engine will consume approximately 65 kg of cobalt, demand for high-grade cobalt is expected to rise by a further 30 per cent over the next five years to reach 16 273 t per annum. Total refined cobalt demand is expected to reach 72 500 t in 2011<sup>13,14</sup>.

## **Supply Trends**

While the fundamentals underpinning current and future demand for copper and cobalt appear sound, concern relating to the security of supply of high-grade deposits of both metals is driving the search for alternative sources.

Constraints in supply have been a characteristic of the copper industry for more than a decade. Factors such as falling ore grades, lower volumes, project delays and disruptions, higher costs, scarce new resources and fluctuating prices have contributed to this situation through lower investment and exploration levels. In the 1990s and early 2000s, copper prices were so low for so long that few incentives existed for mining companies to keep exploring for new prospects and establishing new projects. Prices have, however, steadily improved (with the exception of a drop in 2008 and 2009), enabling mining companies to

recommence investment programmes. Nevertheless, given the long lead times involved between exploration and commissioning, overall mine supply is expected to remain constrained in the short-term and an ongoing problem for the copper market<sup>15</sup>. On the back of diminished copper stockpiles – forecast to drop to an all time low in 2011 following a 22 per cent decline in inventories in 2010 – a global refined copper market deficit of 350 000 to 450 000 t is anticipated in 2011. Prices are expected to remain around US\$10 000/t in the short-term<sup>16,17</sup>.

Global copper mine production has historically been geographically concentrated in South America, with Chile and Peru accounting for around 40 per cent of annual global production. Other global producers include the United States, China, Indonesia, Australia and Russia. While total land-based copper resources are reported to exceed 3 Bt, global reserves are estimated at 630 Mt, of which around one-third are held in Chile<sup>18</sup>. Analysts maintain that, at current production rates, traditional supply regions will be unable to meet expected global requirements by 2020. As such, new sources of supply will need to be identified and projects in the pipeline fast-tracked. An estimated 70 per cent of the global shortfall envisaged over the next decade will be met via greenfield projects based in the developing world, 44 per cent of which will be in non-OECD countries. China, Zambia, Mongolia and the DRC are projected to dominate the supply of mined copper over the long-term<sup>19,20</sup>.

The cobalt market is small in comparison to that of copper. Cobalt is found in very low concentrations and is generally produced as a by-product of nickel and copper mining. Total world reserves for contained cobalt are estimated at 7.3 Mt, equivalent to 125 years of industrial demand at present levels. Approximately 3.4 Mt of the world's cobalt reserves are located in the Copperbelt. The DRC and Zambia account for 40 per cent and 19.7 per cent, respectively, of current (88 000 t in 2010) global cobalt production. Around 40 to 50 per cent of incremental global production of the next five years is projected to arise from the DRC<sup>21</sup>.

Apart from China, other major cobalt consuming countries include the United States, European Union, Netherlands and Japan. Since such countries lack domestic production of the metal it has been declared a strategic metal and stockpiled. As the leading producer and growing consumer of refined cobalt, China relies heavily on imported cobalt ores and intermediates. Approximately 85 per cent of the DRC's production is imported by China. Although supply currently exceeds demand for cobalt, there are concerns regarding future supply dynamics given the political instability of the Copperbelt region compounded by increasing efforts by the DRC government to further beneficiate cobalt ores internally prior to export<sup>22</sup>.

#### **THE SIGNIFICANCE OF THE COPPERBELT IN COPPER-COBALT SUPPLY**

Africa has the potential to contribute significantly to meeting global requirements for refined copper and cobalt in the medium- to long-term due to the presence of the Central African Copperbelt, which contains approximately 40 percent and 10 per cent of the world's cobalt and copper reserves, respectively. The Copperbelt occupies a major geological structure called the Lufilian Arc that extends over a distance of more than 500 kilometres from Kolwezi in the southern parts of the Katanga Province, DRC, to Luanshya in neighbouring Zambia. This arc is host to extensive high-grade copper-cobalt mineralisation in very large stratiform deposits<sup>23</sup>.

A reported one-fifth of all global copper resources with a grade of over 1.0 per cent are located in the region. In some instances, grades of 7 to 8 per cent copper have been recorded. Most operations underway in the region report copper grades of between 1 and 4 per cent. By contrast, grades at Australia's Olympic Dam average 1.1 per cent, while at Escondida and Chuquibambilla (both in Chile) the grades are 1.08 per cent and 0.86 per cent, respectively. The uniqueness of these deposits in terms of their grade, presence of valuable by-products and large tonnages amenable to low-cost bulk mining, has contributed to the Copperbelt re-emerging as a global 'hotspot' for copper investment and exploitation in recent years. Even with sustained production over almost 100 years, it is projected that there will remain huge resources of copper and cobalt in this extensive mineral province<sup>24</sup>.

