



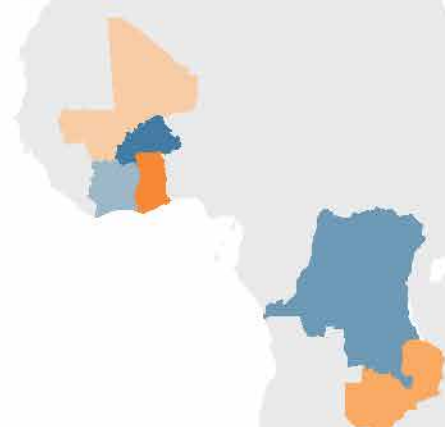
LION in the Copperbelt

Country context

Model findings

Policy Recommendations

January 2019



Acknowledgements

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Authors

Nils Handler, Johannes Danz, BGR

Photo credits

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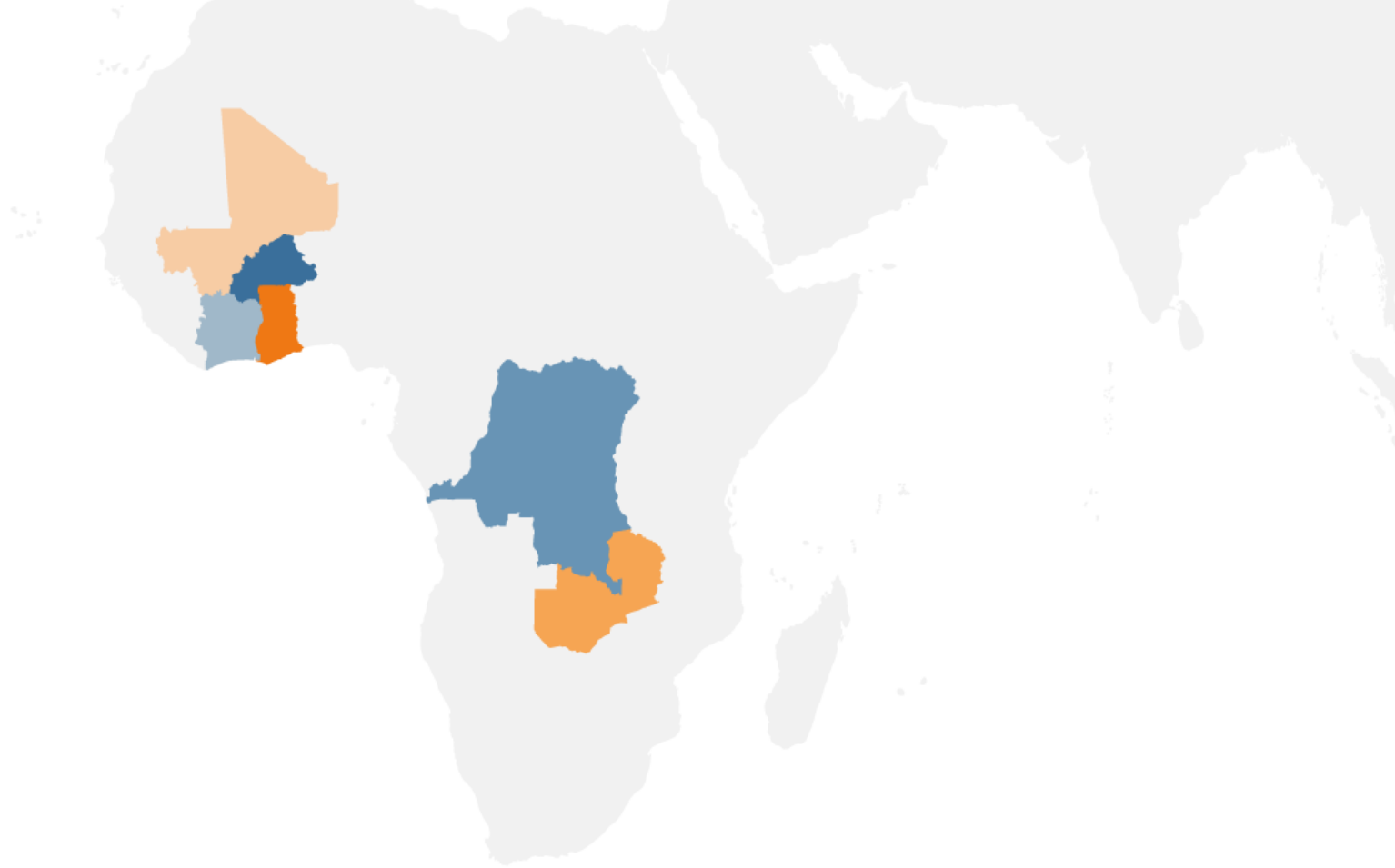
Increasing Local Procurement in the Mines around the Copperbelt

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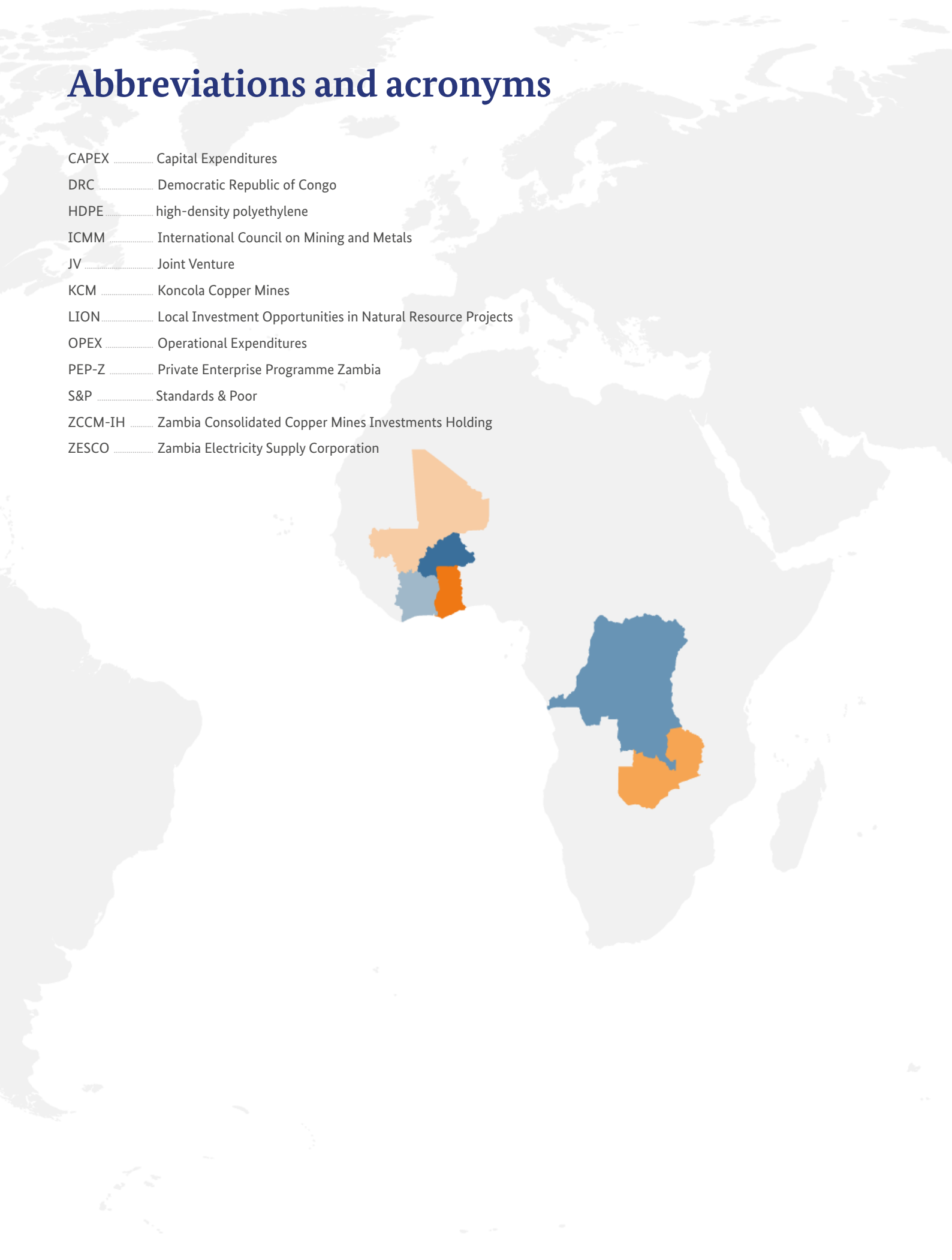
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Abbreviations and acronyms

