Oxford Policy Management

Raw Materials Group

ICMM
International Council on Mining & Metals

Report

The role of mining in national economies (2nd edition)

Mining's contribution to sustainable development
October 2014

The first edition of this report was published in 2012 and is available at www.icmm.com.

FOREWORD

Building our understanding

Numbers tell important stories. But they never tell the whole story.

By enriching and updating the data since our initial report (in 2012) on the role of mining – now including all 214 national economies across the world – we are learning more about how mining and metals contribute to each country.

The numbers seem to speak for themselves. The well-known role of mining as an economic catalyst is re-affirmed, particularly in terms of national revenues and jobs. Nearly 45 per cent of government revenues in Botswana and 25 per cent in Democratic Republic of Congo come from mining. Each mining-generated job can lead to creation of 3–5 additional jobs outside the mining sector. And mining represents more than 50 per cent of national exports in 16 developing and emerging countries, generating critically needed foreign exchange credits.

Under the right conditions, it is clear that mining can make a contribution that translates to greater well-being for the people, communities and countries where mines operate. And society as a whole depends on the metals that are produced, whether they are for the aluminium boat of the independent fisher, the copper in wind turbines, or the chromium-cobalt alloys used in artificial hips.

Beyond that economic impact – which is often but, sadly, not always positive – the report offers a wealth of information with clear implications for the whole sector. The updated Mining Contribution Index – a composite to assess how mining contributes to the economy – tells us that, of the 50 countries where mining is most important, all but a small handful (such as Australia and Canada) are countries that are less developed or, in a few cases, emerging economies.

This tells us a story far beyond the numbers. It means that the mining sector has a crucial role in fostering sustainable development where it matters most. Poverty alleviation in the world's poorest countries is inextricably tied to the minerals and metals that underpin modern society.

We now know that in many low-middle income countries mining accounts for 60–90 per cent of total foreign direct investment. This investment from abroad finances badly needed infrastructure in mining countries – water supplies, sewage systems, transportation and communication facilities, hospitals, homes and schools – and delivers the most significant macro-economic impact. Mining exports rank second, accounting for 30–60 per cent of total exports in low-middle income countries. The export of mining products is the main avenue for many countries to participate in the world economy.

Royalties and tax revenues are less significant, ranking a distant third in economic contribution – a point that is misunderstood by those who focus solely on apportioning the share of the financial rewards that mining brings, rather than on increasing the size and nature of the rewards throughout the economy and society.

ICMM companies increasingly embrace their role in poverty alleviation. Increasingly they recognize the economic, environmental, socio-cultural implications of their activities through the full mine project life cycle. But it is not a solo role. Mining can catalyze improvements to quality of life and the environment only in partnership with governments and local populations. We must each play our part.

Only by working collaboratively with others as development partners can the industry ensure that the catalytic impact of mining is fulsome and positive, and the perils of the resource curse averted. Best results depend on crisply defined and bounded responsibilities and systems of accountability for companies, governments, communities and civil society organizations.

ICMM takes pride in publishing this second edition of *The role of mining in national economies*, and in including the comments of esteemed reviewers as part of the report. They offer welcome recognition of the progress in our understanding, as well as clear critiques and suggestions for future work. They remind us that while our work in promoting the contribution of mining and metals to the long-term well-being of the human- and eco-system has made great strides, there are still many challenges and new directions to explore.

R. Anthony Hodge
President, ICMM

INTRODUCTION
Setting the scene

This is the second edition of ICMM's overview of the role of mining in national economies. In our first, published in 2012, we documented the force of the mining industry in the world economy. We portrayed an industry of increasing economic significance for many lower- and middle-income economies, while maintaining its critical importance for many high-income countries.

In the lead-up to the Rio+20 conference on sustainable development in 2012, ICMM commissioned a series of reports to describe the contribution of mining and metals to sustainable development. That report found that the contribution to national economies varies greatly between countries. The benefits, costs, risks and responsibilities of mining are rarely well-documented and are frequently poorly understood or even controversial.

The 2012 edition was a first attempt to address these problems by presenting comparative data on some of the main economic contributions of the mining industry for 212 national economies, and creating a Mining Contribution Index (MCI) which ranked countries by the importance of mining and metals to each economy. It was the first time we had crafted together a full global mosaic, with the help of our partners Oxford Policy Management as well as the Raw Materials Group.

The data in the last report covered 2000–2010, when commodity prices were generally strong. This update extends the analysis to 2012, a period when commodity prices were softening. In addition, this edition benefits from the results of case studies in about a dozen countries, undertaken through our Mining: Partnerships for Development project. This report examines whether additional indicators might be added to the three main indicators (based on export and production values).

This edition offers deeper analysis of the role of mining in poverty reduction, which is the highest priority of the emerging Sustainable Development Goals (SDGs).[1]

Section 1 provides an overview of the nature of the mining and metals industry and its contribution.

Section 2 describes the current global context for mining, with a review of trends in the value of world production and among major producer countries and how they have evolved in the past two years. It examines the relative roles of changes in production volumes and prices in driving production values by looking at three selected countries: Brazil (where iron ore dominates), Ghana (gold) and Zambia (copper).

Section 3 focuses on the elements of the economic contribution that mining makes at the national level. It discusses the major macro-level contributions from mining. It considers the challenges of obtaining reliable data on these contributions, drawing from the example of Zambia, which ranked number 1 in the original MCI and where ICMM recently applied the Mining: Partnerships for Development Toolkit (ICMM 2013).

A revised MCI is presented in Section 4, including a broadened scope of countries (now, 214 national economies) and minerals.

Section 5 provides specific insights on mining as an economic catalyst and the role of mining and metals in poverty reduction – the priority issue of the emerging Sustainable Development Goals.

Section 6, presents the perspectives of five commentators who assess the usefulness of the MCI, the data and limitations that should be addressed in the future.

In Section 7, the report concludes with suggested next steps.

1 At the Rio+20 Conference held in Brazil in 2013 there was an agreement by member states to launch a process to develop a set of SDGs, to build upon the Millennium Development Goals (where the target date was 2015) and to converge with other elements of the post 2015 development agenda.

Mining and metals' contribution to sustainable development

1

SECTION 1

Mining and metals' contribution to sustainable development

The mining and metals industry spans a complex web that includes about 6,000 companies employing some 2.5 million people across the world and an informal component – known as artisanal and small-scale mining – which likely includes some 15–20 million people or more.

The industry touches many interests including government (who through their role as regulator play a crucial role enabling mining companies to maximize their contribution), investors, contractors and suppliers, service providers, government, Indigenous Peoples and their organizations, mining-affected communities, civil society organizations, organized labour, academia and research institutions and downstream users. The resulting implications of mining and its products ripple across society.

The extraction and processing of minerals and metals to provide goods and services essential to human society is as old as human development itself. In today's world, population growth, urbanization, social and economic development and even demands for a green or low-carbon economy are all contributing to an increase in the demand for minerals and metals. But meeting this demand and achieving the sought benefits come at a cost – to people and to the environment.

This reality lies at the heart of the concept of sustainable development. Its central idea is that any human activity, including mining, should be undertaken in such a way that the activity itself and the products delivered provide a net positive long-term contribution to human and ecosystem well-being. The critical focus then is not on how mining can be sustainable but on how mining, minerals and metals can contribute to sustainable development.

The long-term nature of mining is important to note when considering its contribution to sustainable development – certain mines and mining regions are active for centuries. For example, there are historical records of activity at Boliden's Garbenberg Mine in central Sweden as early as the mid-14th century. Although it lay closed from 1900–1950, recent investment has once again reinvigorated the mine.

Even after closure, facilities may require careful management for centuries. Today there are examples of perpetual water treatment from closed mines such as at JX Nippon's state-of-the-art facility at the closed Toyoha Mine located in the water basin that is the source of water for Sapporo in northern Japan.

This multi-generational aspect of mining activity sets it apart from almost all other human endeavours. To achieve a net positive contribution over such a long time horizon, consideration must be given to not only the benefits that are generated and the costs and risks that must be borne, but also their distribution across society, and whether or not responsibilities are clearly assigned and effectively discharged. In practical terms, this concept of contribution needs consideration over the full mine project life cycle (Figure 1) and the complete mineral product life cycle (Figure 2).

Revenues and costs follow different time profiles across the mine project life cycle. For example, whilst the direct labour contribution is highest during the early construction stages of the mine, it takes some time for the main bulk of the fiscal contributions to emerge. At various points in the life cycle, the overall potential and actual contribution of a mining project comprises many other significant aspects in addition to the fiscal ones (discussed in more detail in Section 5). This is an important issue for governments in deciding how best to utilize their mineral revenues.[2] It is especially relevant and difficult in the early stages when expectations may be high but fiscal revenues are relatively low.

2 In Figure 1, the revenue line is merely a stylized attempt to represent the time sequence of government revenue receipts. This sequence is based on hard data for those countries where ICMM has analysed the full life cycle of contribution. Government revenues are initially low, corresponding only to indirect taxes (eg pay-as-you-earn, value added taxes) during exploration. These increase with activity during construction and development and in particular when production commences (eg royalties). Finally, there is often a delay in corporate income tax due to capital allowances which means that it is only some time into operations that fiscal contributions peak.

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Figure 1: **The mine project life cycle**

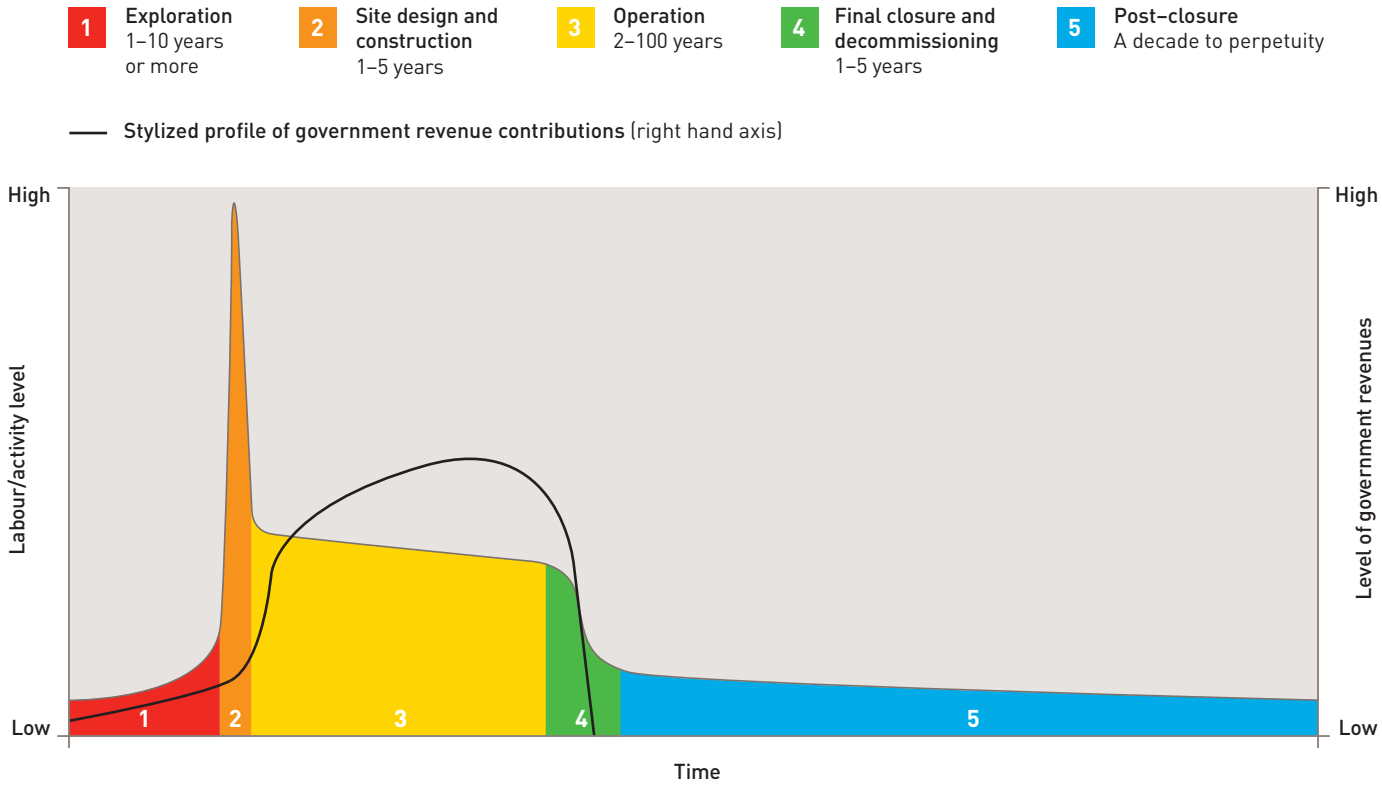
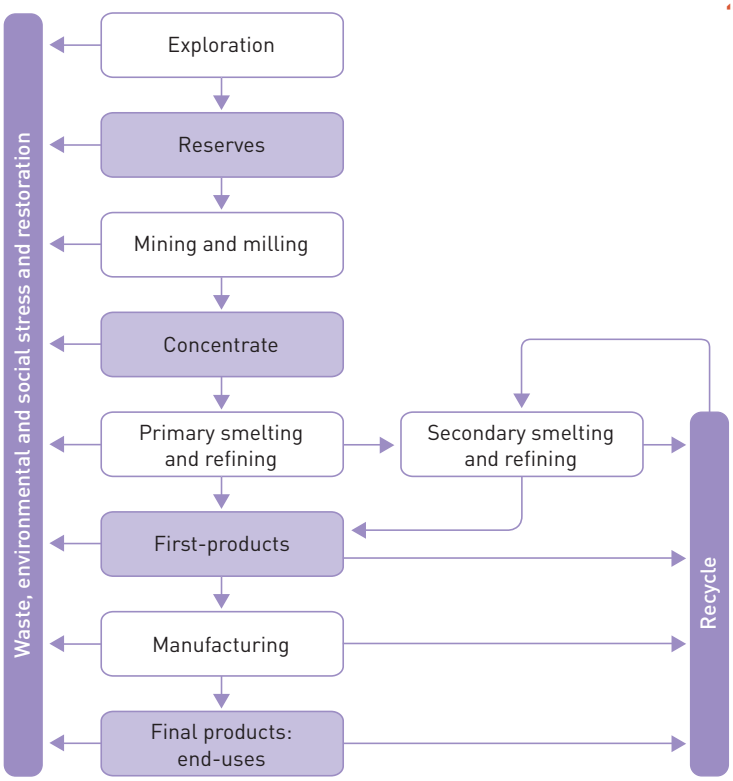


Figure 2: **The mineral product life cycle**



"THE CRITICAL FOCUS IS NOT ON HOW MINING CAN BE SUSTAINABLE BUT ON HOW MINING, MINERALS AND METALS CAN CONTRIBUTE TO SUSTAINABLE DEVELOPMENT"

SECTION 1

Mining and metals' contribution to sustainable development

The industry faces a fundamental and difficult challenge. It has long been concerned with the management of the environmental and social impacts of its activities. However, society is calling for it to go further than this to ensure that its activities deliver a net positive contribution over the long term. This is a tougher challenge than simply considering environmental and social impacts and their mitigation. However, it represents a fairer approach for all concerned offering the possibility of a full treatment of the range of benefits, costs and risks over time. Consideration must be given to how all the implications of mining touch both people and the environment over both the short and long terms. In some cases, this will mean that concrete actions will be required – by company, by community, or by government – to ensure that a net positive contribution is seen by all interests.

Taking on this challenge is why, in 1999, leading mining and metals companies launched the Mining, Minerals and Sustainable Development (MMSD) project. This process was concluded in 2002 with the formal adoption of an action plan for change in the industry and the establishment of the International Council on Mining and Metals to promote and monitor its implementation.

Over thousands of years, minerals and metals have brought huge benefits to society – they are vital commodities that serve as a foundation to society's material quality of life. Metals' capacity for recycling, mining's long time horizon as an activity, its need for both skilled and unskilled labour, its links to infrastructure and the provision of needed services, and the vast array of applications that its products make possible are all aspects of this contribution. With responsible public and private management it can make a unique and powerful contribution to sustainable development. In particular, the industry can and will play a pivotal role in the implementation of the SDGs that the United Nations will finalize by November 2015.

As explained in the introduction, this report only focuses on part of this picture – the economic contribution to national economies of the world's 214 countries (as listed by the World Bank) using available data. The analysis in Section 5 also provides a broader perspective on the numerous different roles that mining can play in supporting poverty reduction which is one of the key SDGs.

"METALS' CAPACITY FOR RECYCLING, MINING'S LONG TIME HORIZON AS AN ACTIVITY, ITS NEED FOR BOTH SKILLED AND UNSKILLED LABOUR, ITS LINKS TO INFRASTRUCTURE AND THE PROVISION OF NEEDED SERVICES, AND THE VAST ARRAY OF APPLICATIONS THAT ITS PRODUCTS MAKE POSSIBLE ARE ALL ASPECTS OF THIS CONTRIBUTION"

Global context of mining's contribution

2

SECTION 2

Global context of mining's contribution

Over the last decade the role of mining in the global economy has grown rapidly. This section sets the scene for analysing mining's contribution by examining how the overall value of mineral production has evolved over time. It summarizes recent trends and future outlooks for commodity prices, and likely developments in mining companies' production costs. Lastly we discuss, for a selection of countries, the relative importance of price and volume effects in explaining their booming mining sectors over the last decade.

2.1

Total mined mineral production

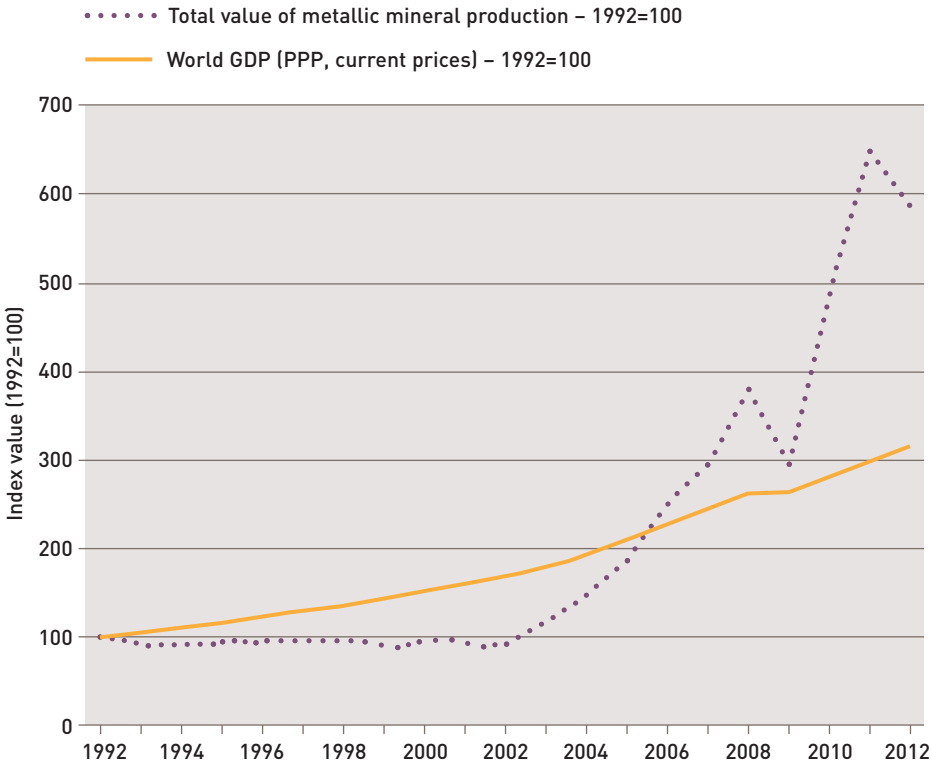
The global value of mineral production[3] has grown enormously over the last decade. In 2012, it was over six times higher than in 2000 and 60 per cent higher than at its 2008 peak. Even though production values fell by 11 per cent in 2012, they remain historically high.