### **STATUS OF CURRENT MINING OPERATIONS ON THE COPPERBELT**

Copper production in the DRC and Zambia has been increasing year-on-year since the late-1990s. Collectively these two countries account for 2.1% and 4% of world copper production respectively, and this is expected to rise to 4.9% and 5.7% by 2013. Copper output in the region could rise from around 1.2 Mt to nearly 3 Mt by 2015, positioning the Copperbelt as the second largest producing region after Chile. The long history of mining along the Copperbelt has resulted in a major additional source of copper and cobalt in the form of old plant tailings. Metallurgical extraction processes in the past were relatively inefficient, and as much as 1-2 per cent copper was lost in such tailings. Retreatment of such wastes is seen as a high potential source of copper-cobalt and therefore investment in such activities is increasing in conjunction with other projects. Aside from exploration potential, there is also a high level of interest from Asian investors for off-take potential. Further, large deposits that have not yet been explored using modern technology<sup>25</sup> create an opportunity for expanding and developing new operations over the longer-term<sup>25</sup>.

### **Mining Investment Trends in Zambia**

The production of copper plays an important role in Zambia's economic activities and since 2003, been a leading factor behind the country's annual growth rate of 5 per cent. In 2010, output reached 750 000 t of finished copper cathode – the highest level since 1973 – positioning the country as the eighth largest producer in the world and highest in Africa. A target of 1 Mt is expected by 2012 and 2 Mt by 2015. This is considered achievable given the imminent completion of some of the largest project expansions to date, increased production at other mines, and new units coming on stream<sup>26,27</sup>.

Since the finalisation of the privatisation process in 2000, foreign investment in the Zambian mining sector has increased significantly and has reportedly exceeded US\$5 billion. Copper investments have been concentrated around the towns of Ndola, Kitwe, Chingola, Luanshya, Chililambombwe and Mufulira. The Zambian government still retains ownership in most production companies through its holding company, Consolidated Copper Mines Investment Holdings (ZCCM-IH). Foreign mining companies currently active in Zambia include London-listed Vedanta Resources, Canada's First Quantum Minerals, Equinox Minerals, Glencore International of Switzerland, Metorex Mining Limited of South Africa, and the Chinese Natural Resources Corporation (CNRC). The majority of copper investments in Zambia over the past two years have originated from the CNMC. In 2009, the company acquired an 80 per cent stake in Luanshya Copper Mines for US\$50 million and promised a further US\$400 million in brownfield improvements at the

mine, US\$300 million to establish a new leach plant, and US\$600 million at the Mufulira tailings dam. A further US\$310 million will be spent by CNMC on the Muliashi copper project by 2012. Approximately 15 000 jobs have been created as a result of these companies' collective investment programmes<sup>28</sup>.

The majority of activities undertaken by the eight copper companies active on the Zambian Copperbelt are in the operational stage and well-established. All the mines under care and maintenance during the 2008 crisis have resumed operations and include both open pit and underground mines. Mines are supported by a network of concentrators, tailings treatment facilities, solvent extraction/electrowinning (SX-EW) and refining operations. In addition to this existing base of operations, four additional mines are in various stages of exploration, feasibility and construction, one leach plant is under evaluation and one leach plant is under development.

### *Mining Activities*

In terms of mining activities, Konkola Copper Mines Plc is one of the largest copper mining companies in Zambia with a reported average annual production rate of 200 000 t. Proved and probable reserves are estimated at 404.8 Mt with contained copper of 6.52 Mt at 1.61 per cent copper. Measured and indicated resources of 301.5 Mt are reported with 7.25 Mt of contained copper at a grade of 2.4 per cent copper. The Konkola Deep Mining Project, currently underway, will bring the company's expected annual production to around 500 000 t<sup>29,30</sup>.

One of the largest new mines, and the single largest capital investment in Zambian history, is Equinox Minerals Ltd's 100%-owned Lumwana Copper Mine, which commenced operation in late-2008. The mine has measured and indicated resources of 342.5 Mt of ore, grading 0.74 per cent copper, plus inferred resources of 563.1 Mt at 0.63 per cent copper. A life of mine of 37 years is projected. At full capacity, it is expected that Lumwana will provide around 20% of the country's total metal copper production. Output for 2011 is estimated at 145 000 t copper in concentrate<sup>31,32</sup>.