CAPEX	Capital Expenditures
DRC	Democratic Republic of Congo
HDPE	high-density polyethylene
ICMM	International Council on Mining and Metals
JV	Joint Venture
KCM	Konkola Copper Mines
LION	Local Investment Opportunities in Natural Resource Projects
OPEX	Operational Expenditures
PEP-Z	Private Enterprise Programme Zambia
S&P	Standards & Poor
ZCCM-IH	Zambia Consolidated Copper Mines Investments Holding
ZESCO	Zambia Electricity Supply Corporation



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Zusammenfassung

Im Rahmen ihres entwicklungspolitischen Engagements für lokale Wertschöpfung im Rohstoffsektor hat die Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) LION entwickelt. LION steht für *Local Investment Opportunities in Natural resource projects* – zu Deutsch: lokale Investitionsmöglichkeiten in Rohstoffprojekten. Der innovative Ansatz verschneidet Primärdaten zur Kostenaufteilung von Bergbaubetrieben mit deren Barbetriebskosten, die sich im Kupfergürtel auf mehr als US\$5 Milliarden jährlich belaufen. Dies belegt die Modellierung, die auf die im Sommer 2018 durchgeführten Feldstudie aufbaut.

Diese Begleitpublikation beleuchtet die lokalen Bedingungen in Sambia und der Demokratischen Republik Kongo, wo LION die Märkte für Zulieferprodukte des Kupfer- und Kobaltbergbaus modelliert, beispielsweise für Energie, Ersatzteile und Schwe-

felsäure. Dieses bisher nicht verfügbare Informationsangebot ist ein wichtiger Baustein um lokale Wertschöpfung zu fördern. Es dient als Informationsgrundlage für Politikgestaltung und als Angebote zur Wirtschaftsförderung, beispielsweise bei der Anbahnung von Joint Ventures zwischen lokal produzierenden Unternehmen und international etablierten Technologieträgern.

LION ist ein Produkt aus *Enterprise around Mining*, einem Arbeitsstrang im BGR Sektorprogramm Rohstoffe und Entwicklung. Es nutzt die erhebliche Kaufkraft des Bergbausektors um lokale Wertschöpfung zu fördern mit dem Ziel einer nachhaltigen Wirtschaftsentwicklung. Ursprünglich wurde das Instrument für den Goldbergbau in Westafrika (Ghana, Elfenbeinküste, Burkina Faso, Mali) entwickelt, bei dem sich die Barbetriebskosten der Bergbaubetriebe jährlich auf etwa US\$2,6 Milliarden belaufen.



Executive summary

As part of its development policy commitment to local value addition in the resource sector, the Federal Institute for Geosciences and Natural Resources (BGR) has developed LION, which stands for *Local Investment Opportunities in Natural Resource Projects*. The innovative approach blends primary data about mines' cost split percentages for individual procurement categories with publicly available cash operating costs. Mining procurement spend hovers around US\$5 billion per year in the Copperbelt (Zambia & Democratic Republic of Congo) according to the BGR model which builds on a field study conducted in the summer of 2018.

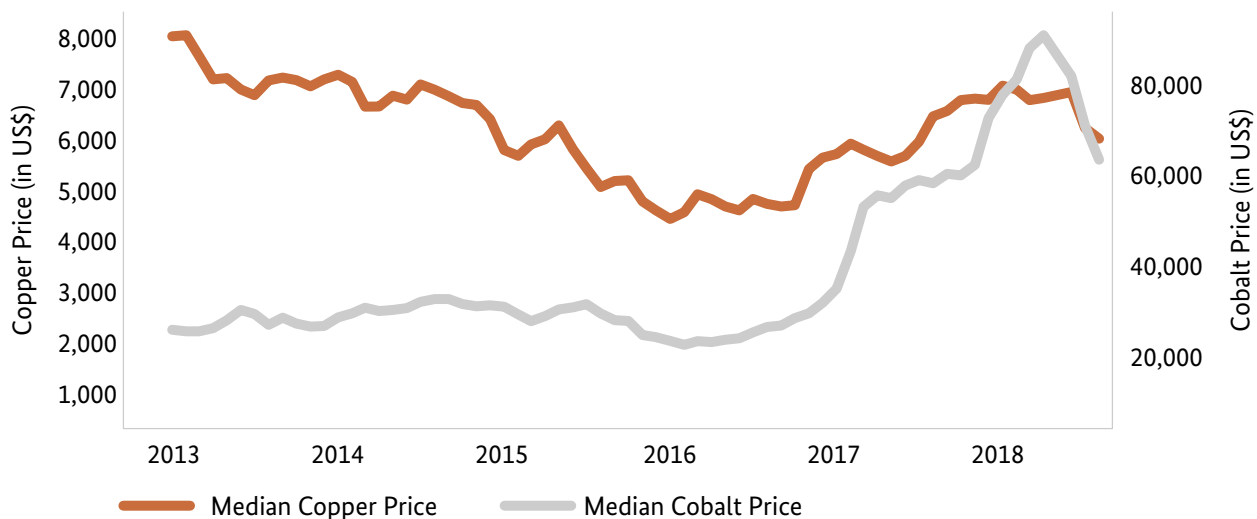
This publication supplements the LION model by illuminating the local contexts in Zambia and the Democratic Republic of Congo, where LION models the markets for supplier products such as energy, spare

parts and sulfuric acid. This information not previously available is an important puzzle piece to promote local value addition. It forms a basis of information for designing effective policies and to marshal support for local economies by the public and private sectors, for example via joint ventures between locally producing companies and international technology providers.