Figure 3 shows that the growth in mineral production value significantly outstripped growth in world gross domestic product (GDP) during this period, signalling the growing relative importance of mining in the global economy.

This boom has largely been driven by the unprecedented growth in demand for minerals and metals in China, India and other emerging economies. The contrast with the preceding decade is stark: the period 1992–2002 saw no growth in the value of mineral production in nominal terms (implying a reduction in real, inflation-adjusted terms).

This growth in production value reflects a combination of increased prices and increased production volumes. Section 2.6 further elaborates on the relative importance of the two in driving production values.

Figure 3: World GDP and mineral production – 1992 to 2012



World Bank and Raw Materials Data (2014).

3 Including metallic and industrial minerals, but excluding coal, uranium and quarried products (limestone, crushed stone, sand and gravel). For a full list of minerals and metals included, see Annex B.

2.2

Short-term price trends

Although commodity prices fell sharply during the global financial crisis, they rebounded quickly. However, since the peak in 2011, prices have fallen across many mineral and metal commodities, in some cases significantly (Figure 4). Notably the three largest metallic minerals (gold, copper, iron ore which together account for around 70 per cent of global output value) have all experienced price declines.

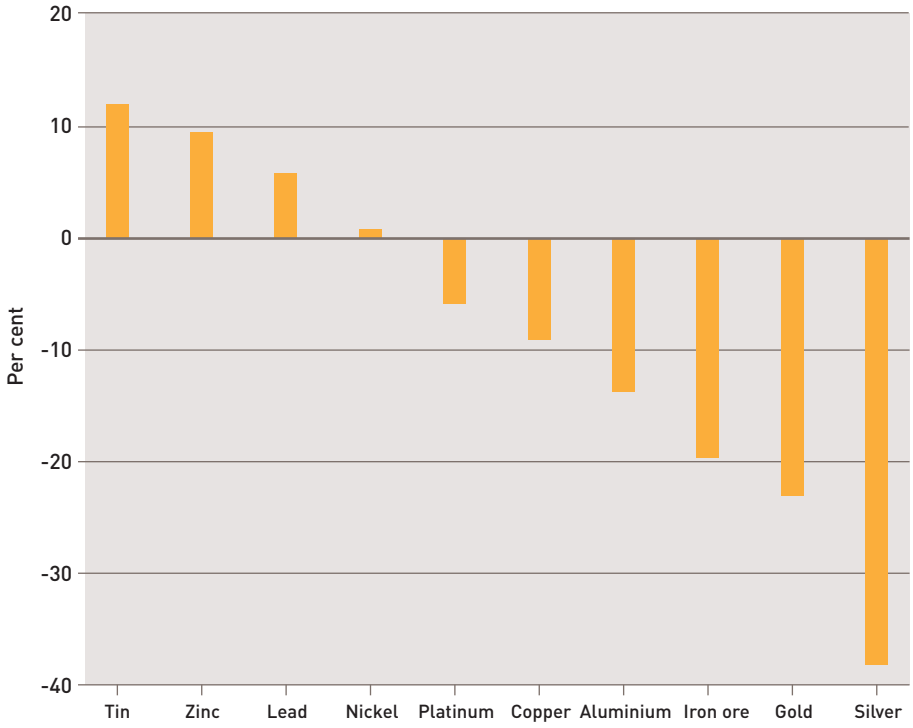
2.3

Long-term metal prices

Many commodities remain at historically high prices despite the recent downward trend. Figure 5 shows a mined commodity price index comprising eight metals (iron ore, gold, copper, nickel, zinc, platinum group metals, silver and lead) and two industrial minerals (phosphate and potash) weighted by their total value of production. Iron ore, gold and copper dominate the index. In 2012 these three metals together accounted for 70 per cent of the total. Although the collective share of these three metals is stable overtime, there have been significant changes in the relative value of these three metals. In 2010 iron ore contributed 38 per cent to the total value while gold only accounted for 15 per cent. In 2012 iron ore's share had decreased to 32 per cent while gold's had increased to 20 per cent. Copper represented 18 per cent in both years.

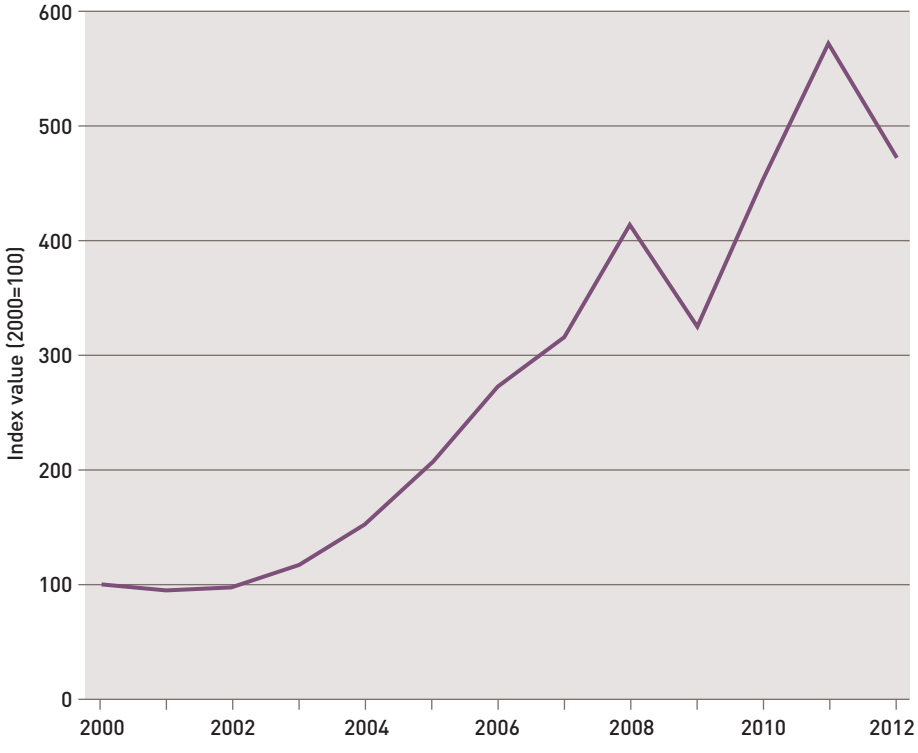
Continued high levels of demand from larger emerging economies, transitioning into more capital intensive economic structures, will likely support prices at or around current levels, at least in the near term.

Figure 4: Changes in prices from 4th quarter 2011 to 2nd quarter 2014



Source: Raw Materials Data (2014). Note iron ore price changes is from 4Q2011 to 1Q2014.

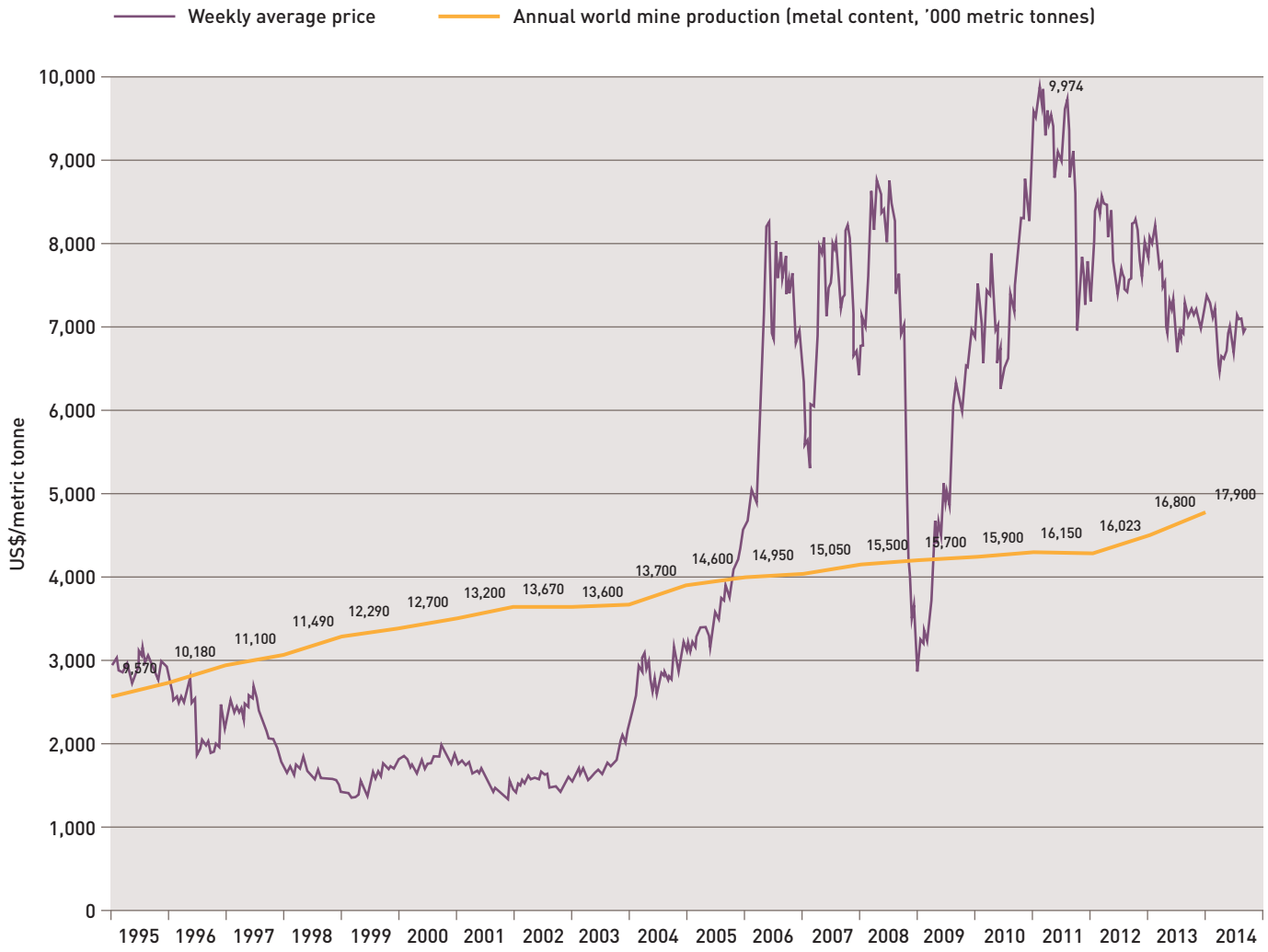
Figure 5: Metal price index (2000=100)



Source: Raw Materials Data, Stockholm 2014.

Global context of mining's contribution

Figure 6: **Copper prices (US$/metric tonne)**



Source: Raw Materials Data, Stockholm 2014.

Figure 5 hides the fact that price volatility has increased considerably for most minerals and metals over recent years. Figure 6 illustrates this price volatility for copper (see Annex A for charts illustrating this trend for a selection of other major minerals). This trend is partly – but not wholly – explained by the unusually large price movements around the global financial crisis of 2008/9.

"NEW MINERAL DEPOSITS ARE OFTEN FOUND DEEPER UNDERGROUND. COSTS OF MOVING MATERIALS HAVE THEREFORE INCREASED FOR BOTH OPEN PIT AND UNDERGROUND OPERATIONS"

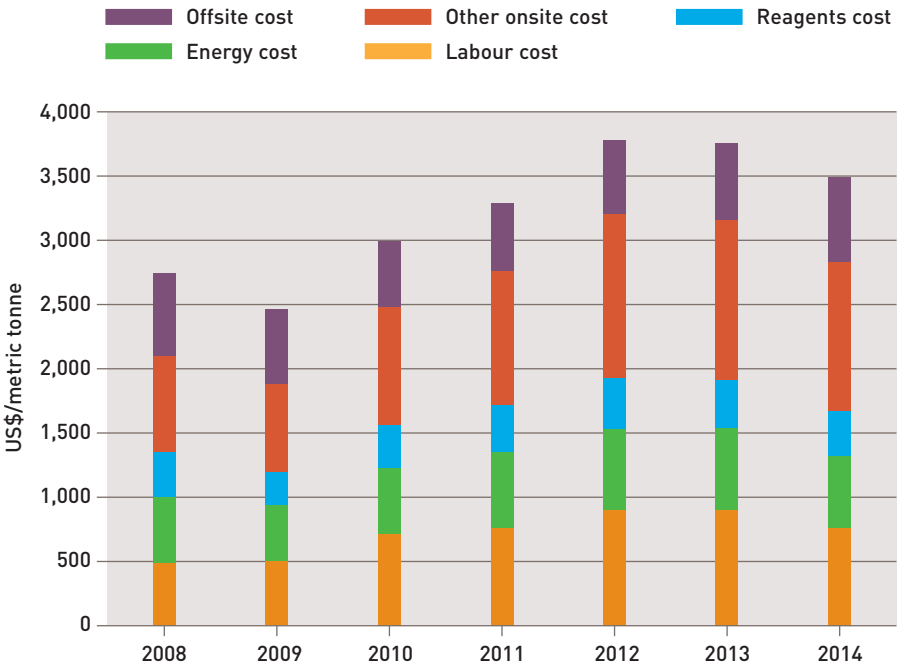
2.4

Trends in production costs

From the perspective of mining companies, higher prices have not always translated into higher profit margins, as production costs have increased considerably as well (see Figure 7). While the cost and price developments differ widely across minerals and metals, it is possible to identify some factors which put upward pressure on prices:

- As miners rushed to take advantage of historically high prices, the demand for inputs exceeded supply, pushing up the prices of mining inputs such as equipment, services, fuels, chemicals and personnel. Inflation of input costs has been particularly pronounced in the case of well-trained and experienced staff – the supply of which is fixed in the short term.
- New deposits generally have lower grades and more complex mineralogy than was common a few decades ago – this is particularly the case for certain minerals such as copper. This raises costs and means that lower grade ore bodies will not be mined unless prices are sufficiently high to cover these costs, or new (lower cost) technologies are developed.[4]
- New mineral deposits are often found deeper underground. Costs of moving materials have therefore increased for both open pit and underground operations.
- Newly discovered deposits are often more distant from markets and in areas where the climate is harsh, for example in the Arctic or in deserts high up in the Andes. This increases the costs of exploration as well as mine development (eg investment in infrastructure required to access markets).

Figure 7: Trends in costs of copper production (US$/metric tonne)



Source: Raw Materials Data, Stockholm 2014.

- Increasingly rigorous regulatory standards and permitting thresholds – to ensure full consideration of environmental and socio-economic implications – have lengthened licensing time thus adding costs.
- Improved living and working conditions in general (for example health and safety) and domestic wage increases after many years of depressed levels in countries such as South Africa and China also contribute to increased production costs.

These factors might to some degree be cyclical and could hence be partly reversed, but in the short- to medium-term they push up costs and therefore the minimum price levels at which mining is economically viable. If prices fall below a level that allows investors make a profit, projects will be put on hold and the supply from these mines will be taken out of the market. This reduction in supply will, in turn, put upward pressure on prices and help to sustain the current levels even if somewhat below recent peaks.

Moreover, much of the investment into new mines during the recent period of high prices has focused on ore bodies and deposits that were not profitable under lower prices (for example high-cost, deep underground mines). The increasing costs can wrongly be interpreted as being a result of poor management focusing only on additional volumes but are in fact a reflection of rational behaviour from mine management to use parts of the ore bodies which can only be mined when prices are high, but at a higher cost. When prices fall back these will be closed again, thereby lowering average production costs and reducing available supply in the market.

4 The development of new technologies takes time and it is unlikely that new technologies will have any dramatic effect during the next five years or so.

Global context of mining's contribution

Table 1: **Top 20 countries in terms of production value**

Rank based on 2012 data		2000 production value (US$bn) (1)	2000 production value (of world total) (2)	Production value as % of 2000 GDP (current US$) (3)	2010 production value, revised (US$bn) (4)	2010 production value (of world total) (5)	Production value as % of 2010 GDP (current US$) (6)	2012 production value (US$bn) (7)	2012 production value (of world total) (8)	Production value as % of 2012 GDP (current US$) (9)	Rank based on 2010 data (revised) (10)	Change in ranking (11)
1	China	10.6	8.2%	0.9%	109.2	16.6%	1.8%	123.1	15.8%	1.5%	1	0
2	Australia	16.4	12.8%	3.9%	87.3	13.3%	7.6%	108.5	14.0%	7.1%	2	0
3	Brazil	7.8	6.0%	1.2%	62.4	9.5%	2.9%	65.9	8.5%	2.9%	3	0
4	Russian Federation	10.8	8.4%	4.1%	43.2	6.6%	2.8%	53.0	6.8%	2.6%	4	0
5	Chile	10.5	8.2%	13.9%	36.3	5.5%	16.7%	42.1	5.4%	15.8%	5	0
6	United States	11.3	8.8%	0.1%	33.2	5.0%	0.2%	41.8	5.4%	0.3%	8	2
7	South Africa	12.7	9.9%	9.6%	33.6	5.1%	9.2%	38.5	5.0%	10.1%	7	0
8	Canada	7.9	6.1%	1.1%	25.5	3.9%	1.6%	32.7	4.2%	1.8%	9	1
9	India	2.9	2.3%	0.6%	35.4	5.4%	2.1%	26.8	3.4%	1.4%	6	-3
10	Peru	4.7	3.7%	8.8%	21.1	3.2%	14.2%	25.1	3.2%	13.0%	10	0
11	Mexico	2.4	1.9%	0.4%	11.0	1.7%	1.0%	17.7	2.3%	1.5%	13	2
12	Indonesia	4.9	3.9%	3.0%	14.7	2.2%	2.1%	14.9	1.9%	1.7%	11	-1
13	Kazakhstan	2.4	1.9%	13.1%	9.7	1.5%	6.6%	12.5	1.6%	6.2%	14	1
14	Ukraine	1.8	1.4%	5.8%	11.8	1.8%	8.7%	12.2	1.6%	6.9%	12	-2
15	Iran, Islamic Rep.	0.8	0.6%	0.8%	6.9	1.0%	1.6%	8.2	1.1%	1.6%	15	0
16	Turkey	0.4	0.3%	0.2%	4.0	0.6%	0.6%	6.3	0.8%	0.8%	20	4
17	Uzbekistan	1.2	0.9%	8.8%	3.3	0.5%	8.5%	5.7	0.7%	11.1%	25	8
18	Zambia	0.6	0.5%	19.0%	5.0	0.8%	31.2%	5.4	0.7%	26.4%	16	-2
19	Philippines	0.4	0.3%	0.5%	4.5	0.7%	2.2%	5.4	0.7%	2.2%	18	-1
20	Argentina	0.7	0.5%	0.2%	4.1	0.6%	0.9%	5.4	0.7%	0.9%	19	-1

Source: World Bank, Raw Materials Data (2014). Please see Annex B for definitions and sources.
Note that 2010 production value figures differ from those in ICMM (2012) due to revisions by Raw Materials Data.

2.5

Total production values by country

Activity in the mining sector matters hugely to many countries in the world economy. Table 1 presents a summary of mining production values (excluding coal) in the 20 largest producing countries, as well as their share of global production values in 2012 (columns 7 and 8).