Other notable producers in 2010 included Mopani Copper Mines' Nkana and Mufulira mines (250 000 Mt of copper metal and 2 400 t cobalt)<sup>33</sup>, Metorex's Chibuluma Mine (17 729 t refined copper)<sup>34</sup>, and First Quantum's Kansanshi Copper-Gold Mine. Kansanshi is regarded as the eighth largest copper mine with measured and indicated resources of 383.8 Mt at a grade of 1.08 per cent copper. Production amounted to 231 124 t in 2010. A US\$390 million expansion programme at the mine is underway to increase production to 400 000 t by 2015. First Quantum is also carrying out exploration at the Sentinal deposit<sup>35,36</sup>.

In terms of recent investments, the Brazilian mining giants, Vale and South Africa's Africa Rainbow Minerals are investing US\$320 million in the Konkola North mine in Chililabombwe<sup>37</sup>. The mine is expected to become operational in two years with an annual output expected to be around 45 000 t of copper. Another recent entrant is Makuba Resources Limited, an African-focused base metal exploration company. The company's Northcore Project is in the advanced exploration stage<sup>38</sup>.

### *Smelting and Refining Activities*

Zambia is the largest supplier of refined copper on the African continent. The key smelters and refineries include the Mufulira smelter (870 000 t), Nchanga smelter (311 000 tpa), Nkana Refinery (300 000 t), Chambishi smelter (150 000 t blister copper per annum) and Chambishi Metals (25 000 t blister copper)<sup>39</sup>. Operations at First Quantum's Bwana Mkubwa SX-EW facility were suspended temporarily in October 2008, but were resumed in early 2010 following the reopening of the Lonshi border. However, the mine and refinery was officially closed in January 2011 due to the lack of available feedstock<sup>40</sup>.

### **Mining Investment Trends in the DRC**

Since 1995, the DRC government has been engaged in a process of privatisation of its mining assets which contain estimated reserves of 30 Mt of copper and 3 Mt of cobalt. The giant mining parastatal, Gécamines, has entered into various joint venture agreements with foreign mining firms in an attempt to improve its declining production rates and rekindle mining activities along the Copperbelt. Copper output in 2010 reached 409 935 t and is forecast to rise to 851 608 t in 2012. Cobalt production reached 39 327 t in 2010 and is projected to rise to 91 355 t in 2012<sup>41</sup>. In terms of foreign mining investment trends, in 2010 the DRC exceeded South Africa as the main exploration destination in Africa<sup>42</sup>. The outlook for the country's copper-cobalt mining sector is positive and expected to grow significantly over the short- to medium-term as new mines come on stream and new projects planned.

Much of the recent mining-related investment in the DRC has been concentrated in the southern part of the country around the towns of Kolwezi, Lukasi and Lubumbashi. In addition to Gécamines, there are 11 foreign mining companies involved in the copper-cobalt sector in Katanga. Producers include Canadian firms Anvil Mining, Africo Resources, Greenock Resources Inc, Freeport McMoRan Copper & Gold Inc/Lundin Mining Group and First Quantum Ltd, South Africa's Metorex Mining Limited and ARM/Vale, Australia's Tiger Resources and Mawson West, Kazakhstan's Eurasian Natural Resources Corporation (ENRC), and Swiss-based Glencore's subsidiary Katanga Mining Limited.

At the time of investigation, there were 11 copper plants in operation in Katanga, and seven in suspension for various economic and legal reasons. Only two projects are in the development/construction stage; one mine, and one SX/EW refinery. Nine mining companies (excluding Gécamines) have exploration projects underway. Capital investment varies across projects with some as low as US\$6 million and others exceeding US\$1.3 billion.

### *Mining Activities*

The largest copper mine by capacity operating in the DRC is the Tenke Fungurume Mine, owned by Freeport-McMoRan/Lundin Group and Gécamines. The US\$900 mine and processing plant commenced operations in early 2009 and produced 115 000 t of copper cathode in 2010. This is anticipated to rise to 130 000 t in 2011. The mine has a 40 year expected life. Known and indicated resources for the whole Tenke Fungurume concession

are 235 Mt (3.01 per cent copper and 0.31 per cent cobalt) with contained metal estimates of 4.2 Mt copper and 444 000 t cobalt<sup>43</sup>.