LION model is a product of *Enterprise around Mining*, a work stream of the BGR sectoral program Extractives and Development. It leverages the substantial purchasing power of the mining sector to strengthen local value addition and hereby foster sustainable economic growth and development. The tool was initially developed for gold mining in West Africa, where mining procurement spend amounts to about US\$2.6 billion annually.

1. All eyes on the Copperbelt

Figure 1 Copper and cobalt price development



The Copperbelt is frequently making news headlines these days. The copper it produces is an important mineral for the future energy transition, its cobalt a vital ingredient for smartphones and the batteries fueling the future e-mobility. In both the Democratic Republic of Congo (DRC) as well as Zambia the mining sector is paramount for the economy. Specifically, the countries are ranked 2nd (DRC) and 24th (Zambia) in the International Council on Mining and Metals (ICMM) ranking on the role of mining in national economies¹. Both minerals are identified as essential for a low carbon future². Thus cobalt and copper in these two countries set the Global Energy Transition in motion – and vice versa.

In the past two years the price for copper has increased from US\$4,500 per ton to US\$7,000 per ton, i.e. less than doubled, whereas the price for cobalt has quadrupled from US\$22,000 to US\$90,000. The resulting policy imperative is to leverage the demand increase and the resource sector more broadly to achieve economic development objectives. In 2017 the value added by the manufacturing sector in Zambia represented 7.6 percent of GDP, in the DRC it represented 19.7 percent of GDP for the same year according to World Bank data³. This is a good basis on which to further enhance local procurement and thus indirectly employment in the sector.

BGR has developed the Local Investment Opportunities in Natural Resource Projects (LION)-Model with this goal in mind. The tool estimates aggregated operational procurement spend in 34 standard-

¹ www.icmm.com/en-gb/society-and-the-economy/role-of-mining-in-national-economies/mining-contribution-index

² 'The Growing Role of Minerals and Metals for a Low Carbon Future'. The World Bank, 2017

³ World Development Indicators

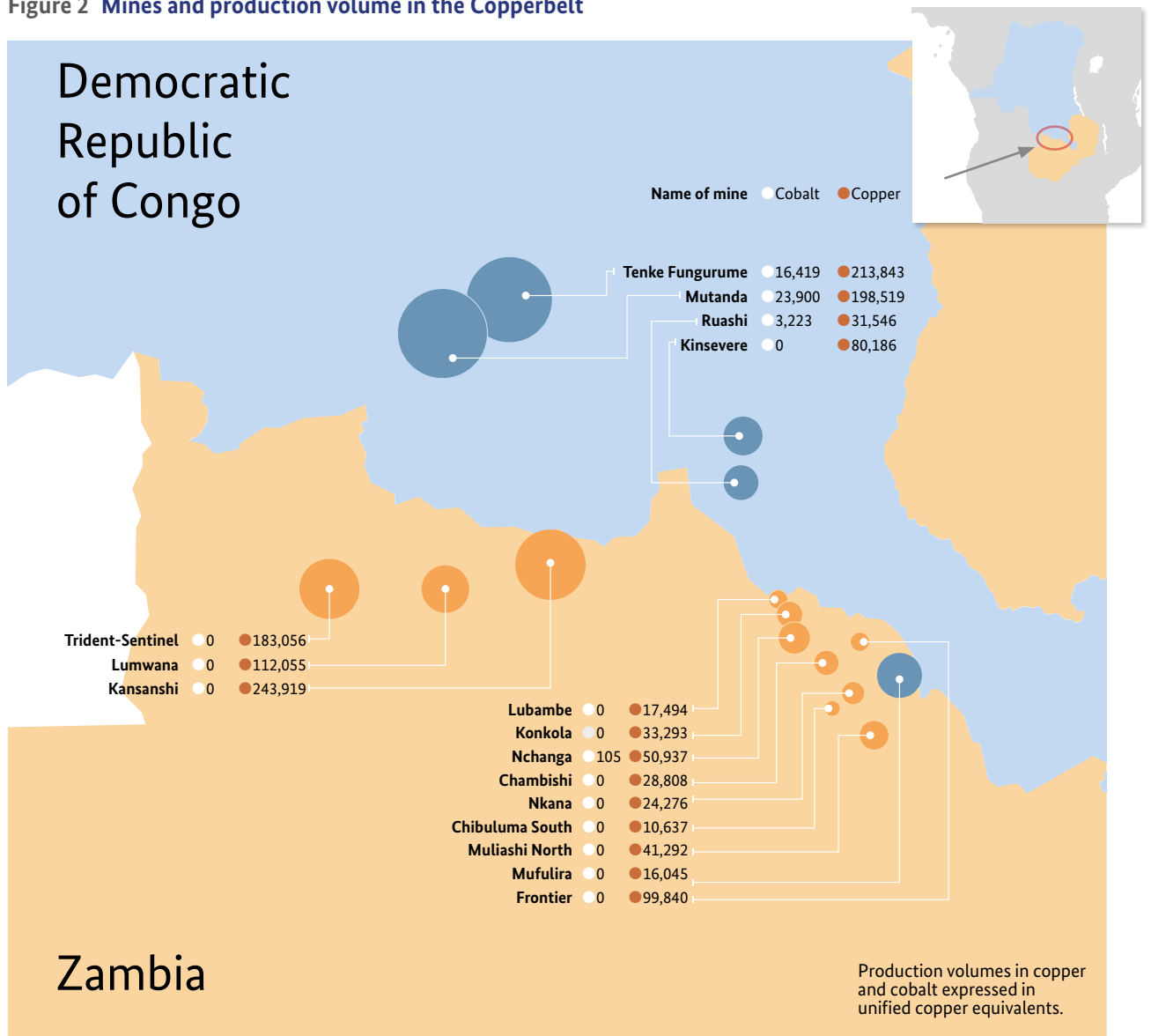
ised product and service categories. It combines publicly available cash costs with spending percentages for a set of pre-defined categories. In the Southern African Copperbelt model currently covers 18 mines in Zambia and the DRC for the time period between 2013 and 2017. It is the result of data collection in the region in the summer of 2018.

The LION tool provides modelled market data and contextual information via BGR's Tableau Public platform⁴. The policy instrument is based on real procurement data. The cost splits have been determined based on actual procurement data and expert input. It is efficient to update with new cash cost data, easy to use and interactive, i.e. users can select

years, countries or specific categories to explore. Before being applied to the Copperbelt the model has already been successfully developed for gold mining in West Africa.