More specifically, the table shows:

- production value data for three years: 2012, 2010 and 2000 (columns 1, 4, 7)
- absolute as well as relative data to gauge the importance of mineral sectors in each country relative to global production and relative to nominal GDP for each country (columns 2, 3, 5, 6, 8, 9)
- changes in rankings since the 2012 edition of this report (column 11).

The table indicates very few changes since the 2012 report (with data to 2010). The top of the table remains dominated by the major developed country producers and by large emerging market producers including the five BRICS (Brazil, Russia, India, China, and South Africa) as well as other important emerging economies (eg Chile, Indonesia and Mexico). In the bottom half of the table – at the lower end of production values – there has been more change over the last two years, with countries like Turkey and Uzbekistan making notable advances in the rankings.

2.6

Distinguishing between price and volume effects

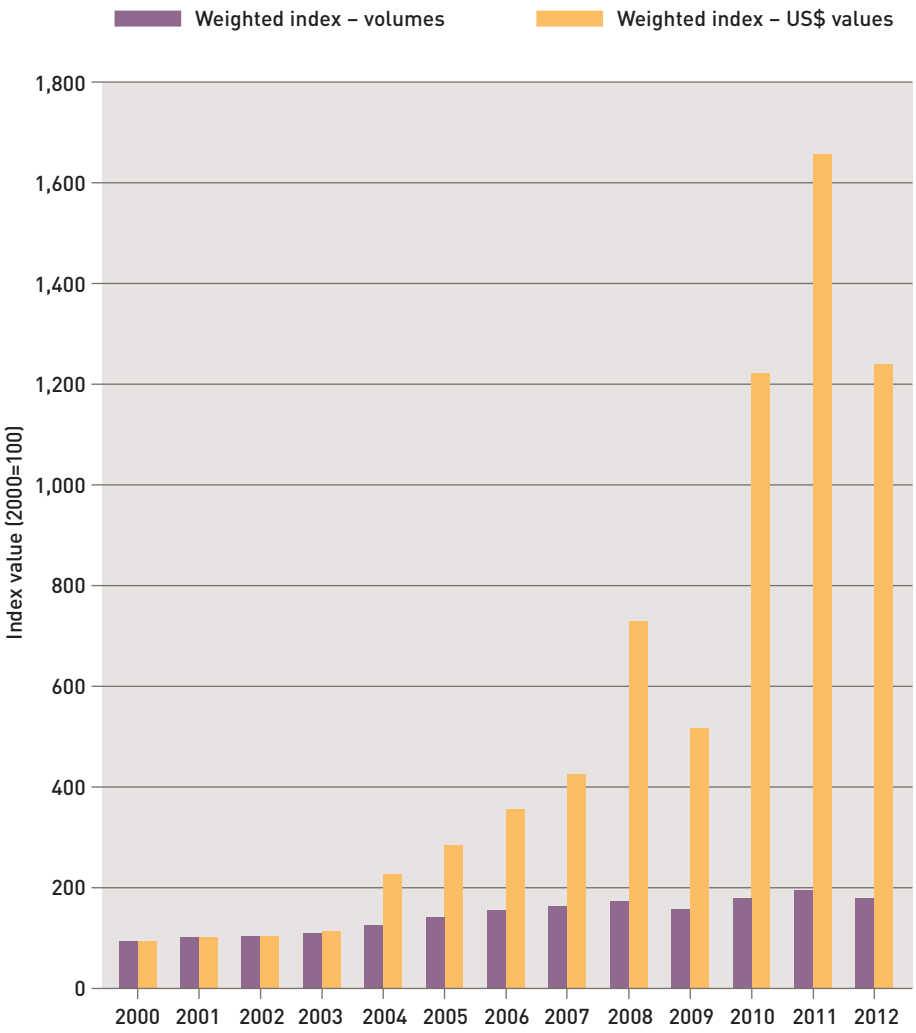
The above discussion highlights the rapid changes in mineral commodity prices, their volatility over time and the large impacts on production values. To illustrate the relative importance of changes in prices vs. production volumes in driving increased production values, this section looks at three countries with large mining sectors dominated by iron ore (Brazil), copper (Zambia) and gold (Ghana). The overall gap between volume and value indices seen across the three countries illustrates how any MCI-type assessment can be sensitive to often quite large movements of prices over a relatively short period of time.

Brazil

Mining in Brazil is dominated by iron ore which in terms of 2012 US$ values constituted 92 per cent of the value of the three main metals (iron ore, copper, gold) in that country. Brazil's production volumes of iron ore, copper and gold almost doubled during the 12 years to 2012, rising by 85.2 per cent (volumes of iron ore alone grew by 74.3 per cent). However, this growth in volumes was overshadowed by very large increases in prices. These price increases converted the volume growth into a weighted production value growth rate in US$ terms of no less than 1,137 per cent between 2000 and 2012 (Figure 8).

Commodity price increases were thus a dominant driver of the overall measured contribution of mining in Brazil over the period studied.

Figure 8: Volume and value growth of metals – Brazil 2000 to 2012



Source: Raw Materials Data, Stockholm 2014.

"THE OVERALL GAP BETWEEN VOLUME AND VALUE INDICES SEEN ACROSS THE THREE COUNTRIES ILLUSTRATES HOW ANY MCI-TYPE ASSESSMENT CAN BE SENSITIVE TO OFTEN QUITE LARGE MOVEMENTS OF PRICES OVER A RELATIVELY SHORT PERIOD OF TIME"

Global context of mining's contribution

Ghana

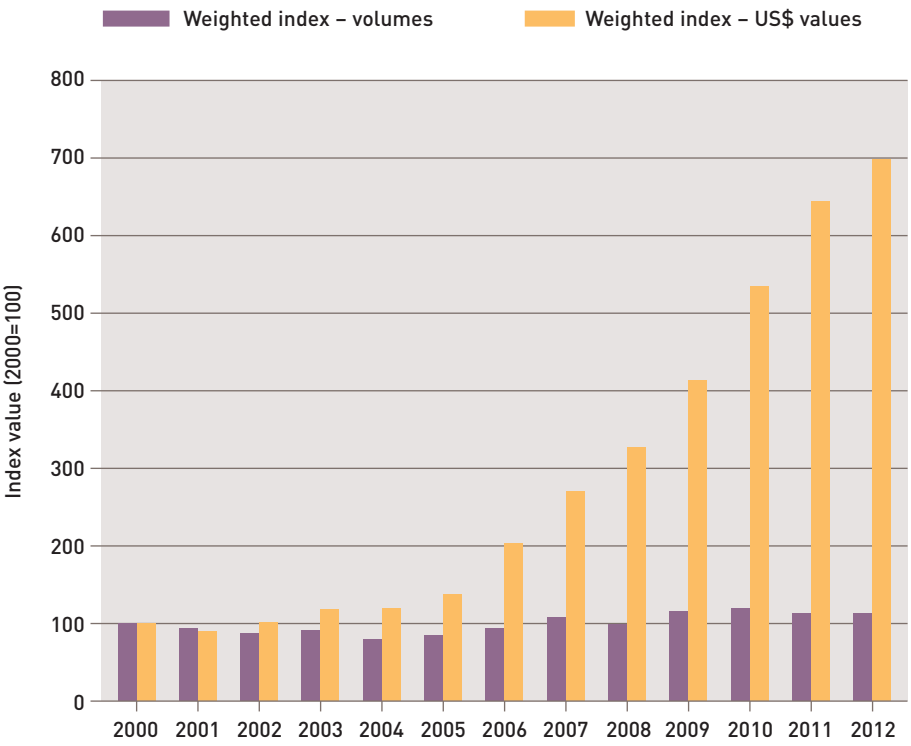
Gold prices rose significantly over the period from 2000 to 2012, although not nearly as much as the prices of copper and iron ore. However Ghana achieved only a moderate expansion of mineral production volumes in the period: total volume of gold produced only increased by 16 per cent (volumes actually fell recently – in the ten years to 2010 volumes grew by 21.4 per cent).
The gold price rose significantly during this period, meaning Ghana's growth in the production value of its gold between 2000 and 2012 of almost 600 per cent (Figure 9) was almost entirely due to price increases. Given the more limited rise in the gold price compared to iron ore and copper, the divergence between the indices for volume and value was significantly lower in Ghana's case compared to Brazil and Zambia.

Zambia

The situation in Zambia is somewhat similar to that of Brazil. Over the 2000–2012 period, Zambia enjoyed rapid growth in both production volumes and prices of copper (its dominant mineral sector). The large copper production volume increases – a near-doubling between 2000 and 2012 – reflected a surge of new investment that arrived after the sector was privatized in the late 1990s.

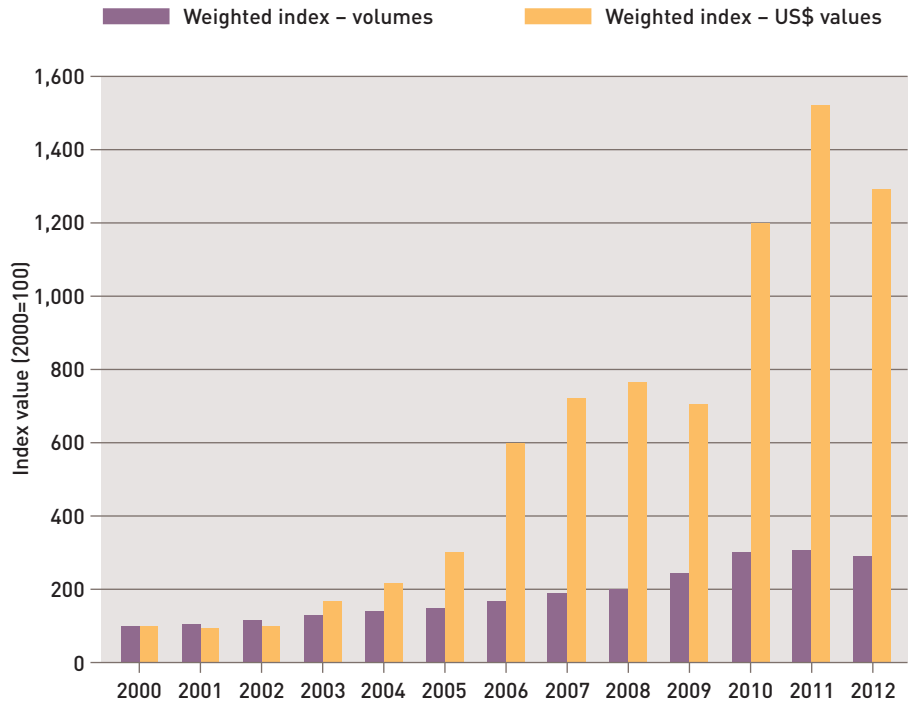
The combination of rising production volumes and higher prices over this period meant that Zambia's production value grew by almost 1,200 per cent over the period (Figure 10). By extending the data to 2012 we see the effects of the changes in global commodity prices. There was a large dip in the copper price in 2012 which reduced Zambia's value index by 15 per cent relative to 2011, even whilst production volumes remained broadly stable.

Figure 9: Volume and value growth of metals – Ghana 2000 to 2012



Source: Raw Materials Data, Stockholm 2014.

Figure 10: Volume and value growth of metals – Zambia 2000 to 2012



Source: Raw Materials Data, Stockholm 2014.

National context of mining's macroeconomic contribution

3

SECTION 3

National context of mining's macroeconomic contribution

The mining sector contributes to economic and social development in a variety of ways. Some of these are relatively well-understood and well-documented, others have potential to be transformative but are poorly understood and documented.

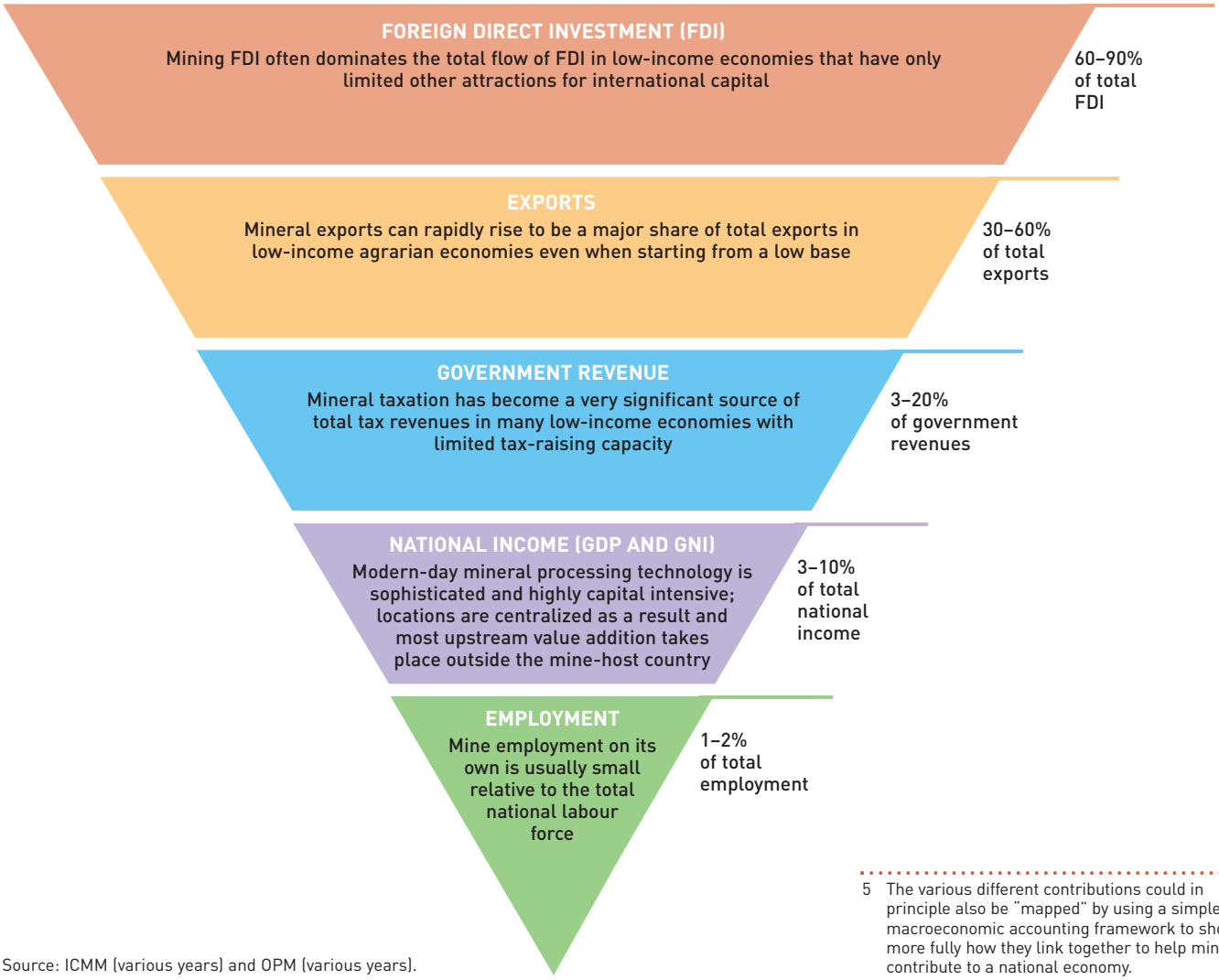
A cross-country comparison of mining contributions is hampered – with few exceptions – by a lack of reliable, accessible and standardized data.

This section discusses how mining provides vastly different levels of contribution in relation to the different macroeconomic aggregates of most economies, using cross-country data where available. It also draws on insights from country-level case studies, including those using the ICMM *Mining: Partnerships for Development Toolkit*. To date, such case studies have been conducted in Zambia, Brazil, Chile, the Democratic Republic of Congo, Ecuador, Ghana, Guinea, Lao PDR, Peru, Romania and Tanzania.

The most recent ICMM case study covering Zambia is used to illustrate important points in terms of the magnitude, timing and data quality on these contributions.

Figure 11 represents the macro-level contributions of mining in the shape of an inverted pyramid. The percentages are not additive but indicate the range of stand-alone contributions in each area. Every category is important in itself, and this section discusses each in turn.[5]

Figure 11: Macro-level contributions of mining in low- and middle-income countries



Source: ICMM (various years) and OPM (various years).

5 The various different contributions could in principle also be "mapped" by using a simple macroeconomic accounting framework to show more fully how they link together to help mining contribute to a national economy.

3

3.1

Foreign and domestic investment (FDI)

In almost all country case studies, the share of mining in total FDI has been large (60–90 per cent), but this is particularly evident in low-income countries. Countries are often able to attract mining investment even when FDI into other sectors appears unattractive. This partly reflects the modest requirements of mining FDI (relative to most industries) in terms of prior existing infrastructure, skilled labour or financial services. At the same time, mining FDI is highly sensitive to changes in the institutional and economic environment.

Zambia illustrates these points forcefully. Through the mid-1990s, the overall investment rate (investment as a proportion of GDP) had been modest at about 8–12 per cent. Following privatization in the late 1990s, large investments to recapitalize mining operations resulted in a doubling of the national investment rate to over 25 per cent by the mid-2000s.[6] FDI flows linked explicitly to mining have recently accounted for more than 80 per cent of total FDI in Zambia. Cumulatively, since the privatization of the mining sector in the late 1990s, FDI in mining has amounted to over US$10 billion (equivalent of almost 70 per cent of Zambia's total accumulated FDI stock).

However, there are clear exceptions to this pattern. For example, Brazil is one of the world's most successful emerging market economies in terms of attracting FDI (in excess of US$50 billion per annum in recent years). However, FDI into the mining sector represents a relatively small share of Brazil's total FDI, reflecting that much of Brazil's recent investment in mining is attributable to the Brazil-based company Vale.

6 Annual FDI flows in all sectors before the year 2000 were typically around US$90–200 million. These increased to over US$600 million annually by 2006, and then to almost US$2 billion by 2011.

Box 1
Dutch disease and the challenges of managing large inflows from mineral exports[9]

In a typical Dutch disease scenario, inflows of currency from mineral exports and increased domestic aggregate demand push up the prices of non-tradable goods and services. This leads to falling competitiveness among domestic firms in two ways: (1) imported goods become relatively cheaper, thereby displacing the market for domestic producers, and (2) domestic goods targeting international export markets become less competitive.

Similar demand-side pressures can arise during the earlier construction phases of a large mining project. A parallel supply-side effect (the "resource-movement" effect) can also emerge if and when skilled labour and other scarce resources are withdrawn from import-competing or other exporting activities. Dutch disease is a particular threat to agriculture-based export industries, where the commoditized nature of exports means that margins are low, so that even a small increase in production costs can make domestic producers uncompetitive on international markets.

Importantly, the review of mineral export data shows that many countries that are already heavily reliant on mined mineral exports have recently (or will soon) also become significant exporters of oil and/or gas. This points to the growing importance of managing risks of Dutch disease.

3.2

Mineral exports

Mined minerals represent a large share of exports in many countries. In 2012, 38 countries relied on mined minerals for over 25 per cent of their merchandise exports (referred to here as mineral reliant). Some three-quarters of these countries are low- and middle-income countries. This number has risen over time: in 1996 there were only 29 mineral reliant economies, as recently as 2005 there were 33.