Katanga Mining Limited's Kamoto Underground Mine and KOV Open Pit Mines produced 52 048 t copper cathode, 14 724 t contained copper concentrate and 3 445 t cobalt metal in 2010<sup>44,45</sup>. An additional 16 538 t copper cathode was produced at Anvil Mining's Kinsevere 1 operations. The open pit mine has proven and probable reserves of 20 Mt, at a grade of 3.9 per cent, containing 689 500 t copper metal. A US\$400 million expansion programme (Kinsevere 2) is underway by Anvil to ramp up output to 60 000 t during 2011. The company is also reviewing opportunities at the Motoshi project<sup>46</sup>. A relative newcomer to the sector is Mawson West Ltd, who is operating the Dikulushi mine (acquired from Anvil Mining in February 2010). Dikulushi has a 7 year life of mine with an annual production target of 15-20 000 t copper. Exploration at the company's Kapulo Copper-Silver Project is ongoing<sup>47,48</sup>.

Operations at First Quantum's Frontier Mine and Kolwezi Tailings Retreatment Project were stopped in 2009 following a government enquiry relating to the validity of the company's mining rights. International arbitration proceedings have begun against the DRC government and Gécamines. The Kolwezi plant was designed to initially produce 35 000 t of copper cathode and 7 000 t of cobalt hydroxide annually over its projected 22 years of operation, but capacity is intended to be doubled during the first year for a budgeted capital cost of approximately US\$40 million<sup>49</sup>. ENRC bought the rights to the Kolwezi operation in early 2010<sup>50</sup>.

In terms of new investors undertaking exploration activities, African Rainbow Minerals and Vale have a 50:50 joint venture in the Kalumines Project near Lubumbashi<sup>51</sup>, Tiger Resources owns a 60% stake in the Kipoi project<sup>52</sup>, and Greenock Resources is involved in the Kakanda Copper Cobalt Project, situated adjacent to the Tenke Fungurume project<sup>53</sup>.

### *Smelting and Refining Activities*

Historically, copper smelter production in the DRC consisted largely of low-grade electrowon production. Three smelters in the DRC that remain operational are Gécamines's Luilu and Shituru Electrolysis plants and the OMG's Lubumbashi Slag Treatment plant. Over the past few years, with the resumption of mining activities in the DRC, the production of refined copper has gradually increased. Output has risen from 36 000 t in 2007 to 170 000 t in 2010 aided by production increases at Katanga Mining's Luilu leach plant and ramp up at Metorex's Ruashi II plant and at Freeport-McMoRan's Tenke Fungurume facility. Tenke Fungurume currently has the largest refinery capacity at 115 000 t, followed by the Luita plant and Shituru refineries (100 000 t each), Katanga

Mining's Luilu leach plant (70 000 t), and Metorex's Ruashi II plant (45 000 kt). Following refurbishment of the old Luilu Metallurgical Plant, by 2013 output from Katanga Mining will increase to 150 000 t. Refinery capacity will be further boosted by the commencement of operations at Anvil Mining's Kinsevere Phase II SX-EW plant and First Quantum's Kolwezi Tailings Plant. In terms of production process, by 2014 it is forecast that SX-EW will account for 75% of the total installed capacity as projects in development are disproportionately hydrometallurgical. Total refined capacity in the DRC is forecast to reach around 640 000 t by 2013. This expected surge in capacity in the DRC



will have important implications not only for world mined copper supply but also for world refined copper supply and market balance in the years to come<sup>54</sup>.

## **COMPARATIVE ANALYSIS OF THE BUSINESS ENVIRONMENT IN THE DRC AND ZAMBIA**

Comparatively, Zambia is regarded as a more favourable investment destination than the DRC due to its relatively stable political environment and proactive approach by the government to creating a business environment conducive to growth. Nevertheless, although the outlook for the sector looks favourable in the short-term, there are two challenges which require urgent attention if Zambia is to be able to sustain and capitalise on its position as a leading global copper-cobalt producer.

The first challenge relates to a shortage of power, which requires upgrading and expansion to meet projected demand requirements. Demand by mines is estimated to rise to 1 000 mega watts by 2015. Zambia currently generates 1 400 mega watts per year and consumes 800 mega watts. Domestic demand rises to 1 800 mega watts during peak periods. The situation is aggravated by the fact that Zambia exports power to several of its neighbours and only 18 per cent of the population currently has access to electrical power. The government's Rural Electrification Programme is aimed at alleviating this situation, which raises questions as to whether there will be sufficient supply to meet both industrial and socio-economic requirements in the short- to medium-term<sup>55,56</sup>. A further complication is the government's recent announcement of a 30 per cent increase in the price of electricity to mining companies. This follows on a 35 per cent increase in 2008<sup>57</sup>.