This publication provides supplementary information for the interested reader of BGR's online model results⁵, puts them into perspective and distills policy recommendations and conclusions. This publication first presents the current context of the mining sectors in Zambia and the DRC. It then goes on to discuss the LION model, its main findings and briefly compares the model findings with those for West Africa. It then translates the findings into recommendations for different audiences in both countries.

Figure 2 Mines and production volume in the Copperbelt



^{4,5} public.tableau.com/profile/extractivesanddevelopment#!

2. Summary of Copperbelt country contexts

2.1 Zambia

There are around 20 operational copper mines in total in Zambia, including big players such as Konkola Copper Mines (KCM), Mopani, Mufulira, Nkana, Lumwana, and Kansanshi. Many mines went into care and maintenance during the lower copper price period, but are now ramping their production back up. Many mines are mothballed below a copper price of US\$5,000. There is virtually no cobalt production in Zambian mines compared to the DRC, which also impacts their economics. As mining has been around for decades in Zambia, some have legacy cost structures due to being set up to provide social and employment benefits (e.g. Konkola). Others are sweating existing assets, which means they are avoiding to replace old machines and to make capital investments, for example in Chibuluma.

In Zambia, there is a mix of underground and open pit mining. In some cases both co-exist within one mine. All mines are on-grid – historically they have been supplied by the privatised Copperbelt Energy Corporation (CEC), but increasingly the national operator Zambia Electricity Supply Corporation (ZESCO) is also supplying directly. Underground mines usually have higher electricity costs. The KCM mine for example is operating under very difficult conditions as it is one of the World's wettest mine. It has to pump around 450 million litres of water to the surface every day in order to avoid a flooding of the shafts.



Water pumps in the Konkola Copper Mines (KCM)

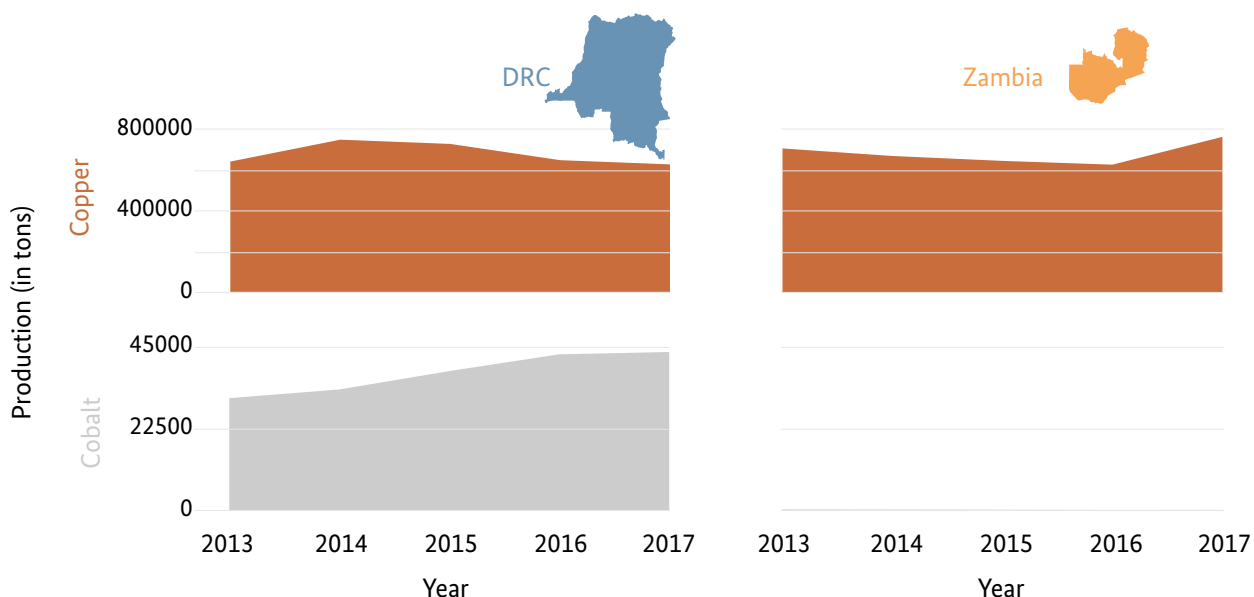
There are a range of investor types and types of operators, including both listed and unlisted or de-listed. Investors have different countries of origin, including India, Kazakhstan, and China. The government is a minority shareholder in many of the mines through Zambia Consolidated Copper Mines Investments Holding (ZCCM-IH) (generally 10 to 20 per cent).

Current policy demands

In terms of the local procurement context, there have been numerous studies and initiatives since 2011 aiming to support local content development – notably the Local Content Development Initiative and Private Enterprise Programme Zambia (PEP-Z); a multi-sectoral supplier development and business linkages programme. There have also been some recent initiatives trying to facilitate local-international supplier joint ventures.

The local supply context has historically been dominated by the local traders, in some cases as registered agents or distributors of international brands. Many former mine employees who have left or been retrenched during the downturns are now supplying the mines. There is nevertheless some local value-adding supply e.g. steel balls and lime, as well as both technical and non-core services. They are competing with mine suppliers and recently significant Chinese manufacturing investments are changing the competitive landscape.

Figure 3 Production trend in cobalt and copper. Cobalt is only relevant in the DRC



2.2 Democratic Republic of Congo

Copper and cobalt mining on the DRC side of the copper belt includes large industrial mines such as Tenke Fungurume, Mutanda, Katanga, Kinsevere; medium industrial mines such as Kipoi, as well as smaller and artisanal production. Unlike Zambia, cobalt production is significant in the DRC as you can see from figure 3. Most are open pit at the moment, with a few exceptions such as Frontier and Kamoto. It is likely that many mines will move underground in the medium term, as the more accessible ore is used up. Producing in the rainy season can be challenging, therefore the majority of production has to take place in the dry season at some mines. However, at a cash cost level this seems to be offset by higher ore grades than Zambia, and at the moment by significant cobalt by-product revenue. There are also various projects close to operational stage which could support growth of the market.

As with Zambia, there is a diversity of investor types, although there appears to be a trend of Western investors selling to Chinese-owned companies. An example is Freeport selling Tenke Fungurume to China Molybdenum Co.

Logistics and infrastructure are major cost considerations – it can take around 30 days for goods ordered

from South Africa to reach the mines in the DRC. Significant border clearing issues and frequent delays result in significant logistical and stock-holding costs. Poor infrastructure connecting the Copperbelt area to Kinshasa imply that it is typically easier to source supplies via Zambia than from the Congolese capital.

Initial statements often implied that there is no local production capacity and that the operating environment is very difficult for competitive manufacturing suppliers. And yet, some interviews later revealed that previously relevant capacity existed which could be revitalised. Further, there are some national and international investments are currently planned, including lime, steel balls, sulphuric acid and high-density polyethylene (HDPE) pipe. In addition, there are some locally-owned value-adding services companies such as logistics and fuel, as well as international suppliers with local workforces such as security.