Mining export earnings are partly offset by foreign exchange outflows, including imports of specialized capital equipment, debt repayments and profit repatriations. Even after accounting for these outflows, the case studies show that the overall impacts from mining on exporting countries' balance of payments and foreign reserves are large and positive.[7]

7 See, for example, the cases of Tanzania (ICMM 2009) and Romania (OPM 2009a).

The impacts from the various inflows and the associated local spending can be dramatic, especially in less-developed small, open economies. This leads to risks of so-called Dutch disease (see Box 1), whereby a booming resource sector can result in the appreciation of the real exchange rate (RER),[8] thereby undermining competitiveness and growth in other sectors of the economy. These risks can be mitigated and managed through adequate economic policies, for example by controlling public spending, managing inflationary pressures and reforming the private sector so that it can generate a more rapid supply response. In each case, it requires that policies are technically sound, that sufficient administrative capacity exists to implement them, and that these policies enjoy sufficient political support (IMF 2010).

8 The RER is defined as the ratio of domestic prices to foreign prices, measured in the same currency. This means the RER can appreciate even in countries with fixed exchange rate regimes. If all goods/services are freely tradable on world markets then domestic prices would equal foreign prices, however for non-tradable goods and services any increase in prices (eg due to demand from the mining sector) will result in RER appreciation.

9 A more complete literature review on the topic of Dutch disease is available in ICMM (2006).

SECTION 3

National context of mining's macroeconomic contribution

Table 2: Export contributions (metallic and industrial minerals, excluding coal)

Rank 2012		GDP/capita (PPP at current prices, 2012 US$)	HDI (latest year)	Mineral export contribution 1996	Mineral export contribution 2005	Mineral export contribution 2010 (revised)	Mineral export contribution 2012	Change mineral contribution 1996-2012 (pp)	Change mineral contribution 2010-2012 (pp)	Change in rank from 2010 to 2012
1	Botswana	14,707	0.68	80.9%	90.9%	82.0%	91.6%	10.7	9.6	0
2	Congo, Dem. Rep.	697	0.34	72.4%	70.1%	77.5%	81.5%	9.1	3.9	1
3	Suriname	15,440	0.70	68.8%	58.0%	39.6%	75.7%	6.9	36.1	2
4	Mongolia	8,442	0.70	57.5%	70.4%	78.1%	74.6%	17.1	-3.5	0
5	Zambia	3,043	0.56	76.1%	68.1%	80.1%	69.2%	-6.9	-11.0	-3
6	French Polynesia	n/a	n/a	71.0%	57.5%	70.6%	64.6%	-6.5	-6.0	0
7	Mauritania	2,878	0.49	35.9%	50.6%	66.2%	62.9%	27.0	-3.3	3
8	Chile	21,045	0.82	47.7%	57.1%	65.0%	61.6%	13.9	-3.4	-1
9	Eritrea	1,200	0.38	62.5%	2.6%	2.8%	60.5%	-2.0	57.7	132
10	Guinea	1,237	0.39	76.3%	82.1%	47.6%	60.1%	-16.2	12.5	-2
11	Peru	11,103	0.74	48.3%	57.9%	62.8%	60.1%	11.8	-2.7	-2
12	Tajikistan	2,361	0.61	30.2%	59.6%	54.9%	58.5%	28.3	3.7	32
13	Guyana	6,159	0.64	37.4%	38.0%	57.0%	58.5%	21.1	1.5	8
14	Namibia	9,316	0.62	38.3%	43.1%	45.2%	53.4%	15.0	8.2	2
15	Papua New Guinea	2,424	0.49	24.5%	41.6%	56.7%	51.3%	26.8	-5.4	0
16	Sierra Leone	1,610	0.37	27.8%	58.3%	52.2%	50.6%	22.8	-1.6	-2
17	Burkina Faso	1,555	0.39	8.2%	2.5%	43.2%	46.3%	38.1	3.1	8
18	Sudan	3,607	0.47	n/a	n/a	12.4%	45.8%	n/a	33.4	75
19	Montenegro	13,528	0.79	n/a	n/a	46.8%	44.6%	n/a	-2.2	1
20	Armenia	7,418	0.73	24.6%	39.3%	50.7%	44.5%	19.9	-6.2	-3

Source: UNCTADstat. For full definitions of minerals included see Annex B.
Note that 2010 mineral export contributions differ from those in ICMM (2012) due to revisions by UNCTADstat.

Table 2 presents a list of the 20 countries with the highest mineral export contributions as a percentage of total merchandise exports in 2012.

The picture presented here is largely consistent with the table on export contributions presented in the last edition of this report, which used data to 2010. It highlights three findings:

- Low- and middle-income countries continue to be much more prominent in these rankings compared to rankings of production values (see Table 1).
- Rankings based on export reliance are less stable compared to rankings based on production value. Over the past few years, several countries have risen rapidly in these rankings to join the list of top 20 countries – for example, Eritrea, Tajikistan, Sudan and Lesotho all jumped more than 10 places to enter the top-20 list.
- The table shows that many of the countries with high export reliance on mined minerals have relatively low GDP/capita and Human Development Index (HDI) scores. A number of possible issues for policy flow from this fact. It suggests above all that mining investments have to be managed to contribute to poverty reduction and social improvement in the host countries. But it also points to the human resource and related institutional challenges of managing large-scale extractive industries in less-developed countries. We return to the discussion of how mining contributes to poverty reduction in Section 5.

3.3

Government revenues

The payment of royalties and taxes to government represents one of the most important contributions by the mining industry – it is certainly the most actively debated. The country-level work of the Extractive Industries Transparency Initiative (EITI) is bringing greater precision to the reporting of such revenues. However there is as yet no standardized database with data on mining sector tax contributions on a sufficiently large number of countries to warrant inclusion in the MCI.[10]

The available evidence suggests that mining's contribution to government revenues varies significantly across countries. This variation is corroborated by partial data from the International Monetary Fund (IMF)[11] which provide a useful indication of magnitudes as well as cross-country variation. Table 3 ranks the mining countries in this sample by the average size of the mining contribution to government revenues in those countries during 2000–2010.

The table reveals the low degree of correlation between mining's contribution as indicated by the MCI ranking and the contribution to government revenues: several of the highest ranked MCI countries appear to have relatively low levels of revenue contribution. This can partly be explained by the nature of the IMF data as averages over 2000–11. In fact, the fiscal contributions from mining can vary significantly over time, pointing to need for more granular data on such contributions (see Box 2).

There is a strong case for improving the comparative data in this area so that tax contributions can be more accurately measured and compared across more countries.

Table 3: Government revenue contribution and the MCI ranking

Country	% of fiscal revenues 2000–2011 (average)	Rank on 2012 MCI (quintile)	Rank on 2014 MCI (quintile)
Botswana	44.6	2	1
Congo, Dem. Rep.	25.3	1	1
Guinea	22.9	2	1
Mongolia	18.3	1	1
Chile	15.4	1	2
Zambia	11.1	1	2
Namibia	8.1	1	1
Ghana	6.4	1	2
Sierra Leone	3	3	2
Lesotho	1.9	3	1
Tanzania	1.4	1	1

Source: IMF (2012), authors' calculations.

"THE PAYMENT OF ROYALTIES AND TAXES TO GOVERNMENT REPRESENTS ONE OF THE MOST IMPORTANT CONTRIBUTIONS BY THE MINING INDUSTRY – IT IS CERTAINLY THE MOST ACTIVELY DEBATED"

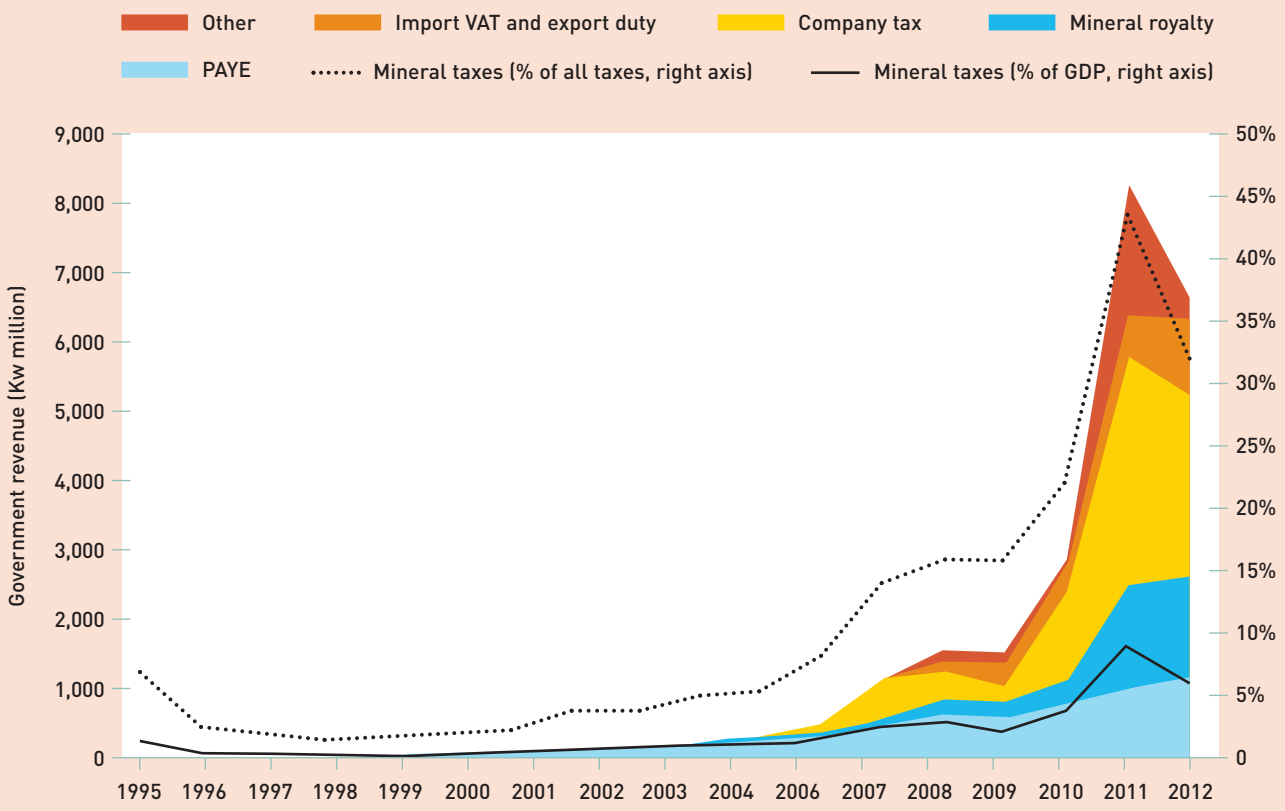
10 The IMF's statistics department has published a template for reconciling resource revenue data with its Government Finance Statistics classifications, doing this in consultation with EITI. A project to pilot this in eight countries is now underway.

11 The data in question were presented in IMF (2012). These data have been modified slightly and revised to 2011 on the basis of a personal communication from the IMF. The authors have incorporated separate data for Zambia provided by the Zambia Revenue Authority using definitions used in the Zambia EITI assessment of 2012.

National context of mining's macroeconomic contribution

Box 2
Fiscal contributions from mining in Zambia

Figure 12: Mining's contribution to government revenues in Zambia (1995 to 2012)



Source: ICMM (2014) based on original data from the Zambia Revenue Authority, using definitions from Zambia EITI assessments.

Although copper prices began rising in the early 2000s, government revenues from Zambia's mining sector remained low and were widely perceived to be disappointing. Over time this led to a climate of considerable criticism of the mining companies and widespread talk of the need to raise the rates of royalty and mining taxes.[12]

The reality was more nuanced: the low level of mining tax revenues through 2008 reflected the stage of maturity in the industry following large investment after 2000 and the inevitable lags (given standard capital depreciation allowances) between increases in production and the arrival of higher tax revenues. Figure 12 shows clearly that once deferred tax payments started to unwind in 2011 and 2012, there was indeed a very large boost in government revenues (from corporation tax in particular). Only a small part of this came from the rate hikes of 2008.

This change in the contribution of mining has been dramatic. By 2012 the contribution in Zambia had risen to 32 per cent of total government revenue, a higher ratio than in any of the other mining countries in the IMF comparisons except for Botswana (see Table 3).

12 These suggestions were accepted in part in 2007/08 when there was a small increase in the rate of corporation tax and the introduction of a (soon removed) windfall profits tax. Royalty rates on the various different new mining companies in the system were standardized earlier than this.

3.4

GDP contributions

The GDP contribution of mining is defined as the total net incomes produced by the mining sector. The incomes directly produced by mining comprise labour incomes (wages and salaries), interest and financing costs (payable to lenders) and profits (operational surplus before tax and depreciation charges). In addition, mining generates indirect contributions through the value generated by providers of mining sector inputs (ie procurement of goods and services).

Based on case studies undertaken by ICMM, mining typically provides only a modest direct contribution to a country's GDP (typically around 3–10 per cent of national totals), even in countries with large mining sectors. These low numbers reflect a combination of features of modern mining (capital rather than labour intensive) and the economic structures of less-developed host countries (with limited industrial capabilities to supply the mining sector).

Box 3
Stronger national statistics offices could help to ensure an adequate understanding of GDP contributions of mining

Persistent statistical discrepancies risk fuelling allegations and criticisms about the accuracy of reporting of the mining companies and can be extremely damaging to effective debate and policy making for mining. The Zambia case provides one example of this.

Until 2014, the official Zambian statistics showed mining's contribution to GDP as very low (compared to other mining countries) despite the sector demonstrating large contributions in other indicators. By 2012, mining's share of total GDP was reported as 8 per cent (constant prices) and only 2.6 per cent (current prices). This contrasted remarkably with the GDP share of 30 per cent as seen through the mid-1970s when mining output levels (volumes) were similar to those of today. Because of widespread disquiet about the reliability of these numbers, it had become quite common in both official and non-official analysis for authors to "invent" their own numbers for GDP contribution. Such practices drastically reduced the reliability of analysis and the quality of debate about mining.[14]

In this example, the Central Statistical Office (CSO) was able to rebase its GDP estimates after 2012 and the rebased numbers have confirmed the unofficial calculations in ICMM (2014) that the GDP contribution of mining was at least 12 per cent (current prices): more than four times the previous official figure.

However, the additional indirect contributions can be significant. In order to assess the impacts of mining on income generation in other sectors, input-output models are used to calculate how mining can generate economic contributions elsewhere. For example, in more mature industrial economies such as Romania and Brazil the total GDP contributions – from mining per se but also in other linkage industries – can be quite significant. One dollar of economic activity in the mining sector can generate three dollars or more of economic activity elsewhere.

There is a growing body of evidence that mining activities need not be an enclave, and that the actions of government, mining industry and development partners can indeed boost linkages between mining and other sectors – and thereby broaden the indirect benefits of mining in the economy.[13] At present, data on GDP contributions from mining (whether direct or indirect) are not available in any standardized format for the majority of the world's economies. In fact, even within individual countries with large mining sectors, there are often serious deficiencies in the availability and quality of data, which help explain the sometimes fractious debates that take place around the role of mining in the economy (see Box 3).

"ONE DOLLAR OF ECONOMIC ACTIVITY IN THE MINING SECTOR CAN GENERATE THREE DOLLARS OR MORE OF ECONOMIC ACTIVITY ELSEWHERE"

13 See, for example, Aragon and Rud (2011), Natural Resources and Local Communities: Evidence from a Peruvian Gold Mine. Yale Working Paper, available online.

14 As just one example, former President Rupiah Banda stated in 2010 that the GDP contribution of mining was already over 11 per cent but needed to increase to 20 per cent. This contrasted with the official Vision 2030 document just a few years earlier that had said that the GDP share of mining would decline to less than 3 per cent by 2030 as the economy diversified.

SECTION 3

National context of mining's macroeconomic contribution

3.5

Employment and wages

Modern-day mining in almost all countries is highly capital intensive, and hence the contribution of mining to direct job creation at the national level is often relatively small – rarely more than 1–2 per cent of total national employment. At the same time new jobs created by large mining companies are normally well-remunerated compared to prevailing national wage rates.

Being concentrated in particular provinces or regions, mining can also be a very influential source of income and spending power and hence a stimulus for new productive activities. The available evidence clearly shows that mining can be successful in generating both indirect employment through the supply chain and induced employment as the salaries of direct employees and employees of supplying companies are re-spent within the wider economy.

Taking all this into account, employment multiplier effects can often be significant. One direct mining company employee may correspond to 3–5 employees elsewhere in the economy. In poorer and more rural regions with a lack of alternative economic activities, the indirect and induced employment effects can be especially important (ICMM 2013).

The case of Zambia demonstrates this last point well. The country's four largest mining companies (two operating in the Copperbelt Province and two in North-Western Province) have together generated about 150,000 direct, indirect and induced jobs. As a consequence, mining and mining-related employment now accounts for 16 per cent of all employment (formal and informal) in the Copperbelt and 15 per cent in North-Western Province.

Notably, induced employment (the jobs created by the spending of miners and supplying company wages) is estimated to account for as many employment opportunities as direct and indirect employment combined. Yet induced employment is often overlooked in policy debates, partly because it is not easily identifiable and/or linked to mining, and also because a large part of it is likely to be in the informal sector. Nonetheless, it represents a substantial contribution to local incomes, particularly among the poor, and a potential base for diversified economic development, especially in agriculture.

To summarize, employment represents one of the most significant contributions from mining – but only once the indirect and induced effects are factored in. However at present there is insufficient data on a comparable basis across the world's countries to include employment in the MCI (see Box 4).

Box 4
Employment impacts and ILO LABORSTA

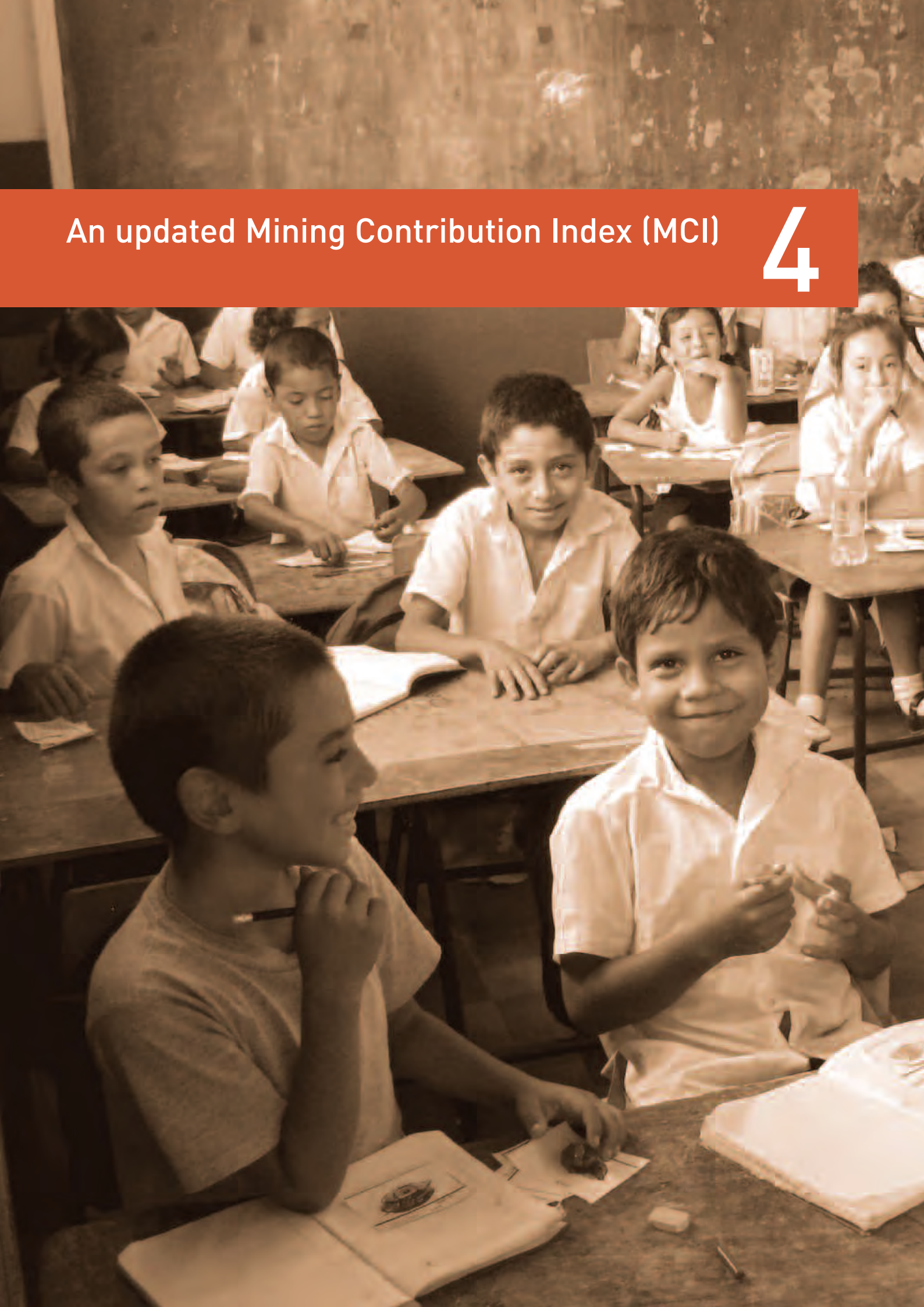
A source of internationally comparable data on mining's contribution to employment would greatly strengthen the MCI. The International Labour Office (ILO) publishes data on employment in mining and quarrying through its database LABORSTA (Table 2B of that ILO database presents total employment by economic activity). Although this includes data for some 150 countries, these data are typically derived from infrequent national labour force surveys or population censuses. Currently, the ILO data is not presented for any year later than 2008 and for many countries the latest data points are even older (eg 2000 for both Brazil and Zambia). Table 4 provides examples of employment contributions according to this data, and for the years available.