The second challenge relates to the prevailing mining tax and legislation regime, which requires reforming in order to minimise any sense of instability and unpredictability in the sector going forward. In 2008, Zambia increased company income tax from 25 to 30 per cent, raised mineral royalty from 0.6 to 3 per cent, introduced a 25 per cent windfall tax, and separated hedging income from mining income for tax purposes. A profit variable tax of 15 per cent was also imposed. Following protests from mining companies, the government removed the windfall tax in 2009, but kept the other taxes. The dilemma facing the government is to ensure that the mining sector remains attractive to foreign investors, while simultaneously ensuring that mining activities engender the maximum socio-economic impacts possible<sup>58</sup>.

Comparatively, the DRC is one of the lowest cost producers in the world, while Zambia is one of the highest. DRC cash costs amounted to US\$0.47 per pound in 2007, while Zambian cash costs were US1.26 per pound. The DRC's advantages include significantly cheaper power (this will be considerably advanced by the hydroelectric power potential of the Congo River which has the capacity to generate 150 giga watts of power) and lower

labour rates than Zambia as well as lower treatment charges due to the higher number of vertically integrated refinery operations. Operations in the DRC also earn far higher by-product credits from the production of cobalt compared to Zambian mines. The cobalt credits reduced cash costs in the DRC by between 30 and 40 per cent compared with 3 to 4 per cent for Zambian operations<sup>59</sup>.

In the DRC, three of the greatest challenges preventing the optimal exploitation and expansion of mining activities relate to data availability, poor governance and business practices and inadequate infrastructure. Although the DRC has a long history as a copper-cobalt producer, the sector is characterised by a relative paucity of up-to-date public information relating to mineral occurrence and size of deposits. Data is available for the larger copper-cobalt deposits, which are owned and operated by foreign companies, but those that remain majority owned and controlled by Gécamines, information is significantly lacking. Exploration efforts would be greatly advanced if copper-cobalt showings that have already been located in the DRC were captured and reported.

Although the government encourages foreign investment to boost employment, exports and economic growth, and various stakeholders in the mining sector have signed a code of conduct designed to reduce fraud and increase transparency, the threat of political instability, questionable governance practices, and uncertainty created around security of land rights remains a serious threat to the growth and expansion of the country's mineral industry. The DRC ranked 164 out of 178 nations in the 2010 Corruption Perception Index. This has implications for the continuing attractiveness of the country to foreign investors<sup>60</sup>. To justify the additional risks involved in investing in the DRC, the potential returns and rewards must exceed those obtained by mining producers in other jurisdictions. Mining companies may start to consider the establishment of smaller mines, with shorter payback times. While this could reduce the capital risk on the part of the investor, it will also reduce the socio-economic impact and reach that such projects could potentially engender<sup>61</sup>.

Infrastructure in the DRC is considered inadequate dilapidated and in some areas severely damaged. China's US\$9 billion resource-for-infrastructure deal with the DRC government will go some way in upgrading the national road and rail network and critical infrastructure base in the country over the long-term. In order to address short-term requirements, many mining companies have had to undertake their own investment, either in partnership or individually, to improve infrastructure surrounding their activities. For example, the successful development of Anvil's operations depended on the innovative transport solution to take minerals across Lake Mweru to a sealed road network in Zambia. Anvil also invested US\$10 million in building a new road between Kilwa and Kasomeno and upgrading the link between Kisonga and Lubumbashi with the financial assistance of the World Bank<sup>62</sup>.

## **CONCLUSION**

Aided by high prices and surging demand, investment activities on the DRC and Zambian Copperbelt have intensified over the past five years. While some projects have just involved expansions and upgrades to existing plant and equipment, a significant percentage of investment has been in new greenfield activities. Although the copper-cobalt mining sector in Zambia is well-established with most mines fully operational, there is a strong pipeline of exploration projects underway. In the DRC, operations are comparably more

recent and the pipeline involves exploration, development and operating plants. Given the high-grade copper and cobalt mineralisation of the Copperbelt, the region will contribute significantly to meeting future global requirements for both metals in the medium- to long-term. However, DRC's volatile security situation and limited infrastructure make it

difficult to predict what the future for the country's copper industry holds. Similarly, clarity from the Zambian government on the issue of mining taxation and ensuring access of mining producers to critical inputs, specifically power, is urgently needed in order to reassure, retain and attract additional investors going forward.

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