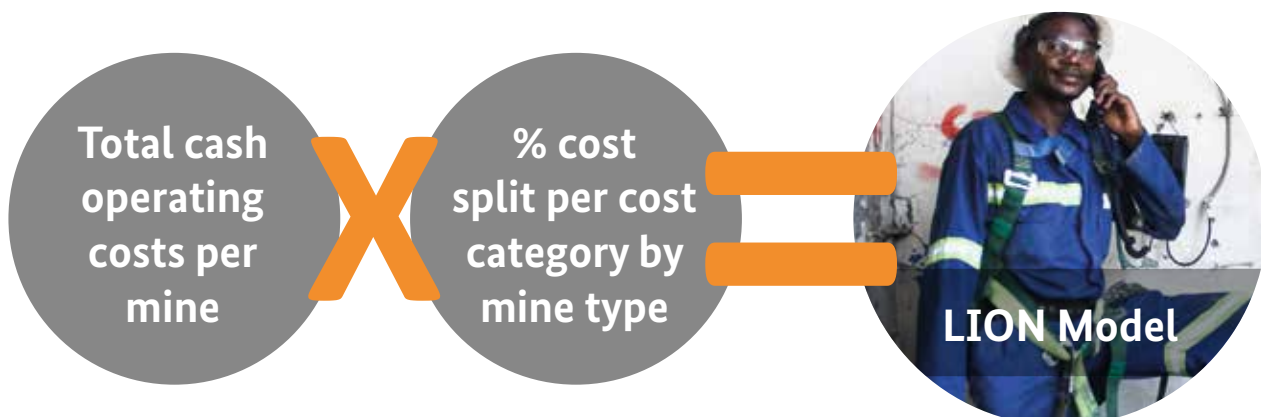
3. The LION model and its methodology

The BGRs contribution to the debate on local content in Zambia and the DRC is the LION-tool. Its value proposition is to identify big ticket items most suitable for effective localization strategies by mining companies, international suppliers, and policy makers. By estimating market sizes it also identifies opportunities for local companies to supply the mines, and for donors to support such efforts.

The study consolidated a list of operational mines in Zambia and the DRC (see Annex), and integrated it with available cash operating costs in the Standards & Poor (S&P) Global Database. It then worked with local partners to gather available information and reach out to relevant mining officials such as procurement and finance specialists requesting procurement information. The review of the procurement data was synthesized in a cost-split; that is a matrix indicating the segment shares of different procurement categories.

The cost-split was validated via face-to-face interviews of the mining officials, as well as by further meetings with experts such former procurement officials, accounting officials, and logistics and supply chain professionals with mines as clients. The feedback was leveraged to fine-tune the cost split including a revision of reagent categories for copper and gold mining.

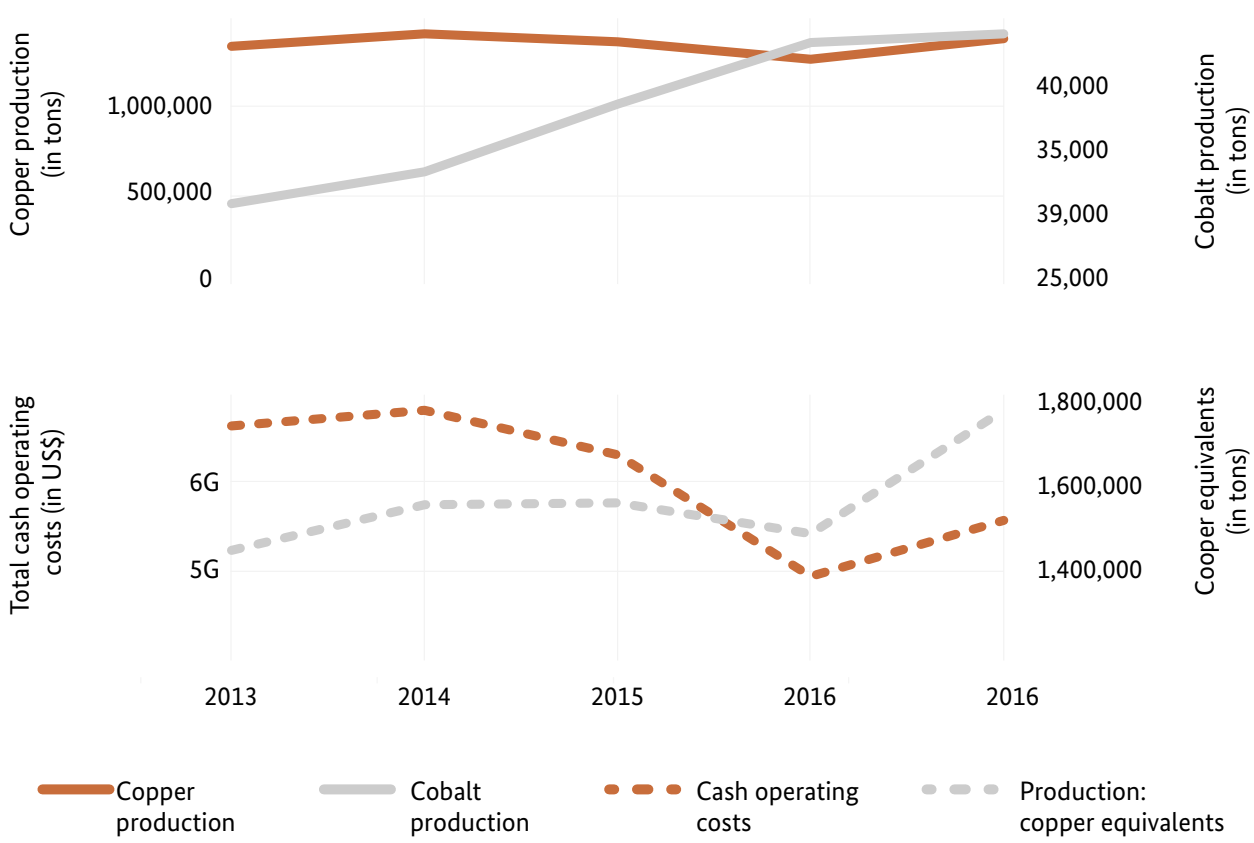
The data was then processed with Tableau to generate charts, maps and other visualizations most of which you can see in this publication. The maps geo-referenced the individual mines, the size of the circles indicate the respective production volume. In the Tableau Public version available online the production data is available for several years. The mine production data is expressed in copper equivalents. This means that the cobalt production (only relevant in the DRC) is converted into its monetary equivalent in units of copper.



Below you can see the aggregate outputs for the Copperbelt. It indicates the total production of copper, cobalt, and copper equivalents, and most importantly the total cash operating costs in the region.

The latter figure estimates total procurement spend at US\$6.8 billion in 2014, US\$6.3 billion in 2015; US\$4.9 billion in 2016 and US\$5.5 billion in 2017.