These numbers for direct employment are consistent with conclusions from the ICMM country case studies that direct employment is correctly located as the bottom and smallest bar of the inverted pyramid (see Figure 11).

Table 4: Employment in mining & quarrying (percentage of total employment)

Country	Year	Percentage
Australia	2008	1.24
Bolivia	2007	1.55
Canada	2008	1.54
Namibia	2004	1.97
South Africa	2008	2.39
Suriname	2004	5.94
Tanzania	2006	0.59

An updated Mining Contribution Index (MCI) 4



SECTION 4

An updated Mining Contribution Index (MCI)

The previous edition of this report highlighted the lack of consistently available and up-to-date data on the different national level contributions of mining. As a first step toward addressing this issue, ICMM and its partners developed the initial MCI.

The objectives of the MCI were – and still are – to capture important aspects of the contribution from mining sectors to national economies and to stimulate debate around the data challenges involved in measuring these contributions.

To strengthen the index and better reflect the multi-faceted macro-level contribution from mining discussed in the previous section, the authors considered including additional indicators to capture government revenue and employment effects (see Table 5). Due to data limitations these could not be included, and as result the revised MCI is calculated using the same three indicators as in the 2012 publication (see next section).

Other changes to strengthen the index included extending its scope in terms of time, countries and minerals covered. More specifically, the revised MCI includes data to 2012, hence incorporating the slowdown in global commodity prices. The dataset containing production value data now includes an additional 37 countries.

The dataset also includes a wider set of minerals, with the notable additions of coal and industrial minerals (mainly potash and potassium). See Annex B for details of how the country and mineral scope has changed from the original MCI.

Table 5: Additional selection variables considered for inclusion in the MCI

Selection variable considered for inclusion	Reason for non-inclusion
Fiscal contributions from mining as percentage of GDP or percentage of total fiscal revenue	Lack of available data for sufficient number of countries
Direct employment in mining as percentage of total formal employment	Lack of available data for sufficient number of countries

In interpreting the MCI, it is important not to view rises or falls in rankings as measures of absolute progress or decline. Rather, the MCI is intended as a tool to assess the relative importance of mining to national economies. Moreover, as shown in Section 2, global commodity prices are volatile. This means that short-term price fluctuations can impact on a country's rankings, even though the longer-term contributions from mining have not changed very much. To mitigate this effect when looking at the MCI over time, it is more useful to focus on the movement of countries between quintiles in the index rather than changes in rankings.

4.1

Methodology for calculating the MCI and data display

The MCI is a composite index comprised of three indicators, each capturing different aspects of mining's contribution to national economies:

- **Mineral and metal export contribution 2012.** Provides a measure for the scale of mining in relation to other productive activities, in particular for small, open and low- to middle-income countries.
- **Increase/decrease in mineral and metal export contribution 2007–2012.** Adds a dynamic component to the index by providing an indication of whether the importance of mining as an economic activity is growing or falling over time.[15]
- **Mineral production value expressed as a percentage of GDP in 2012.** Provides a sense of scale of the value of production relative to the size of the economy. Note that it does not represent the contribution of mining to GDP – on average perhaps a third of production value represents value addition to the national economy.

15 Note that mineral export contributions may increase, not due to higher prices and/or output in the mining sector, but to declining prices and/or output in other export sectors (eg agricultural commodities). The MCI at present does not distinguish between these two effects.

4

Table 6: Indicators included in the MCI data table (note only indicators shown on the orange background are used to calculate the MCI)

Column	Indicator	Definition and sources
1	Country	Countries in World Bank database, asterisks indicate non-UN countries and territories
2	Metallic mineral, metals and coal export contribution 2012	Exports of metallic minerals, metals and coal (UNCTADstat data) as share of total merchandise exports. See Annex B for full definitions.
3	Change in export contribution 2007–12 (percentage points)	Difference between column 2 and the same indicator calculated for 2007, expressed as percentage points
4	Total mineral export contribution. (including oil, gas and coal) 2012	Total non-fuel and fuel minerals, including hydrocarbons, as share of total merchandise exports (UNCTADstat)
5	Metallic mineral and coal production value 2012 (as percentage of GDP)	Total production value in US$, current prices (Raw Materials Data 2014) expressed as percentage of GDP (World Bank data).
6	Change in production value as percentage of GDP, 2007–12	Difference between column 5 and same indicator calculated for 2007, expressed as percentage
7	Metallic mineral and coal production value 2012 (US$bn)	Total value of mineral and coal production, in current prices (Raw Materials Data 2014)
8	Exploration-spend-share-of-global-total expressed as share of production-value-share-of-global-total	SNL Metals & Mining exploration data (2014)
9	Population growth 2000–12	World Bank data
10	Human Development Index (HDI – latest year available)	United Nations Development Programme
11	2014 MCI score	Sum of weighted percentile ranks across selection variables
12	2014 MCI quintile and change in quintile since 2012 MCI	Country quintile rank in 2014 and changes from quintile rank in 2012 – expressed as movements up (positive number) or down (negative number)

The MCI is calculated as follows:

1. Countries are ranked in descending order for each of the 3 MCI indicators. Countries for which data do not exist are omitted from the ranking. As a result, indicator 1 is ranked out of 201 countries, indicator 2 is ranked out of 198 countries, and indicator 3 is ranked out of 189 countries.

2. For each country percentile ranks are calculated based on the three indicators, by dividing the country rank by the maximum rank within that indicator – to generate a ranking between 0 and 1.

3. Finally, the three MCI indicators are weighted equally at 1/3, summed up, and multiplied by 100. Where data are only available on two of the indicators, these are weighted equally at 0.5 each. Where data are only available for one indicator, this country is given a zero score on the MCI.

The MCI data table includes 12 columns comprising the indicators used to calculate the index as well as other relevant data presented for information (as described in Table 6).

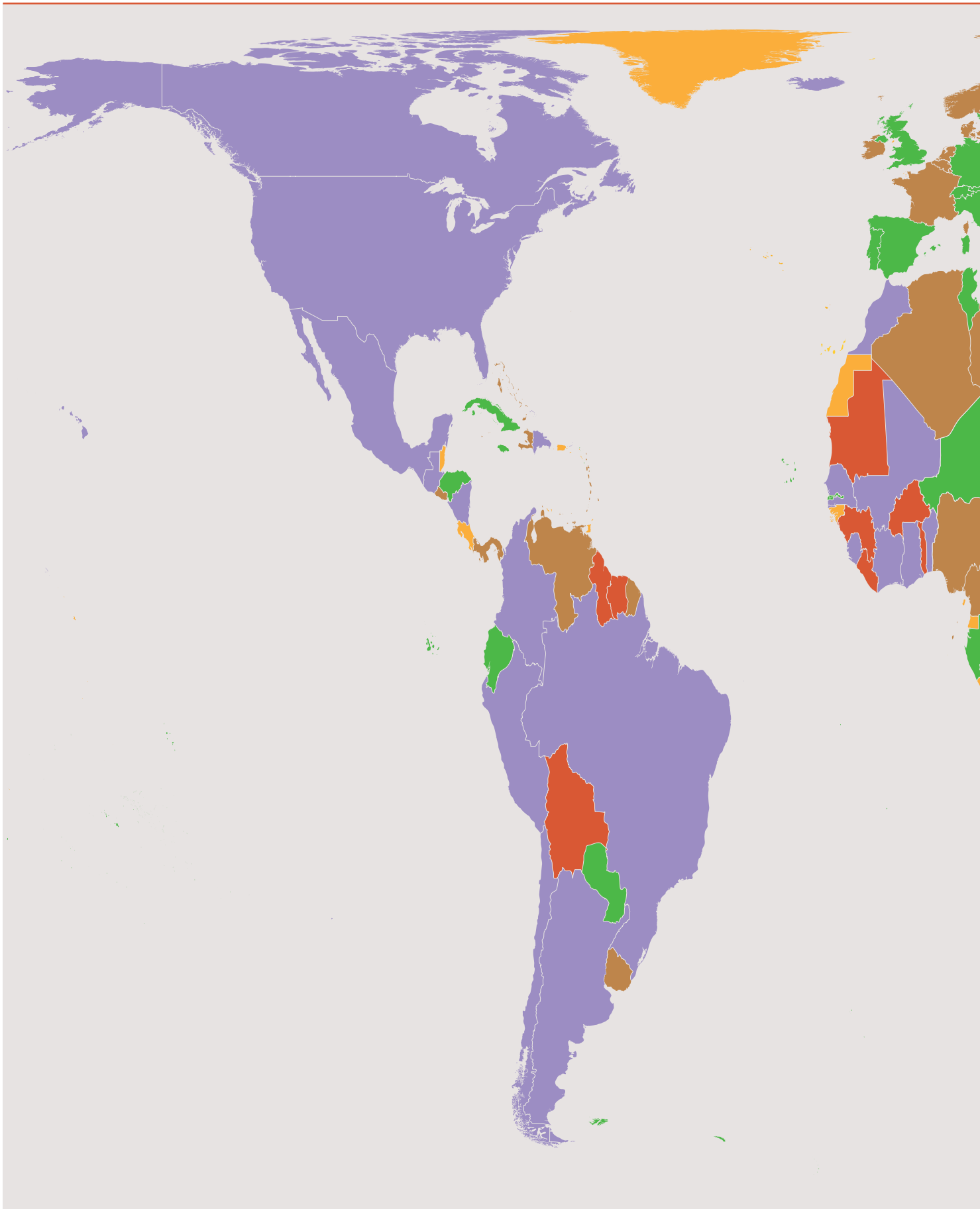
In the map overleaf countries are colour-coded based on MCI scores (above 80, 60–80 etc.) to provide a clear signal about the importance of mining and metals in each country's national economy. This approach is consistent with our 2012 work.
In the accompanying MCI data table we also show (column 12) which quintile each of the 214 countries belongs to (top 43 countries, second 43 countries etc.) as well as the change in quintile since 2012.

SECTION 4

An updated Mining Contribution Index (MCI)

Mining Contribution Index score

Above 80 | Above 60, less than 80 | Above 40, less than 60 | Above 20, less than 40 | Zero to 20



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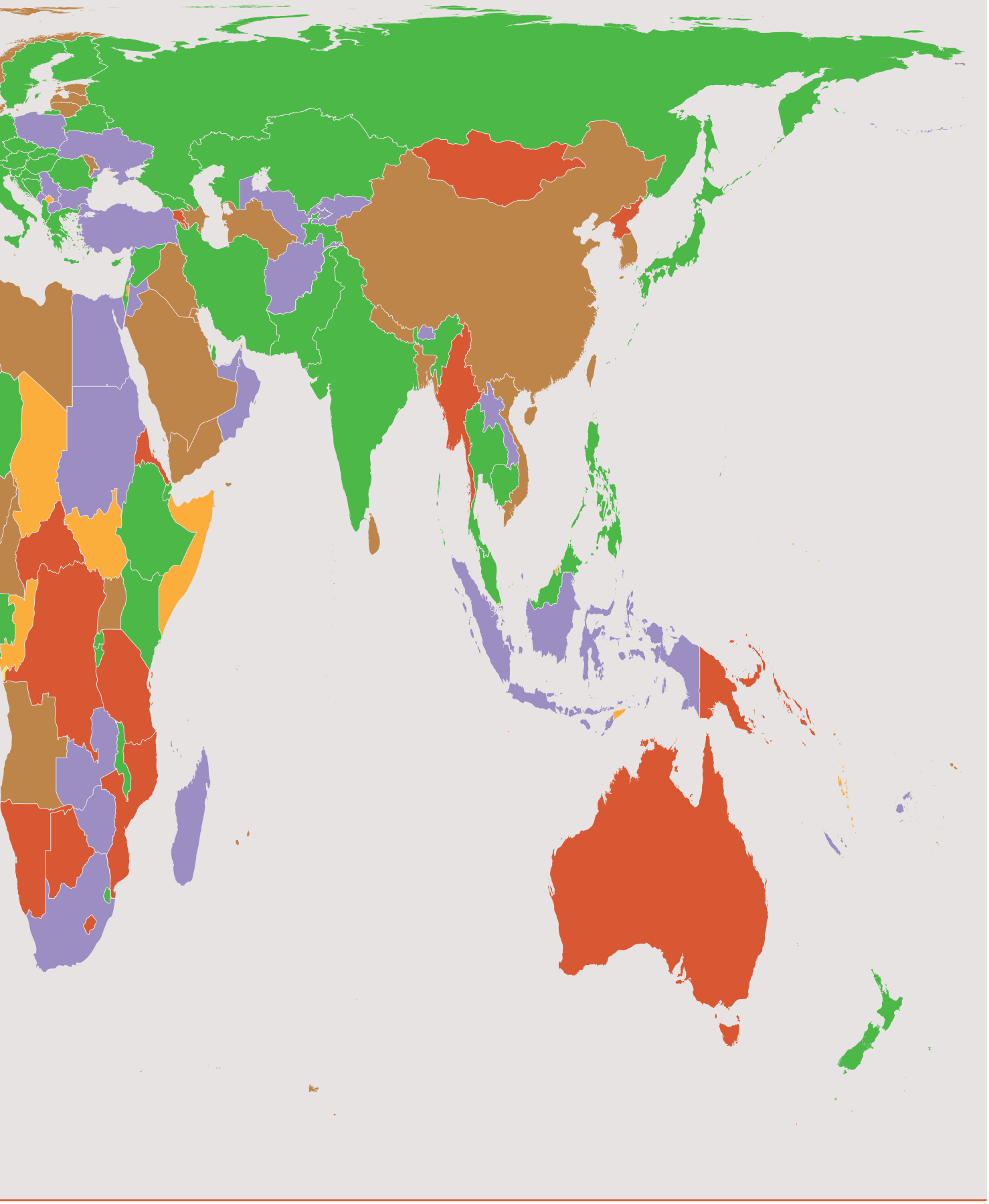


SECTION 4

An updated Mining Contribution Index (MCI)

Mining Contribution Index score

Above 80 | Above 60, less than 80 | Above 40, less than 60 | Above 20, less than 40 | Zero to 20

Data table by country

	COUNTRY	EXPORTS			PRODUCTION			EXPLORATION	COUNTRY DATA		ASSESSMENT	
	(* indicates non-UN country)	2012 export contribution	Change in export contribution 2007–2012	Total export contribution 2012	2012 production value (% of GDP)	Change in production value 2007–2012	2012 production value (US$bn)	Exploration spend relative to production value	Population growth 2000–2012	Human Development Index (Latest year available)	2014 MCI score	MCI 2014 quintile (Change in quintile since MCI 2012)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1	Mauritania	62.9%	10.9 pp	71.8%	57.5%	34.0 pp	2.28	2.1x	40%	0.49	96.82	1 (0)
2	Eritrea	60.5%	58.6 pp	60.5%	16.8%	16.8 pp	0.52	3.9x	56%	0.38	96.38	1 (3)
3	Guyana	58.8%	21.0 pp	58.8%	22.1%	7.2 pp	0.63	5.7x	7%	0.64	95.92	1 (0)
4	Congo, Dem. Rep.	81.5%	12.4 pp	92.4%	18.0%	7.0 pp	4.94	–	40%	0.34	95.88	1 (0)
5	Korea, Dem. Rep.	54.4%	31.7 pp	55.8%	–	–	0.97	–	8%	–	95.76	1 (3)
6	Suriname	75.7%	18.9 pp	85.2%	15.8%	5.1 pp	0.79	–	15%	0.70	95.67	1 (0)
7	Guinea	60.1%	9.1 pp	87.4%	34.7%	15.9 pp	1.96	1.6x	31%	0.39	94.79	1 (1)
8	Burkina Faso	46.3%	44.8 pp	46.3%	16.0%	15.3 pp	1.72	9.7x	42%	0.39	94.21	1 (0)
9	Botswana	91.7%	5.7 pp	92.4%	29.4%	-4.5 pp	4.28	1.2x	14%	0.68	93.74	1 (1)
10	Lesotho	44.5%	38.4 pp	44.5%	15.0%	5.2 pp	0.35	0.8x	11%	0.49	92.67	1 (2)
11	Liberia	24.0%	21.0 pp	41.4%	29.1%	27.5 pp	0.51	3.3x	45%	0.41	91.98	1 (0)
12	Togo	28.3%	15.7 pp	43.0%	15.9%	5.8 pp	0.62	0.0x	37%	0.47	89.87	1 (0)
13	Australia	57.3%	8.9 pp	69.0%	10.0%	2.3 pp	153.23	0.6x	19%	0.93	89.36	1 (0)
14	Mongolia	83.1%	1.8 pp	86.4%	52.9%	3.5 pp	5.46	5.5x	17%	0.70	88.55	1 (0)
15	Papua New Guinea	51.3%	4.1 pp	68.5%	26.1%	-8.5 pp	4.08	3.6x	33%	0.49	88.54	1 (0)
16	Myanmar	19.1%	13.4 pp	57.6%	–	–	0.38	–	9%	0.52	86.28	1 (1)
17	Mozambique	47.5%	6.8 pp	71.7%	4.7%	4.3 pp	0.68	17.6x	38%	0.39	84.89	1 (2)
18	Central African Republic	44.4%	10.8 pp	44.5%	3.2%	-0.2 pp	0.07	–	24%	0.34	84.84	1 (2)
19	Armenia	44.5%	6.5 pp	49.9%	5.7%	2.1 pp	0.57	1.4x	-3%	0.73	84.77	1 (0)
20	Solomon Islands	15.5%	15.1 pp	15.6%	10.1%	10.1 pp	0.10	15.8x	33%	0.49	83.93	1 (4)
21	Namibia	53.4%	1.8 pp	54.4%	11.6%	-2.4 pp	1.55	4.6x	19%	0.62	82.51	1 (0)
22	Northern Mariana Islands*	19.1%	8.3 pp	19.2%	–	–	–	–	-22%	–	82.50	1 (0)
23	Bolivia	29.8%	4.1 pp	80.7%	11.0%	2.3 pp	2.97	0.6x	24%	0.67	82.03	1 (0)
24	Tanzania	35.3%	4.3 pp	36.7%	8.9%	3.2 pp	2.50	3.6x	40%	0.49	81.81	1 (0)
25	Uzbekistan	18.6%	3.9 pp	25.7%	11.1%	0.0 pp	5.67	0.4x	21%	0.66	79.89	1 (0)
26	New Caledonia*	37.8%	2.5 pp	37.9%	–	–	1.69	0.6x	21%	–	78.90	1 (0)
27	Indonesia	20.1%	3.0 pp	40.7%	6.3%	-0.5 pp	54.96	1.3x	18%	0.68	78.46	1 (1)
28	Turks and Caicos Islands*	10.3%	9.8 pp	10.4%	–	–	–	–	72%	–	77.55	1 (1)
29	Jordan	14.3%	6.2 pp	15.2%	4.8%	1.3 pp	1.49	0.0x	32%	0.75	77.27	1 (2)
30	Senegal	13.0%	7.1 pp	34.5%	3.7%	3.3 pp	0.51	7.4x	39%	0.49	76.74	1 (1)
31	Zimbabwe	37.8%	0.5 pp	38.5%	21.4%	2.5 pp	2.67	0.4x	10%	0.49	76.61	1 (1)
32	Nicaragua	12.8%	7.8 pp	14.0%	3.5%	2.5 pp	0.37	4.1x	17%	0.61	76.39	1 (1)
33	Kyrgyz Republic	17.6%	2.3 pp	30.9%	8.1%	1.5 pp	0.54	4.0x	14%	0.63	76.29	1 (1)
34	Guam*	13.0%	5.9 pp	45.9%	–	–	–	–	5%	–	76.25	1 (4)
35	Colombia	19.9%	2.8 pp	72.7%	3.5%	0.3 pp	13.07	5.2x	20%	0.71	76.00	1 (1)
36	Brazil	17.3%	5.0 pp	28.2%	3.0%	1.2 pp	66.50	0.4x	14%	0.74	75.31	1 (0)
37	Madagascar	17.8%	13.3 pp	20.4%	0.5%	0.2 pp	0.05	52.7x	42%	0.50	74.33	1 (0)
38	Turkey	12.7%	8.3 pp	17.6%	1.8%	0.5 pp	13.81	0.9x	17%	0.76	73.75	1 (1)
39	Ukraine	9.5%	2.3 pp	13.0%	12.0%	4.8 pp	21.11	0.0x	7%	0.73	73.58	1 (1)
40	Serbia	9.0%	–	12.6%	11.0%	3.6 pp	4.20	7.4x	-4%	0.74	73.22	1 (1)
41	Fiji	9.3%	7.6 pp	34.1%	1.9%	1.9 pp	0.08	12.8x	8%	0.72	71.94	1 (2)
42	Sudan	45.8%	–	80.0%	0.3%	0.1 pp	0.17	0.9x	34%	0.47	69.89	1 (2)
43	Morocco	11.6%	1.9 pp	17.2%	3.3%	1.6 pp	3.20	0.6x	13%	0.62	69.31	1 (1)

Data table by country *continued*

COUNTRY		EXPORTS			PRODUCTION			EXPLORATION	COUNTRY DATA		ASSESSMENT	
(* indicates non-UN country)		2012 export contribution	Change in export contribution 2007–2012	Total export contribution 2012	2012 production value (% of GDP)	Change in production value 2007–2012	2012 production value (US$bn)	Exploration spend relative to production value	Population growth 2000–2012	Human Development Index (Latest year available)	2014 MCI score	MCI 2014 quintile (Change in quintile since MCI 2012)
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
44	Afghanistan	17.4%	11.0 pp	17.6%	0.0%	-0.3 pp	0.01	173.8x	45%	0.47	67.51	2 (1)
45	Cote d'Ivoire	6.1%	5.4 pp	35.2%	2.4%	2.3 pp	0.59	6.2x	23%	0.45	67.48	2 (2)
46	Lebanon	32.5%	9.7 pp	34.7%	0.0%	0.0 pp	0.00	–	37%	0.77	67.34	2 (-1)
47	Canada	12.8%	1.6 pp	37.0%	2.2%	0.3 pp	39.62	2.2x	13%	0.90	67.03	2 (0)
48	Zambia	69.2%	-7.7 pp	70.4%	26.4%	0.7 pp	5.43	2.0x	39%	0.56	66.97	2 (-1)
49	Iceland	37.7%	10.7 pp	39.7%	0.0%	0.0 pp	0.00	–	14%	0.89	66.95	2 (-1)
50	Chile	61.6%	-3.7 pp	62.5%	15.8%	-3.8 pp	42.07	1.1x	13%	0.82	66.38	2 (-1)
51	Benin	20.9%	8.6 pp	36.8%	0.0%	0.0 pp	0.00	0.0x	45%	0.48	66.22	2 (-1)
52	Sierra Leone	50.6%	-7.6 pp	50.6%	31.8%	24.2 pp	1.20	2.0x	44%	0.37	65.51	2 (1)
53	Dominican Republic	7.6%	4.5 pp	10.3%	0.8%	-0.8 pp	0.49	–	19%	0.70	65.41	2 (0)
54	Peru	60.1%	-4.3 pp	71.7%	13.0%	-3.4 pp	25.09	1.8x	15%	0.74	65.35	2 (-1)
55	Macedonia, FYR	6.3%	1.6 pp	12.6%	5.0%	-0.3 pp	0.48	0.7x	3%	0.73	64.75	2 (1)
56	United Arab Emirates	15.9%	5.0 pp	73.2%	0.1%	-0.1 pp	0.39	–	204%	0.83	64.74	2 (-1)
57	Egypt, Arab Rep.	9.4%	3.5 pp	45.2%	0.6%	0.4 pp	1.64	0.6x	22%	0.68	64.00	2 (0)
58	Mexico	5.9%	2.6 pp	20.0%	1.6%	0.9 pp	19.13	3.0x	16%	0.76	62.52	2 (0)
59	South Africa	38.8%	-6.5 pp	41.7%	17.1%	1.9 pp	65.46	0.4x	19%	0.66	62.43	2 (-1)
60	Mali	42.3%	-9.3 pp	42.7%	20.7%	4.2 pp	2.14	3.7x	45%	0.41	62.27	2 (-1)
61	Guatemala	6.7%	2.1 pp	10.5%	1.1%	0.4 pp	0.56	3.2x	35%	0.63	62.13	2 (0)
62	Ghana	17.6%	-0.7 pp	48.1%	12.5%	4.3 pp	5.23	2.9x	35%	0.57	62.08	2 (-1)
63	Bulgaria	17.4%	-0.5 pp	33.5%	9.1%	2.4 pp	4.67	0.4x	-11%	0.78	61.84	2 (-1)
64	Bhutan	15.8%	1.8 pp	35.7%	0.2%	0.1 pp	0.00	–	31%	0.58	61.64	2 (-1)
65	Argentina	6.8%	2.0 pp	13.0%	0.9%	0.2 pp	5.36	4.2x	11%	0.81	61.59	2 (1)
66	Lao PDR	39.6%	-6.5 pp	55.3%	13.6%	3.4 pp	1.28	1.5x	23%	0.57	61.36	2 (-1)
67	United States	7.7%	1.5 pp	15.6%	0.8%	0.1 pp	137.52	1.8x	11%	0.91	60.88	2 (1)
68	Oman	5.8%	4.5 pp	77.0%	0.6%	0.3 pp	0.48	0.7x	51%	0.78	60.69	2 (0)
69	Poland	6.8%	0.5 pp	10.2%	4.0%	0.6 pp	19.46	0.5x	1%	0.83	60.49	2 (1)
70	Montenegro	44.7%	–	58.5%	0.0%	0.0 pp	0.00	89.5x	2%	0.79	60.38	2 (-1)
71	Honduras	6.9%	1.0 pp	10.5%	1.1%	-0.2 pp	0.21	0.6x	27%	0.62	59.45	2 (0)
72	Sweden	5.9%	1.8 pp	15.3%	1.0%	0.5 pp	5.24	0.7x	7%	0.90	59.11	2 (0)
73	Iran, Islamic Rep.	5.1%	1.6 pp	75.4%	1.6%	0.4 pp	8.22	0.2x	16%	0.75	58.51	2 (0)
74	Kazakhstan	15.2%	-1.8 pp	84.0%	12.1%	-0.9 pp	24.61	0.8x	13%	0.76	58.39	2 (0)
75	Ethiopia	7.0%	1.3 pp	7.0%	0.6%	0.2 pp	0.24	12.3x	39%	0.44	57.27	2 (0)
76	Philippines	6.3%	0.4 pp	8.5%	2.5%	0.5 pp	6.27	2.7x	25%	0.66	57.04	2 (0)
77	Rwanda	39.1%	-1.7 pp	47.0%	1.7%	0.4 pp	0.12	1.7x	36%	0.51	56.79	2 (1)
78	Finland	6.3%	1.0 pp	17.2%	0.6%	0.4 pp	1.52	4.9x	5%	0.88	55.29	2 (1)
79	Thailand	5.2%	1.5 pp	11.7%	0.7%	0.0 pp	2.54	0.4x	7%	0.72	55.16	2 (1)
80	Bosnia and Herzegovina	15.4%	-4.4 pp	22.9%	9.6%	3.8 pp	1.61	–	0%	0.73	54.96	2 (1)
81	Tajikistan	58.5%	-11.2 pp	60.2%	1.7%	0.5 pp	0.13	–	29%	0.61	54.91	2 (1)
82	Russian Federation	9.6%	-0.7 pp	77.3%	4.4%	0.4 pp	89.77	0.6x	-2%	0.78	54.39	2 (1)
83	Burundi	17.8%	-1.9 pp	18.0%	2.2%	-1.9 pp	0.05	4.3x	48%	0.39	53.87	2 (2)
84	Djibouti	17.3%	8.3 pp	23.4%	0.0%	0.0 pp	–	–	19%	0.47	53.85	2 (0)
85	Hong Kong SAR, China*	14.9%	9.4 pp	15.2%	0.0%	0.0 pp	-	–	7%	0.89	53.53	2 (0)
86	Gambia, The	19.7%	5.0 pp	20.6%	0.0%	0.0 pp	-	–	46%	0.44	53.32	3 (-2)

SECTION 4

An updated Mining Contribution Index (MCI)

Mining Contribution Index score

Above 80 | Above 60, less than 80 | Above 40, less than 60 | Above 20, less than 40 | Zero to 20

Data table by country *continued*

COUNTRY		EXPORTS			PRODUCTION			EXPLORATION	COUNTRY DATA		ASSESSMENT	
(* indicates non-UN country)		2012 export contribution	Change in export contribution 2007–2012	Total export contribution 2012	2012 production value (% of GDP)	Change in production value 2007–2012	2012 production value (US$bn)	Exploration spend relative to production value	Population growth 2000–2012	Human Development Index (Latest year available)	2014 MCI score	MCI 2014 quintile (Change in quintile since MCI 2012)
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
87	Jamaica	39.1%	-23.3 pp	61.7%	2.5%	-0.1 pp	0.37	0.2x	5%	0.72	52.84	3 (0)
88	Spain	5.1%	1.8 pp	12.4%	0.2%	0.0 pp	2.11	1.8x	16%	0.87	52.81	3 (1)
89	Czech Republic	3.1%	0.4 pp	5.9%	3.1%	0.4 pp	6.17	–	2%	0.86	51.95	3 (1)
90	French Polynesia*	64.6%	-8.7 pp	64.6%	–	–	0.07	–	15%	–	51.53	3 (-2)
91	Croatia	7.1%	2.4 pp	20.7%	0.0%	0.0 pp	0.00	–	-4%	0.81	51.47	3 (0)
92	India	11.4%	-5.7 pp	30.1%	4.8%	0.8 pp	89.69	0.1x	19%	0.59	51.20	3 (0)
93	Cambodia	4.7%	3.6 pp	4.7%	0.0%	0.0 pp	0.00	138.3x	22%	0.58	50.96	3 (0)
94	Gabon	6.4%	-1.3 pp	85.0%	6.0%	3.0 pp	1.07	0.8x	33%	0.67	50.62	3 (-1)
95	Kenya	5.5%	0.6 pp	11.0%	0.3%	-0.1 pp	0.11	6.7x	38%	0.54	50.04	3 (-1)
96	Portugal	4.4%	0.8 pp	12.5%	0.3%	0.0 pp	0.61	3.6x	2%	0.82	49.73	3 (0)
97	Israel	29.4%	-6.0 pp	31.1%	0.7%	0.2 pp	1.86	0.0x	26%	0.89	49.62	3 (0)
98	Niger	21.9%	-14.1 pp	57.5%	1.6%	-0.2 pp	0.11	26.7x	56%	0.34	49.06	3 (-1)
99	Italy	4.4%	2.0 pp	9.9%	0.0%	0.0 pp	0.53	0.0x	5%	0.87	48.82	3 (0)
100	Greece	8.1%	-2.8 pp	45.0%	2.7%	0.9 pp	6.79	1.3x	2%	0.85	48.27	3 (0)
101	Tonga	7.5%	5.4 pp	7.5%	0.0%	0.0 pp	–	–	7%	0.70	47.02	3 (0)
102	Austria	4.5%	0.9 pp	8.2%	0.1%	0.1 pp	0.38	0.5x	5%	0.88	46.70	3 (1)
103	Germany	3.7%	0.3 pp	6.4%	0.7%	0.2 pp	24.39	0.2x	-2%	0.91	46.64	3 (1)
104	Albania	12.3%	-3.3 pp	37.6%	1.0%	0.6 pp	0.12	0.2x	-9%	0.72	46.56	3 (-1)
105	United Kingdom	6.6%	0.2 pp	20.2%	0.1%	0.0 pp	2.52	–	8%	0.89	46.16	3 (-1)
106	Malaysia	2.6%	0.8 pp	23.0%	0.6%	0.4 pp	1.70	0.4x	25%	0.77	45.78	3 (1)
107	Swaziland	7.1%	4.7 pp	7.4%	0.0%	0.0 pp	-	–	16%	0.53	45.68	3 (2)
108	Georgia	10.9%	-14.3 pp	12.9%	1.8%	0.1 pp	0.28	0.0x	2%	0.74	44.64	3 (-2)
109	Malawi	6.1%	5.9 pp	6.2%	0.0%	0.0 pp	–	–	40%	0.41	44.54	3 (-2)
110	Macao SAR, China*	7.4%	3.5 pp	7.6%	0.0%	0.0 pp	–	–	29%	–	44.50	3 (-1)
111	Pakistan	2.0%	0.9 pp	3.4%	0.3%	0.0 pp	0.73	0.2x	25%	0.54	44.11	3 (0)
112	Switzerland	5.8%	1.0 pp	9.0%	0.0%	0.0 pp	0.02	0.5x	11%	0.92	44.11	3 (-1)
113	Slovak Republic	3.2%	0.3 pp	9.1%	0.3%	0.1 pp	0.25	356.8x	0%	0.83	44.03	3 (1)
114	Ecuador	2.3%	1.0 pp	60.1%	0.2%	0.1 pp	0.18	7.4x	24%	0.71	44.02	3 (1)
115	Syrian Arab Republic	3.0%	0.8 pp	20.5%	–	–	0.10	–	37%	0.66	43.44	3 (-1)
116	Cabo Verde	3.0%	2.6 pp	13.7%	0.0%	0.0 pp	0.00	–	12%	0.64	43.16	3 (1)
117	Bahrain	29.5%	-6.0 pp	71.0%	0.0%	0.0 pp	0.01	–	97%	0.82	43.09	3 (-2)
118	Qatar	1.6%	1.3 pp	93.0%	0.3%	0.2 pp	0.48	–	245%	0.85	42.90	3 (1)
119	Hungary	2.2%	0.2 pp	5.7%	0.8%	0.3 pp	0.99	0.0x	-3%	0.82	42.68	3 (2)
120	Romania	3.8%	-1.4 pp	9.3%	2.2%	0.6 pp	3.74	2.4x	-11%	0.78	42.28	3 (1)
121	Cyprus	7.2%	-0.5 pp	44.7%	0.1%	0.0 pp	0.03	0.7x	20%	0.85	42.11	3 (-2)
122	Japan	3.7%	0.7 pp	5.4%	0.0%	0.0 pp	1.25	0.2x	1%	0.89	42.09	3 (1)
123	Belarus	0.6%	0.0 pp	36.2%	6.1%	2.1 pp	3.85	0.0x	-5%	0.79	41.75	3 (1)
124	Slovenia	4.1%	-0.8 pp	9.5%	1.0%	0.3 pp	0.46	–	3%	0.87	41.32	3 (1)
125	Tunisia	1.7%	0.3 pp	18.5%	0.7%	-0.1 pp	0.32	0.2x	13%	0.72	41.00	3 (1)
126	New Zealand	4.7%	-1.5 pp	9.5%	0.9%	0.4 pp	1.49	2.4x	15%	0.91	40.76	3 (0)
127	Cuba	21.7%	-16.4 pp	33.2%	–	–	0.96	0.1x	1%	0.81	40.56	3 (-2)
128	Paraguay	2.1%	1.1 pp	22.6%	0.0%	0.0 pp	0.01	25.7x	25%	0.68	40.52	3 (2)
129	St. Vincent and the Grenadines	4.3%	4.2 pp	5.2%	0.0%	0.0 pp	–	–	1%	0.72	39.87	4 (-1)