Figure 4 Production and procurement



4. Main findings of the LION model

The heart piece of the LION model is the estimation of demand for different procurement product categories. It represents the total cash operating costs per mine multiplied by the cost split per cost category by mine type, resulting in the aggregate spend per category. Conditional on further exploration and validation, these top categories become the preferred local investment opportunities.

The modelled procurement spend estimates are useful for various reasons. Mostly, they help understand the scale and nature of the market for mine products and services for a broad range of different stakeholders such as government, private sector and support entities. They therefore support decisions that increase local procurement by providing an initial clue on market attractiveness for various products and services. This can inform local suppliers and potential Joint Venture (JV) partners for example.

For the **Copperbelt in 2017** the top spending categories are

- 1... **Electricity** (US\$470 million for Zambia; US\$453 million for the DRC),
- 2... **Fuel and lubricants** (US\$236 million for Zambia; US\$283 million for the DRC);
- 3... **Spare parts and Operational Expenditures (OPEX) equipment** (US\$235 million for Zambia; US\$255 million for the DRC);
- 4... **Sulphur and Sulphuric Acid** (US\$164 million for Zambia; US\$170 million for the DRC); and
- 5... **Equipment and Plant Maintenance** (US\$136 million for Zambia; US\$141 million for the DRC).

The lowest categories are Telecommunications and Electronic equipment, each with less than US\$10.000 for both countries combined.

In Tableau Public the user can select spend estimations per category for different years. This demon-

strates the evolution over time of the spend data. Similarly, figure 5 also shows this sequential evolution. When thinking of the spikes on the right as a mountain chain, higher peaks indicate a higher level of spending in that particular year.

To get a better bearing of idiosyncrasies of the mining sectors in different African regions it is insightful to juxtapose the Copperbelt data to the existing BGR data from West Africa. Here, the top spending categories are

- 1... **Fuel and lubricants for power generation** (US\$209 million Mali, US\$156 million Burkina Faso, US\$130 million Ghana, and US\$7 million Côte d'Ivoire);
- 2... **Reagents** (US\$73 million Mali, US\$68 million Burkina Faso, US\$163 million Ghana, and US\$38 million Côte d'Ivoire);
- 3... **Fuel and lubricants for mining** (US\$61 million Mali, US\$78 million Burkina Faso, US\$158 million Ghana, and US\$39 million Côte d'Ivoire);
- 4... **Spare parts and OPEX equipment** (US\$64 million Mali, US\$53 million Burkina Faso, US\$140 million Ghana, and US\$33 million Côte d'Ivoire);
- 5... **Grinding media** (US\$42 million Mali, US\$37 million Burkina Faso, US\$90 million Ghana, and US\$21 million Côte d'Ivoire); and
- 6... **Electricity** (US\$146 million Ghana, and US\$43 million Côte d'Ivoire).

The lowest categories are Telecommunications and Water services and waste management, each with less than US\$5.000 for all countries combined.

Thus overall the procurement spending categories are similar in their relative importance, yet not identical in the two regions. Also, the Copperbelt is almost twice as large in terms of the total mining procurement spend compared to West Africa.

Figure 5 Procurement volume by expenditure category

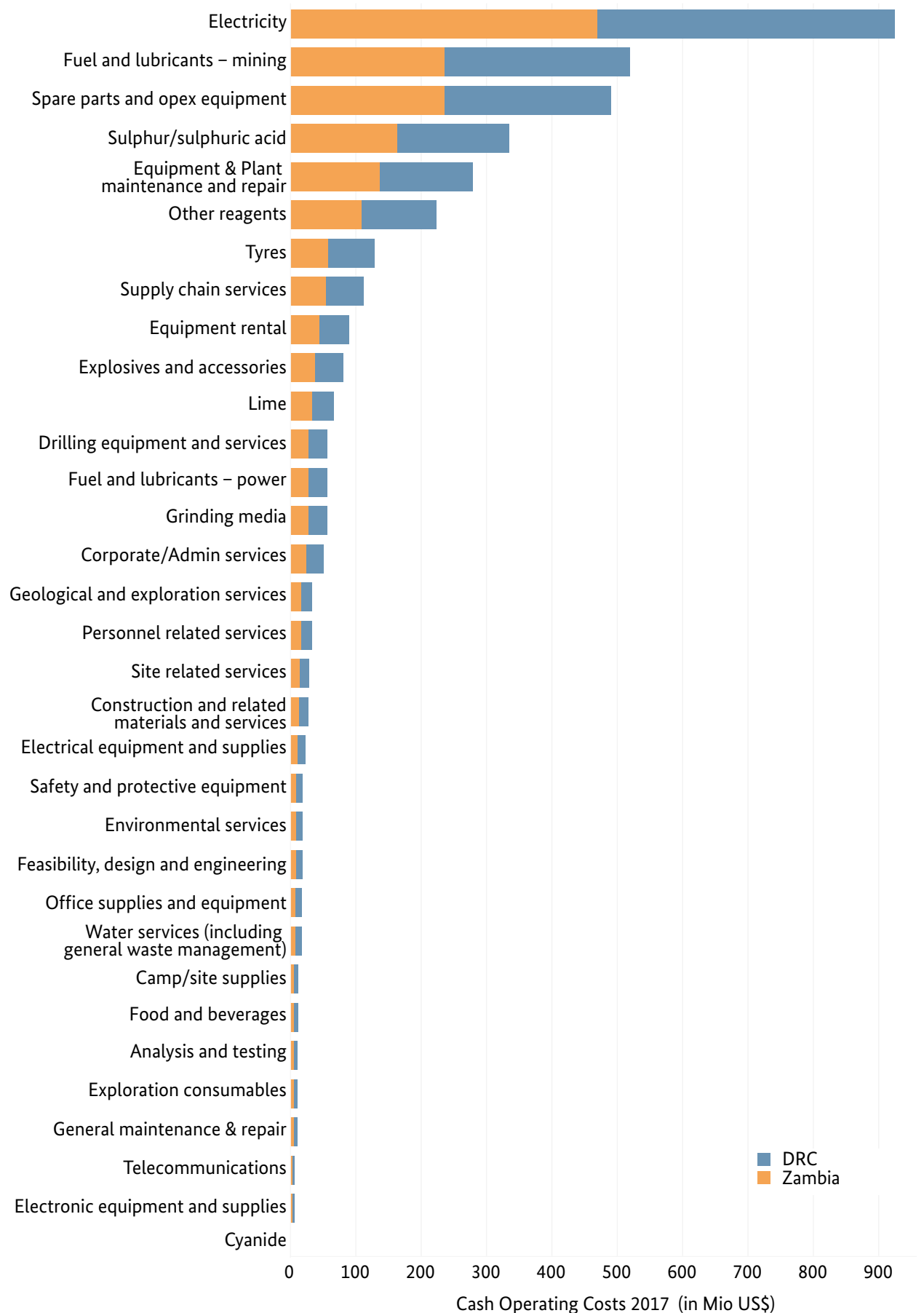


Figure 6 Top 10 procurement items over time

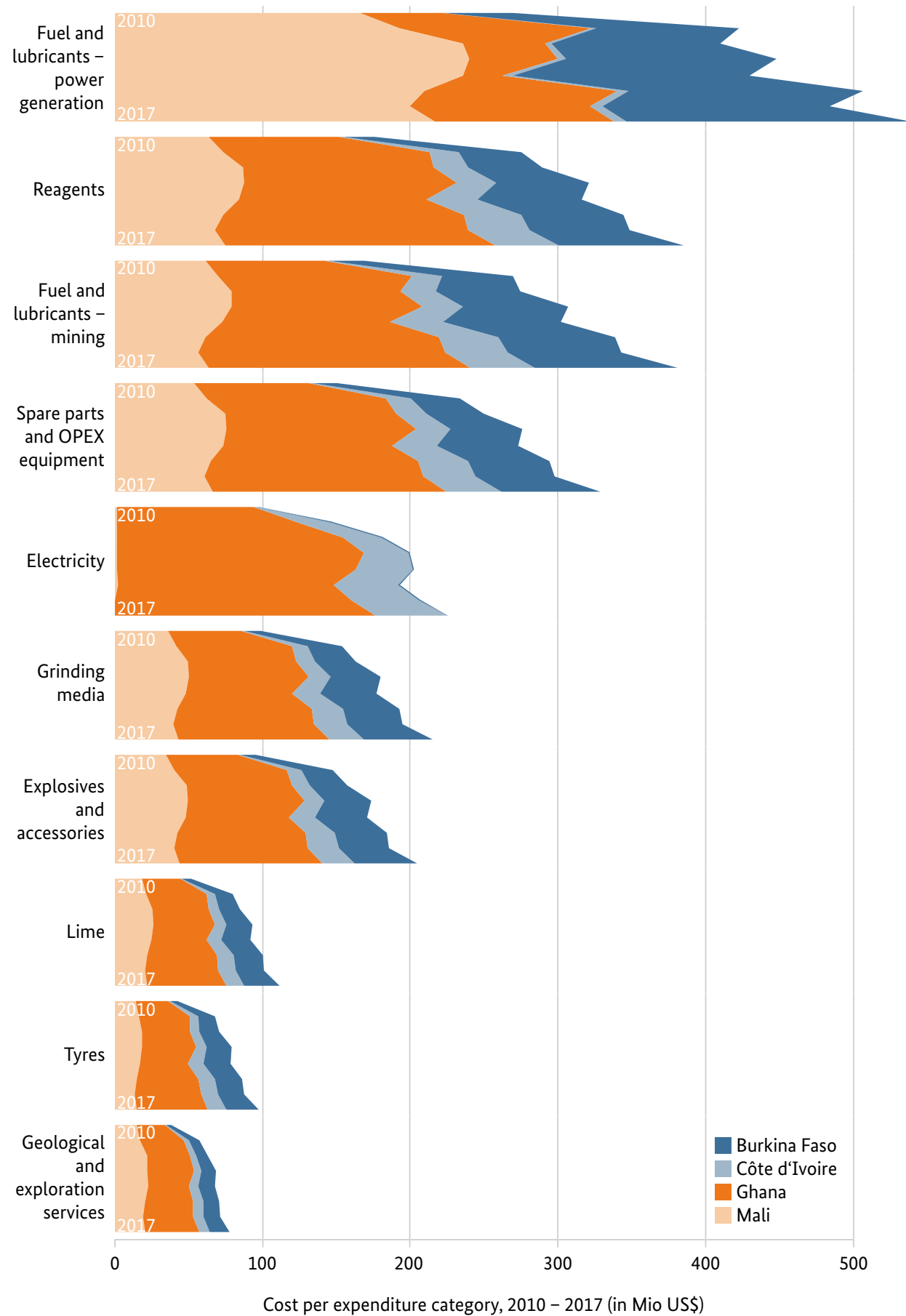
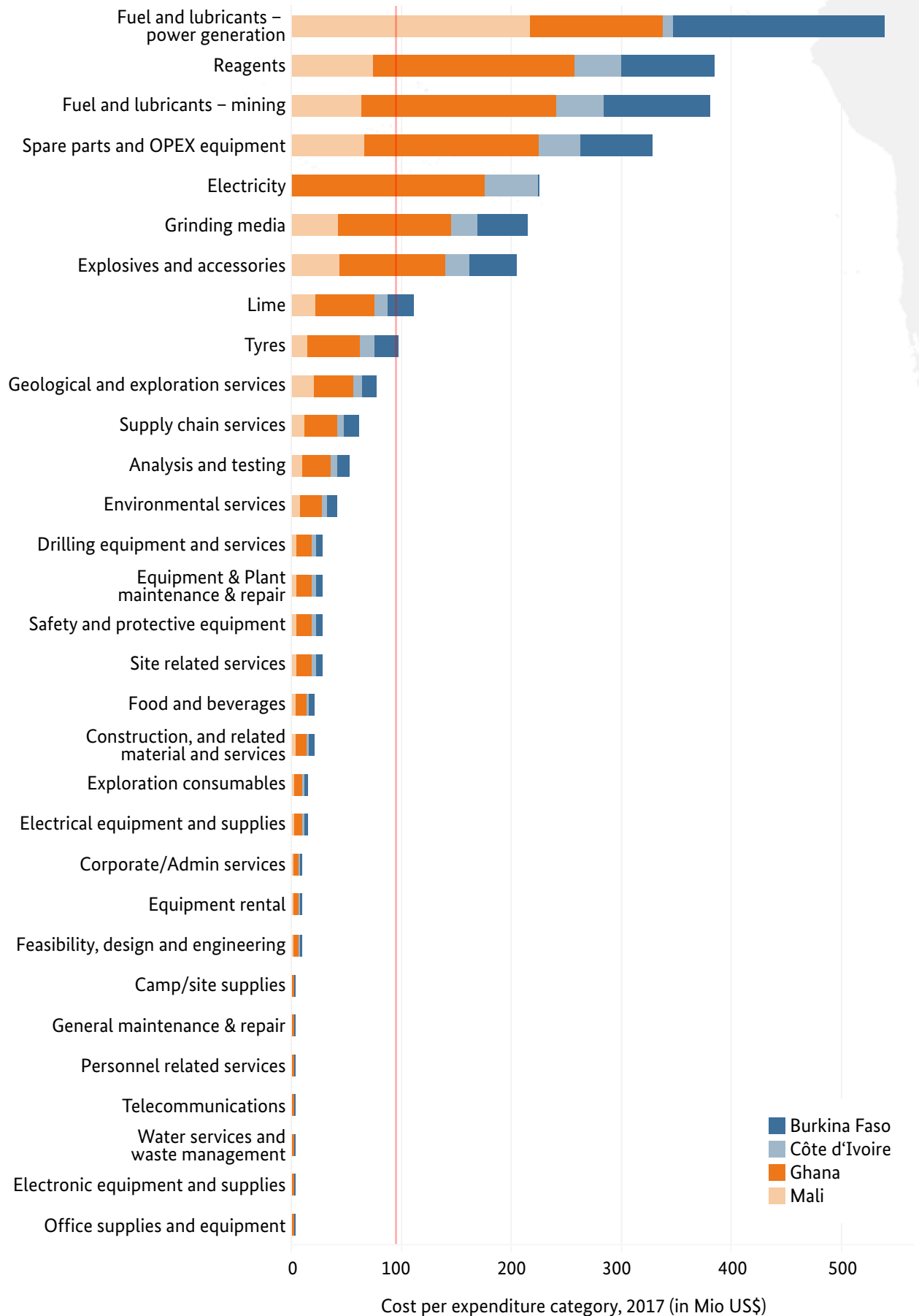