Data table by country *continued*

COUNTRY		EXPORTS			PRODUCTION			EXPLORATION	COUNTRY DATA		ASSESSMENT	
(* indicates non-UN country)		2012 export contribution	Change in export contribution 2007–2012	Total export contribution 2012	2012 production value (% of GDP)	Change in production value 2007–2012	2012 production value (US$bn)	Exploration spend relative to production value	Population growth 2000–2012	Human Development Index (Latest year available)	2014 MCI score	MCI 2014 quintile (Change in quintile since MCI 2012)
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
130	China	1.5%	-1.0 pp	2.9%	6.1%	-0.8 pp	501.98	0.3x	7%	0.72	39.54	4 (0)
131	Vietnam	1.9%	-1.0 pp	10.7%	3.4%	-0.8 pp	5.33	0.2x	14%	0.64	39.06	4 (-1)
132	Latvia	3.9%	0.4 pp	11.7%	0.0%	0.0 pp	0.00	–	-14%	0.81	38.63	4 (-1)
133	Angola	1.4%	-0.2 pp	99.6%	1.1%	-0.9 pp	1.29	2.4x	50%	0.53	36.91	4 (1)
134	Venezuela, RB	3.2%	-2.6 pp	83.7%	0.8%	-0.1 pp	3.20	0.0x	23%	0.76	36.24	4 (0)
135	El Salvador	2.8%	0.5 pp	5.2%	0.0%	0.0 pp	0.00	13.0x	6%	0.66	36.13	4 (-2)
136	Yemen, Rep.	2.6%	0.4 pp	88.5%	0.0%	0.0 pp	0.00	26.7x	36%	0.50	35.68	4 (1)
137	Korea, Rep.	2.7%	0.0 pp	13.2%	0.1%	0.0 pp	0.98	–	6%	0.89	35.30	4 (0)
138	Belgium	8.4%	0.2 pp	19.7%	0.0%	0.0 pp	–	–	9%	0.88	34.89	4 (-2)
139	Norway	5.4%	-2.9 pp	75.2%	0.2%	0.1 pp	0.78	0.5x	12%	0.94	34.61	4 (0)
140	Aruba*	1.2%	0.7 pp	83.0%	–	–	–	–	13%	–	33.73	4 (-2)
141	Bahamas, The	2.6%	-0.8 pp	68.5%	0.3%	0.1 pp	0.02	–	25%	0.79	33.28	4 (0)
142	Ireland	1.3%	0.0 pp	3.1%	0.2%	-0.1 pp	0.51	4.6x	21%	0.90	33.14	4 (0)
143	France	3.0%	-0.1 pp	7.4%	0.0%	0.0 pp	0.52	0.0x	8%	0.88	32.85	4 (0)
144	Antigua and Barbuda	2.2%	2.1 pp	2.3%	0.0%	0.0 pp	–	–	15%	0.77	31.71	4 (1)
145	Panama	3.1%	1.2 pp	15.1%	0.0%	0.0 pp	–	–	24%	0.77	31.66	4 (1)
146	Comoros	3.4%	1.0 pp	3.4%	0.0%	0.0 pp	–	–	36%	0.49	31.65	4 (1)
147	Sri Lanka	5.1%	-2.2 pp	5.5%	0.0%	0.0 pp	0.01	0.0x	6%	0.75	31.44	4 (0)
148	Mauritius	3.7%	0.8 pp	3.8%	0.0%	0.0 pp	–	–	9%	0.77	31.30	4 (-1)
149	Netherlands	3.2%	-0.8 pp	21.5%	0.0%	0.0 pp	0.22	–	5%	0.92	31.19	4 (-1)
150	Malta	1.3%	0.7 pp	42.4%	0.0%	0.0 pp	0.00	–	10%	0.83	31.13	4 (0)
151	Nigeria	0.5%	0.1 pp	94.0%	0.1%	0.0 pp	0.33	0.5x	37%	0.50	29.84	4 (0)
152	Turkmenistan	0.4%	0.0 pp	63.0%	0.1%	0.1 pp	0.05	0.0x	15%	0.70	29.58	4 (0)
153	Dominica	9.7%	-0.6 pp	9.7%	0.0%	0.0 pp	–	–	3%	0.72	29.49	4 (-3)
154	Uruguay	1.8%	-0.8 pp	2.9%	0.2%	-0.1 pp	0.10	4.4x	2%	0.79	29.38	4 (1)
155	Cameroon	2.2%	-1.9 pp	52.6%	0.2%	0.1 pp	0.05	3.1x	36%	0.50	29.03	4 (0)
156	Kuwait	0.7%	0.0 pp	91.7%	0.1%	0.0 pp	0.16	–	71%	0.81	28.84	4 (1)
157	Libya	0.8%	0.2 pp	98.1%	0.0%	0.0 pp	0.01	–	19%	0.78	28.71	4 (0)
158	Palau	3.1%	0.5 pp	3.2%	0.0%	0.0 pp	–	–	8%	0.77	28.63	4 (1)
159	Saudi Arabia	0.6%	-0.2 pp	85.8%	0.1%	0.1 pp	1.03	2.0x	40%	0.84	28.40	4 (1)
160	Barbados	2.6%	0.9 pp	12.5%	0.0%	0.0 pp	–	-	6%	0.78	28.32	4 (0)
161	Luxembourg	6.4%	-0.2 pp	7.5%	0.0%	0.0 pp	–	–	22%	0.88	28.20	4 (-1)
162	Bangladesh	0.4%	0.0 pp	1.2%	0.0%	0.0 pp	0.05	–	17%	0.56	27.99	4 (1)
163	Sao Tome and Principe	1.6%	1.4 pp	3.2%	0.0%	0.0 pp	–	–	35%	0.56	27.52	4 (1)
164	Estonia	4.0%	0.1 pp	17.0%	0.0%	0.0 pp	–	–	-5%	0.84	27.42	4 (-1)
165	Samoa	1.7%	1.2 pp	1.7%	0.0%	0.0 pp	–	–	8%	0.69	27.35	4 (1)
166	Lithuania	1.5%	-0.5 pp	26.0%	0.0%	0.0 pp	0.01	–	-15%	0.83	26.91	4 (1)
167	Algeria	0.2%	-0.3 pp	98.6%	0.2%	0.1 pp	0.40	0.4x	21%	0.72	26.76	4 (-1)
168	Azerbaijan	0.9%	-0.7 pp	94.3%	0.1%	0.1 pp	0.09	3.3x	15%	0.75	26.51	4 (1)
169	Nepal	4.4%	-6.4 pp	4.4%	0.0%	0.0 pp	0.00	–	19%	0.54	26.32	4 (0)
170	Denmark	1.6%	-0.3 pp	11.6%	0.0%	0.0 pp	0.02	–	5%	0.90	25.78	4 (0)
171	Moldova	2.8%	-2.5 pp	4.0%	0.0%	0.0 pp	0.00	–	-2%	0.66	25.60	4 (-1)
172	St. Lucia	3.6%	0.1 pp	34.0%	0.0%	0.0 pp	–	–	15%	0.71	25.58	5 (-2)

SECTION 4

An updated Mining Contribution Index (MCI)

Mining Contribution Index score

Above 80 | Above 60, less than 80 | Above 40, less than 60 | Above 20, less than 40 | Zero to 20

Data table by country *continued*

COUNTRY		EXPORTS			PRODUCTION			EXPLORATION	COUNTRY DATA		ASSESSMENT	
	(* indicates non-UN country)	2012 export contribution	Change in export contribution 2007–2012	Total export contribution 2012	2012 production value (% of GDP)	Change in production value 2007–2012	2012 production value (US$bn)	Exploration spend relative to production value	Population growth 2000–2012	Human Development Index (Latest year available)	2014 MCI score	MCI 2014 quintile (Change in quintile since MCI 2012)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
173	Iraq	0.3%	0.0 pp	99.1%	0.0%	0.0 pp	0.03	–	37%	0.64	25.38	5 (-1)
174	Uganda	1.6%	-6.5 pp	2.3%	0.3%	-0.2 pp	0.05	2.7x	50%	0.48	25.06	5 (-1)
175	Maldives	2.4%	0.3 pp	2.4%	0.0%	0.0 pp	–	–	24%	0.70	24.12	5 (-2)
176	Cayman Islands*	0.9%	-0.1 pp	2.9%	–	–	–	–	38%	–	23.64	5 (-1)
177	Bermuda*	2.2%	0.2 pp	24.4%	0.0%	0.0 pp	–	–	5%	–	22.94	5 (-3)
178	Faeroe Islands*	0.3%	0.1 pp	6.4%	–	–	–	–	6%	–	22.94	5 (0)
179	Seychelles	1.0%	0.7 pp	5.0%	0.0%	0.0 pp	–	–	9%	0.76	22.67	5 (0)
180	Grenada	10.7%	-12.1 pp	10.8%	0.0%	0.0 pp	–	–	4%	0.74	22.58	5 (0)
181	Haiti	1.8%	0.0 pp	1.8%	0.0%	0.0 pp	–	–	19%	0.47	20.44	5 (-2)
182	Vanuatu	0.4%	0.3 pp	0.4%	0.0%	0.0 pp	–	–	34%	0.62	17.99	5 (0)
183	Trinidad and Tobago	1.7%	-0.1 pp	66.6%	0.0%	0.0 pp	–	–	5%	0.77	17.75	5 (-3)
184	Greenland*	2.9%	-8.8 pp	2.9%	–	–	0.02	78.3x	1%	–	17.70	5 (-3)
185	Congo, Rep.	4.3%	-3.7 pp	92.5%	0.0%	0.0 pp	–	–	39%	0.56	17.65	5 (-4)
186	American Samoa*	3.0%	-12.2 pp	39.7%	–	–	–	–	-4%	–	17.44	5 (-1)
187	St. Kitts and Nevis	0.8%	0.1 pp	0.8%	0.0%	0.0 pp	–	–	18%	0.75	17.13	5 (-1)
188	Singapore	1.8%	-0.5 pp	20.3%	0.0%	0.0 pp	-	–	32%	0.90	16.73	5 (-2)
189	Costa Rica	1.2%	-0.3 pp	1.2%	0.0%	-0.1 pp	–	–	22%	0.76	14.75	5 (0)
190	Equatorial Guinea	0.1%	0.1 pp	95.1%	0.0%	0.0 pp	–	–	42%	0.56	14.64	5 (-1)
191	Guinea-Bissau	0.5%	-0.1 pp	3.1%	0.0%	0.0 pp	–	–	31%	0.40	14.11	5 (-1)
192	Belize	0.8%	-0.4 pp	21.9%	0.0%	0.0 pp	–	–3	6%	0.73	13.75	5 (0)
193	Tuvalu	0.0%	0.0 pp	0.1%	0.0%	0.0 pp	–	–	5%	–	12.63	5 (-1)
194	Micronesia, Fed. Sts.	0.8%	-0.6 pp	0.9%	0.0%	0.0 pp	–	–	-4%	0.63	12.58	5 (0)
195	Chad	0.1%	-0.1 pp	93.8%	0.0%	0.0 pp	–	–	50%	0.37	12.29	5 (0)
196	Brunei Darussalam	0.3%	-0.3 pp	96.4%	0.0%	0.0 pp	–	–	24%	0.85	11.43	5 (0)
197	Andorra	0.4%	-1.9 pp	0.4%	–	–	–	–	20%	0.83	11.31	5 (0)
198	Kiribati	0.1%	-0.6 pp	0.1%	0.0%	0.0 pp	–	–	22%	0.61	9.93	5 (0)
199	Timor-Leste	0.1%	-0.7 pp	97.2%	0.0%	0.0 pp	–	–	35%	0.62	9.59	5 (0)
200	Marshall Islands	0.1%	-1.1 pp	2.7%	0.0%	0.0 pp	–	–	1%	–	7.57	5 (-1)
201	Somalia	0.1%	-30.8 pp	0.1%	–	–	0.00	3,747.5x	38%	–	0.75	5 (-4)
202	Channel Islands*	–	–	–	–	–	–	–	8%	–	–	5 (0)
203	Curacao*	–	–	–	–	–	–	–	14%	–	–	5 (0)
204	Isle of Man*	–	–	–	–	–	–	–	11%	–	–	5 (0)
205	Kosovo*	–	–	–	0.0%	0.0 pp	–	–	6%	–	–	5 (0)
206	Liechtenstein	–	–	–	–	–	–	–	11%	0.89	–	5 (0)
207	Monaco	–	–	–	–	–	–	–	17%	–	–	5 (0)
208	Puerto Rico*	–	–	–	0.0%	0.0 pp	0.00	–	-4%	–	–	5 (0)
209	San Marino	–	–	–	–	–	–	–	16%	–	–	5 (0)
210	Sint Maarten (Dutch part)*	–	–	–	–	–	–	–	28%	–	–	5 (0)
211	South Sudan	–	–	–	0.0%	0.0 pp	–	–	63%	–	–	5 (0)
212	St. Martin (French part)*	–	–	–	–	–	–	–	9%	–	–	5 (-2)
213	Virgin Islands (U.S.)*	–	–	–	–	–	–	–	-3%	–	–	5 (0)
214	West Bank and Gaza*	–	–	–	0.0%	0.0 pp	–	–	38%	0.69	–	5 (0)

Mining and development 5

SECTION 5

Mining and development

The relationship between commercial mining and the economic and social development of host countries is complex and often contentious. Global mining companies are large and influential institutions whose investments have the potential to generate significant economic benefits for regional and national economies, but also to have disruptive economic, social and environmental impacts.

Managing economic, social and environmental impacts is critical for the many low- and middle-income countries whose economies are reliant on the mining sector (see Section 3).

Indeed, good and bad practices still co-exist in the industry – sometimes within the same country. However, there is a growing tendency among mining companies to espouse the principles of sustainable development, and a gradually improving awareness of what it means – in practice – to undertake mining operations within such a framework. At its core, the concept of sustainable development means recognizing the economic, environmental as well as socio-cultural dimensions of the industry's activities, and attaching equal respect to these different dimensions.

5.1

Mining as economic catalyst

Commercial mining activities will generate a series of economic impulses that reverberate across society (see Figure 13). Some of these emanate from the spending of the mine itself and others from the spending of the tax and royalty revenues paid to government. These activities can be complemented by well-designed social investment programs implemented by the mine in partnership with local government and non-government actors.

Taken together these impulses have the potential to catalyse longer term sustainable development, through direct, indirect and induced effects. However the contributions to local economies from these channels are not automatic. They vary greatly between different country contexts and depend critically on local institutions, regulations and norms of behaviour in a particular country or community.

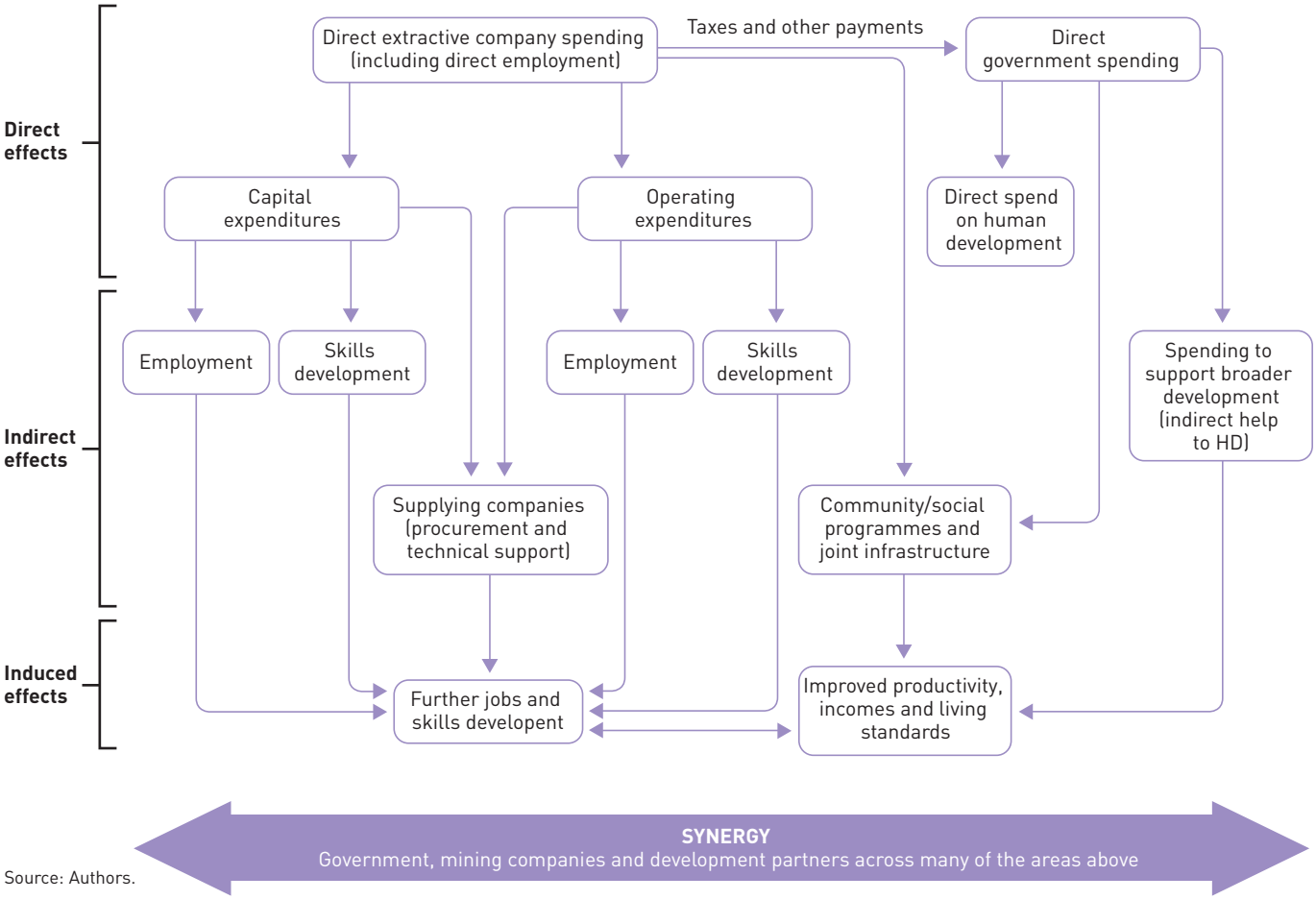
Whether or not mining can catalyse sustainable development also depends on the strength of counterparties. As we discuss in Section 5.2, the challenges are too great for a mining company to go it alone.

Table 7 illustrates how the economic activity of mining can contribute to national economies. It reveals that the channels that involve government revenue and the associated expenditures are likely to be only a small part of the total economic value created of any mining project (15–20 per cent). By contrast, the expenditures by non-government parties over the mining life cycle will invariably be three to four times higher. It follows that any assessment of mining's contribution must look beyond how the government might spend its own share of the mining revenues.[16]

Importantly, contributions through the government (taxation) channel also follow a different time profile compared to contributions coming from non-government economic impulses (eg employment and procurement – see Figure 1 which compares the profiles of the two). The government share will be very small in the early years before operations begin, and will only gradually increase once investments are recovered and corporate income tax starts to be paid. This highlights the importance of developing both the skills and capabilities necessary for local populations to participate in this economic impulse early on in the project life cycle.

16 In particular for host governments with weak fiscal positions, the transformational potential of mining activity cannot come solely from the spending of mining taxes and royalties.

Figure 13: Mining activities and development – the main channels



Source: Authors.

The overall economic, political, social and environmental context for mining varies greatly, and will jointly shape the extent to which the economic impulses from mining as shown in Table 7 are captured within the local economy rather than by foreign markets. Table 8 highlights, for each component of production value, some of the factors determining the extent of contributions from mining that are captured in the national economy.

Greater use of goods and services procured from within the local economy represent a significant opportunity. Since procurement is typically a large share (50–65 per cent) of the production value of mining, even a small increase in the share of procurement that is captured by local firms can have a big impact on the domestic economy.

Mining companies typically make conscious efforts to increase procurement from domestic sources, in order to capture the commercial benefits from having suppliers located nearby. However whilst mining companies can encourage and incentivize domestic firms (eg through training, financial support, technical training), getting domestic industry to step up to the requirements of the mining sector invariably requires broader collaborative efforts.