Figure 7 Regional cost structure by country and year



5. Limitations of the model

While the previous section introduced some of the multiple ways in which the LION model can be useful, there are also some important caveats to keep in mind. Most importantly, the procurement categories and their modelled spend do not automatically translate into opportunities for increased local content and local procurement without further analysis. Further factors that need to be taken into consideration are for example existing local supply and local content, ease of access to the local market, competitiveness of local production, and logistical costs, among others. What the LION model does provide is the initial clue on what warrants further exploration instead of assessing the feasibility of an opportunity.

There are further limitations of the model when placing it into the broader policy debates around local content. For example, it covers operational spend instead of CAPEX or project spend. The rationale for this decision is that OPEX is much more stable over a much longer time horizon than CAPEX, and thus

much more suitable for achieving a steady level of local procurement.

Further, the model does not extrapolate price or spending levels as this would be speculative. Similarly, it does not forecast future demand based on projects that are not yet in operation. The estimation is based on average spend per category, and is therefore not necessarily accurate for an individual mine due to variations in companies' operational strategy, technology choice etc. Also, the aggregate demand categories do not segment specialized individual products or services within individual categories.

Therefore it should be self-evident that the usefulness of the information provided depends on the local context. On its own, the model can give context to other support programmes such as supplier portals and investment facilitation. It will be most effective when combined with other information on local procurement.

6. Recommendations for policy and action by target audiences

The main policy recommendation resulting from the LION model is to focus localization efforts on the big ticket spend categories with the highest value. One by one, these categories need to be assessed and validated as true opportunities for local investment. The benefit of this approach is that it is strategic in dedicating limited resources to the options with the highest marginal return in terms of localizing value-added. The experience from Ghana shows that an initial targeted list of items with the highest potential for value added can later be expanded once procurement has successfully been localized in these categories.

The validation of procurement categories includes the following steps:

- ▶ an assessment of local supply, for example by creating a supplier portal
- ▶ investigating the ease of access to the local market, specifically the existence of regulatory barriers to entry
- ▶ assessing the competitiveness of local production, for example using the revealed comparative advantage metric
- ▶ logistical costs, especially if dealing with supply routes to very remote mining areas

These steps should be repeated for the procurement categories in their hierarchical order to ensure strategic cost-effectiveness as discussed in the previous paragraph. As mentioned, the intended user-groups for the LION tool are: **current and potential mining suppliers; mining companies; government and regulators; and support bodies and donors.** The model can provide value to all these user types. It should be recognised that this is a modest and focused con-

tribution that will provide different levels of value depending on the context and the wider support environment. In the following we discuss audience-specific recommendations for action.

For **local suppliers**, the tool can give a sense of the scale of the market as well as its evolution over time, and other risk factors. It can help coordinate various suppliers to divide and conquer different product categories instead of simultaneously chasing the same small market. It can therefore help suppliers in their decision whether to enter a specific market, where to look for international partners, as well as in lobbying for support. They should therefore match their product offerings with the procurement demand categories to identify business opportunities in existing or new-to-the-firm procurement markets. Importantly they need to check whether their quality and prices meet the demands of the mine customers.

For **international suppliers**, the tool helps them as a first step to understand the scale of a new market, especially if their current awareness of African markets is low. If they have already entered, it gives them a more accurate view of the size and segmentation of the market beyond existing clients. The tool is probably less relevant for sophisticated suppliers with a highly focussed, specialized market. And yet, for larger companies it can give a direction on where to support skills and capacity development as part of their corporate social investment strategy. Obviously their attention should follow the hierarchy of the LION categories instead of focussing on say catering.

For **mining companies**, the tool allows procurement officials to better understand the demand of the en-

tire market beyond their own sourcing activities. Most importantly, the tool can assist in planning local supplier development programs in their prioritisation. The business case for localization by mining companies and international suppliers includes not only the *social license to operate* but also cost savings if properly targeted via the corporate procurement strategy. Lastly, it can serve as a baseline for ongoing reporting, for example by the Chamber of Mines.

For **government officials** the LION tool can help understand the relative scale of different product and service markets. This information is paramount for

designing effective legislation that prioritises local procurement in the categories with the highest value. It can therefore inform policy priorities and action plans targeting investment promotion efforts. Further, the tool can serve as a cross-check for reporting on local content and procurement plans.

For **donors and support bodies** such as linkages programs, chambers of commerce, industry associations and commercial banks, the tool outlines the shape of the procurement markets and hereby assist in investment facilitation. It provides the context, helps in focussing the programs and targeting beneficiaries.

7. Annex

Mine and stakeholder-meetings included in the study

Zambia

- ▶ Chibuluma (Jinchuan/Metorex), Finance Manager and Deputy Finance HOD
- ▶ Konkola Copper Mines/Nchanga (Vedanta) Chief Commercial Officer, Communications Manager
- ▶ Zambian Association of Mine Suppliers and Contractors (President and Secretary)
- ▶ Chambishi Mine (CNMMG)
- ▶ Chambishi Metals (ERG)
- ▶ Kansanshi (First Quantum)
- ▶ Mopani Mines/Mufulira (Glencore)
- ▶ Chamber of Mines
- ▶ ZCCM-IH
- ▶ Ministry of Mines

DRC

- ▶ ERG/Boss Mining (Frontier/Kolwezi/Luita/Kakanda), logistics manager, legal advisor
- ▶ Kipoi (SEK/Tiger Resources) Supply Chain Manager, Buyer
- ▶ Ruashi (Metorex) Procurement Unit Manager
- ▶ Tenke Fungurume Mine (CMOC) Procurement Manager, Legal/Compliance and External Relations
- ▶ Kinsevere (MMG), Supply Chain Manager for Africa, Logistics and Contracts Manager, warehouse superintendent, Community and Social Development Manager
- ▶ Katanga (Logistics Manager)
- ▶ Kanshansi (Procurement officer)
- ▶ Federation of Enterprises of Congo – Communications head, Provincial President for Katanga region, Provincial Director, person responsible for Chamber of Mines, legal and tax advisor