Mining and development

Table 7: Main components of production value[17]

Main components of production value	Examples	Typical shares of total production value
Operating expenditures	Consumables (fuel, power, tyres, reagents, water, transport); light engineering works	50–65%
Capital expenditures (investment and depreciation)	Development and construction of sites, including ports and processing plants; installation of machinery and equipment	
Company salaries and wages	After-tax payment to labour providers; salary withholding taxes	10–20%
Company community spending	Projects in health, education and income generation (in addition to essential mitigation and compensation matters)	0.5–1%
Taxes and other payments to government	Royalties; corporation tax; variable profits taxes	15–20%
Financing costs	Interest payments on short- and long-term loans	15–20%
Profit for shareholders	Dividends to shareholders (includes both private and government investors); share buy-backs; retained earnings	

Table 8: Factors determining the extent to which contributions are captured in the national economy

Main components of production value	Key factors determining contributions to national economy
Operating expenditures	Availability of local supply capacity; infrastructure; enabling business environment; industrial policy
Capital expenditures (investment and depreciation)	Sophistication of host country industrial base
Company salaries and wages	Local educational attainment; availability of suitable skills; education policy
Company community spending	Strength and ability of development partners (NGOs, local governments) to implement projects
Taxes and other payments to government	Fiscal regime and revenue sharing; strength and transparency of public sector financial management
Financing costs	Transparency, liquidity and strength of domestic financial sector
Profit for shareholders	Degree of national ownership of mining sector (direct or through government shareholdings)

"SINCE PROCUREMENT IS TYPICALLY A LARGE SHARE (50–65 PER CENT) OF THE PRODUCTION VALUE OF MINING, EVEN A SMALL INCREASE IN THE SHARE OF THIS THAT IS CAPTURED BY LOCAL FIRMS CAN HAVE A BIG IMPACT ON THE DOMESTIC ECONOMY"

17 The broad orders of magnitudes shown here have been identified from case study examples by Östensson (2014). Although the exact shares vary from one project to another, the degree of variation is considerably smaller than might be expected. Shares at the vast majority of medium to larger scale mines would fit into the ranges shown in the table in spite of some obvious differences in the technologies employed. For example, mines producing low value bulk minerals, where a large portion of the cost is transport (eg most iron ore mines), would tend to have a higher share for suppliers and a correspondingly lower share for employees, while at a medium size underground lead or zinc mine, the share of employees would be expected to be at the higher end of the range.

Such efforts can involve many players including the government, international development partners and business associations in order to deliver improvements in the enabling environment for business, the investment climate, as well as adequate transport infrastructure and access to inputs (eg energy). Supporting and strengthening domestic industry in this way has the added benefit of reducing risks of Dutch disease by facilitating a more effective supply response to the demand for goods and services generated by mining.

The potential benefits are broader yet when one considers the scope for induced impacts and linkages. As Table 7 shows, wages and salaries typically represent 10–20 per cent of production value, and where these are spent on local goods and services they will raise incomes for a variety of local productive and service activities. Similarly, linkages emerge where skills developed by firms supplying the mines are subsequently used in other sectors of the economy (eg civil engineers, technicians, electricians). Moreover there is potential for downstream linkages where the outputs of the mining sector can be used as inputs into other sectors – for example in the area of industrial minerals where potash and phosphate rocks are used as fertilizers in the agricultural sector.

The final important part of the story as represented in Figure 13 relates to the potential synergy between the respective activities of government and mining companies. Maximizing contribution from both the government and non-government shares of total production values requires effective government policy making and implementation, as well as working in partnership across government, industry and development partners.

All the commercial and social development activities associated with a project are likely to involve some intersection with various government policy areas. For example, the local infrastructure investments of a mining company should be aligned with government's regional development activities. Similarly, corporate training programs could contribute to the government's own objectives and actions in relation to skills development. Country case studies carried out over the past few years provide many examples of cases where the incentives faced by extractives companies have been aligned with those of government institutions (ICMM 2010, Mondoloka 2013).[18]

As argued in this report, the potential contributions as well as challenges in managing the mining sector are multi-faceted and context specific. This means that top-down application of off-the-shelf good practices are unlikely, on their own, to yield the desired results. Rather, engagement to maximize the catalytic role of mining in development is necessary. Governments and companies need to look for areas of common interest and concern, and work jointly on addressing these.

5.2

Mining and poverty reduction

Mining companies are inherently connected to the problems of poverty and hardship in their host countries. As noted in Section 2, mining projects are increasingly located in remote regions, many of which feature high levels of poverty and inadequate housing, employment, education, healthcare and security. At the same time, host governments often lack the resources and administrative capacity to address such problems fully.

Cooney (2014) argues that mining companies operating in such contexts have a choice. Either they insulate their projects from the realities of the local social and economic conditions by functioning as enclaves, or they seek to integrate their projects within the local economy and make efforts to improve the quality of life for local populations. Over the past two decades, responsible mining companies have increasingly chosen the latter route: making efforts to integrate better and using their capacities to improve the lives of the local population. This has been a key feature of the approach to sustainable development adopted by ICMM members and others. It means recognizing the various economic impulses from mining, managing these in partnership with local populations and ensuring that impacts are measured and lessons learned.

The challenges in maximizing contributions to poverty reduction vary across country contexts. Yet some common challenges appear to apply to most large-scale mining companies in low- and middle-income countries.

18 Six of the thirty profiles in ICMM (2010) are explicitly related to mining and poverty reduction; four are related to mining and regional development and a further six are related to mining and social investment.

First, the needs in local communities are enormous, and even larger mining companies cannot be expected to address the totality of the local problems of poverty and deprivation. As a result mines will often embark on targeted social interventions that inevitably benefit some community members more than others. Similarly, the (often large) induced benefits generated from the spending of mine workers' salaries are more likely to be captured by already relatively well-off individuals that are able to capitalize on this economic stimuli (OPM 2011). Importantly, even if incomes rise across the board, if they rise faster among the already well-to-do, the resulting inequality and increased perception of relative poverty may spur resentment and unrest in mining communities.

Mining companies are increasingly recognizing this and designing social investment programs to reduce both poverty levels and local inequalities. In Lao PDR, for example, household incomes in communities around the MMG Sepon mine are heavily dependent on the mine and the area is characterized by large income inequalities. In 2007 the company initiated an opportunity and equality policy, with the aim of distributing jobs widely and with a preference to disadvantaged villages. The policy has had some successes in decreasing pre-mine inequalities (see Box 5).

Box 5
The impact of the MMG Sepon mine on community inequality

Every two years MMG Sepon in Lao PDR conducts a household survey of 34 villages (total population 8,500) around the mine. The survey gathers quantitative information concerning population growth, food sources, household possessions and income, as well as qualitative opinions relating to change in the area and the operations of the mine. Average annual per capita incomes in the villages have increased considerably since 2001; overall, they have grown from US$64 in 2001 to US$436 in 2009/10. These increases have been achieved in the context of a rapidly growing population – the number of inhabitants in the immediately affected communities has risen from around 1,100 in 2001 to 2,200 in 2009/10.

When the mine arrived, there were high inequalities between and within villages. Over time these inequalities have declined. Looking across villages, the Gini coefficient in 2001 was 27 (meaning that 27 per cent of the total income would need to be redistributed to attain perfect equality across villages). By 2009/2010 it had fallen to 12.

Looking within villages, in every case the Gini coefficient has fallen from 2001-2009/2010 (on average from 50 to 34). However, although the fall in the Gini coefficient is significant, some inequality within the villages persists, much of which can be traced to family structures – elderly couples and young couples with multiple infant children are not likely to have benefited from the mine as much as families with adults of working age.

Source: ICMM (2011).

A second challenge is that, through a combination of limited resources and a lack of understanding of local dynamics, mining companies need to rely heavily on the support and guidance of government, NGOs and other development partners. This crucial message is fully apparent in the good practice guidelines of international organizations and in the numerous examples found in the growing body of country case studies of mining companies supporting or even leading poverty-related initiatives.[19] ICMM's own case study work has found that in some countries (for example Chile, Ghana and Brazil), mining areas have enjoyed stronger poverty reduction and social development performance than non-mining areas.

In other countries (including Peru and Tanzania) the evidence is more ambiguous. There is no suggestion here that mining companies have truly found the solution to addressing the poverty of their local populations. But there is clear evidence of both an expanding commitment in this area and of cases where particular initiatives have provided a significant contribution to the solution.

19 The IFC is a leading player in this regard. In 2012, the IFC initiated a multi-year Poverty Action Plan which includes a review of the role of the private sector in poverty reduction, a gap in the current IFC Environmental and Social Performance Standards. This Poverty Action Plan is likely to lead to an updating of the existing IFC Performance Standards to include an explicit treatment of poverty alleviation.

Reviewers' comments

6

SECTION 6

Reviewers' comments

The joint authors of this report – ICMM, OPM and RMG – recognize that this work on the role of mining in national economies is only part of the answer to understanding and articulating the contribution of mining to national economies.

To help us produce a more comprehensive study in future years, we asked a panel of experts to review the report focussing on three questions:

1) what works well?
2) why is this compilation is useful?
3) what are the limitations and how could these be addressed?

Their responses are provided below.

Terry Heymann

World Gold Council

This report provides a welcome contribution to furthering the understanding of the contribution that mining can play in national economic development. As the report clearly demonstrates, mining can play an important role across a number of dimensions supporting economic development at both a national and local level.

It is clear that mining is increasingly being recognized as a key lever for sustainable development. This report helps set realistic expectations as to where and how mining can contribute and the magnitude of the potential impact, both of which are critically important for policy makers in thinking holistically about how to "super-charge the mining engine". As the report notes, collaboration between mining companies, governments, local communities and other stakeholders is critical to ensure that the development potential of mining can be maximized.

As with all good research, this report helps us understand the current situation, but also helps us focus on the questions that need further attention. It is broadly appreciated that mining has an economic footprint beyond its direct impact, but further research is required to develop a methodology for measuring these indirect and induced impacts in a consistent and transparent manner. This would be extremely helpful in supporting both mining companies and governments in designing mining operations and financial regimes that support broad-based poverty reduction.

Terry Heymann joined the World Gold Council in February 2010. Managing the Gold for Development programme, Terry is responsible for the World Gold Council's work around the positive socio-economic contribution that gold and gold mining can make, particularly for developing countries. Terry led the development of the Conflict-Free Gold Standard and the All-In Costs Guidance Note, working closely with member companies. Prior to joining the World Gold Council, Terry was a Principal at Marakon Associates, a leading strategy consultancy, where he helped clients in a number of industries on strategic issues and new product development. He has a BA from the University of Cambridge and an MBA from Harvard Business School.

David Humphreys

Independent consultant

The growing number of mineral-driven economies in the world makes it more important than ever that we understand the role that mining can play promoting economic development. Many of these countries are, after all, quite poor. ICMM's work in this area serves to identify the economies which fall into the resource-driven category and provides a useful quantitative assessment of the relative importance of their mineral sectors. The inclusion of coal in this listing is an important improvement over the previous edition.

The need to provide an objective basis for the assessment makes it inevitable that the report places a heavy emphasis on macroeconomic flows, notably exports and the value of mineral output. This certainly tells us where the potential for mining to contribute to development is greatest. Unfortunately it tells us little about how effective countries are in the use of these flows. For this, one has to delve into the microeconomics of resource-driven economies – into matters of regulation, taxation, and the specific interactions of mining enterprises with the surrounding economy.

The report rightly recognizes this when it talks of the importance of "engagement to maximize the catalytic role of mining in development". One aspect of this, paradoxically, is the role that mining can play in promoting diversity; that is, using the economic heft of mining to leverage development outside the mining sector whether through the investment of tax revenues from mining, the development of multi-functional infrastructure (such as roads, ports and power stations) or the transference of skills. Sustainable development in mining may mean the use of mining rents to open new mines but it may equally mean investing in human capital (education) and in economic activities such as forestry, agriculture, aquaculture and tourism which can complement mining and provide long-term economic sustainability.

David Humphreys was formerly chief economist of Rio Tinto and of Russia's largest mining company, Norilsk Nickel. Prior to entering the mining industry, he worked in UK government service as an advisor on minerals policy. He was co-founder and first vice president of the industry federation Euromines. David has written and lectured extensively on the economics of the mining industry and has been a visiting scholar at several universities. He is currently an independent consultant and a non-executive director of Russian gold miner Petropavlovsk. He has a bachelor's degree and PhD from the University of Wales.

6

Holger Grundel

UK Department for International Development

The considerable expansion of global mineral production over the past ten to fifteen years has re-invigorated the debate about mining's contribution to national economies and development. It has raised expectations and concerns among populations and governments in resource-rich countries about who will benefit and who will lose out. New reporting tools and modern media have opened this debate to a much wider audience. However, the proliferation of data and anecdotes does not always facilitate better policy decisions.

This report helps to bring structure to the discussion with updated mining export and production data and clear depictions of how the mining sector interacts with the wider economy. Practical examples help to illustrate mining's contributions to economies with different developmental parameters. Importantly, the report highlights how the wider policy context can accelerate - or hinder – the development impact of mining.

There is exciting potential to expand and refine the MCI beyond export and production which are relatively crude proxies for how much mining is actually contributing to sustainable development. Alternative indicators measuring government revenue contributions (eg EITI) and the quality of governance in extractive industries (eg the Resource Governance Index) shine a light on other important transmission mechanisms from natural resource exploitation to poverty reduction. While most of these indicators remain limited in geographical coverage, combining them with the MCI for smaller country samples in future updates should get us closer to explaining which countries derive maximum value from their mineral resources and why.

Locating mining within countries' wider governance contexts should not only help improve public policies, but also redefine the role of mining companies, particularly in low-income, resource-rich countries, where their interactions with governments, communities and society can help shape the quality of governance as much as they are shaped by it.

Holger Grundel leads DFID's engagement with the oil, gas and mining sectors in Africa. He has previously managed mining, infrastructure, microfinance and rural development programmes for DFID in the Democratic Republic of Congo, China, Senegal and Pakistan. Prior to DFID he was involved in promoting foreign direct investment into South Africa. Holger holds business administration and international development degrees from Germany and the UK and currently lives in Scotland.

Olle Östensson

Caromb Consulting, France

This publication is a valuable and useful contribution to the scarce amount of easily accessible information about the international mining industry. All too often, public debate about the industry's role is handicapped by erroneous or incomplete information, resulting in arguments about sources and definitions rather than constructive policy discourse.

The strength of the report is that it focuses on issues that are important to governments, mining companies and the general public while not oversimplifying and while observing rigorous practices with respect to the interpretation of data. That being said, I sometimes wish for a somewhat less rigorous approach. For instance, it would be interesting to see more cross-country comparisons of the importance of mining for tax revenue and employment, even if they have to be based on estimates. For the next edition, it might be worth trying to develop estimation methods for these parameters.

Regarding employment, since the official data such as LABORSTA are so weak, ICMM could make a contribution by building estimates based on inputs from its member companies and national mining associations. Member companies surely have accurate data on their own employment and probably on that of others in the country. It should be possible to arrive at good estimates for a couple of dozen countries this way. By making an assumption that the relationship between employment and production is on average the same in similar countries, one could arrive at a global estimate since production is known. This could supplement whatever statistics are available.

One area that could use more explanation is FDI. There is often limited understanding of why and how countries attract FDI into mining. Such an explanation could mention the fact that mining, compared to most other industries, has modest requirements when it comes to the prior existence of infrastructure, skilled labour or financial services. At the same time, it is very sensitive to changes in the institutional and economic environment

Olle Östensson is an independent consultant advising governments, international organizations and industry on mineral sector policies. Until 2009 he worked in different management positions in the United Nations Conference on Trade and Development (UNCTAD). In this role he led research projects and co-ordinated major UNCTAD policy reports. He has worked on commodity market analysis and on projects concerning the economic impact of mining in a large number of countries. He writes on subjects related to mining including mining taxation, employment and industrial development, and he teaches a course in commodity trading at the University of Geneva.

SECTION 6

Reviewers' comments

Antonio Pedro

UNECA

The focus of most of the existing indices on the extractives industry - such as the Resource Governance Index of the Natural Resource Governance Institute and the EITI Reports - is on the soft side of the mining industry. Such indices measure the quality of governance and the state of transparency which are very important variables because, very often, mineral resource-driven development hinges on the quality of governance and the strength of institutions.

However, as articulated in this report, the missing link has been the lack of systematic and regular documentation of the economic contribution of the mining industry to development using relevant quantitative data. Yet, this is needed to arm all interested parties with accurate information as they engage in debates on how to maximize that contribution. This evidence can also help governments and other stakeholders manage expectations which are often raised when the discovery of a major mineral deposit is announced.

Having been directly involved in leading studies of minerals clusters in South Africa, Mozambique and Tanzania, I know only too well the challenges of obtaining reliable data to accurately measure the economic contribution of mining to development. This makes the ICMM report a very good contribution to the body of knowledge on this subject matter.

The study is a well-written progressive think piece with very clear messaging, accessible language and a sober discussion of the industry. Adding new issues such as the need to internalize natural capital accounting in business processes and sustainability reporting would have enriched the study.

I am hopeful that as governments strengthen their national statistical systems, and, with other stakeholders, recognize the importance of evidence-based analysis to support policy formulation and constructive dialogue, there will be more data made available to end-users. This will certainly contribute to the production of a more comprehensive MCI.

Antonio Pedro is a mineral exploration geologist from Mozambique with over 30 years' experience of development issues at national, sub-regional, and continental levels. He joined the United Nations Economic Commission for Africa (ECA) in 2001, where is currently the Director of ECA's Sub-regional Office for Eastern Africa in Kigali, Rwanda. He led the work of the International Study Group on Africa's Mineral Regimes (ISG) and the formulation of the Africa Mining Vision which was adopted in February 2009 by the African Union. He is a member of the World Economic Forum Global Agenda Council on "The Future of Mining and Metals", Honorary Fellow in the Graduate School of Natural Resources Law, Policy and Management (CEPMLP) of the University of Dundee, and a faculty member of the Executive Training on Extractive Industries and Sustainable Development at Columbia University.

Philip Daniel and Oana Luca

Fiscal Affairs Department, IMF

This 2014 revision of ICMM's October 2012 overview of the role of mining in national economies is greatly to be welcomed. ICMM has taken an important initiative both to assemble these data and to attempt the challenging task of constructing the MCI. ICMM is well-place to add knowledge on the relevant data.

Relative to the 2012 version, the new edition commendably expands the range of topics and incorporates additional analysis. It would be valuable, in future, to develop a more explicit story about how mining helps an economy tick. This could be supported by a simple mapping of the indicators used in the MCI to macroeconomic accounts.

For further enhancing the MCI, ICMM would have strength in developing a dataset from the private sector. Project-level statistics on production, exports, payments to governments and contribution to the economy would have great value. The MCI will have greater analytical value when fiscal revenues are included—something that remains difficult at present because of the lack of clear international standards for reporting on government revenues from natural resources. Colleagues at the IMF, World Bank and the EITI are working on a project to integrate resource revenue data with standards for government finance statistics. ICMM's work on the MCI has great potential to contribute to this international effort.

This edition of ICMM's review marks an important development in our understanding of how mining can contribute; it deserves to be widely read and to create a platform for further research.

Philip Daniel is currently Advisor, Fiscal Affairs Department at the IMF. He previously served as Deputy Head, Tax Policy Division, Fiscal Affairs (FAD). Before joining FAD, Philip advised many governments on commercial negotiations and policies for extractive industries. From 2001 to 2006, Philip worked on petroleum commercial and intergovernmental negotiations for Timor-Leste. He previously held posts at the Universities of Cambridge and Sussex (UK), and at the Commonwealth Secretariat, London. Oana Luca is an Economist in the Tax Policy Division of the Fiscal Affairs Department at the IMF, where she specializes in the fiscal modeling and analysis of extractive industries, resource revenue forecasting and fiscal rules design. Oana has worked on a number of resource-rich countries, particularly in Africa. Prior to joining the IMF in 2009, she was part of the Development Economics Group at the World Bank and responsible for the regional macroeconomic outlook of East Europe and Central Asia. Oana is a graduate of the Johns Hopkins University's School of Advanced International Studies.

Next steps

7

SECTION 7

Next steps

This second edition of *The role of mining in national economies* takes an additional step towards more rigorously capturing mining's contribution in today's world.

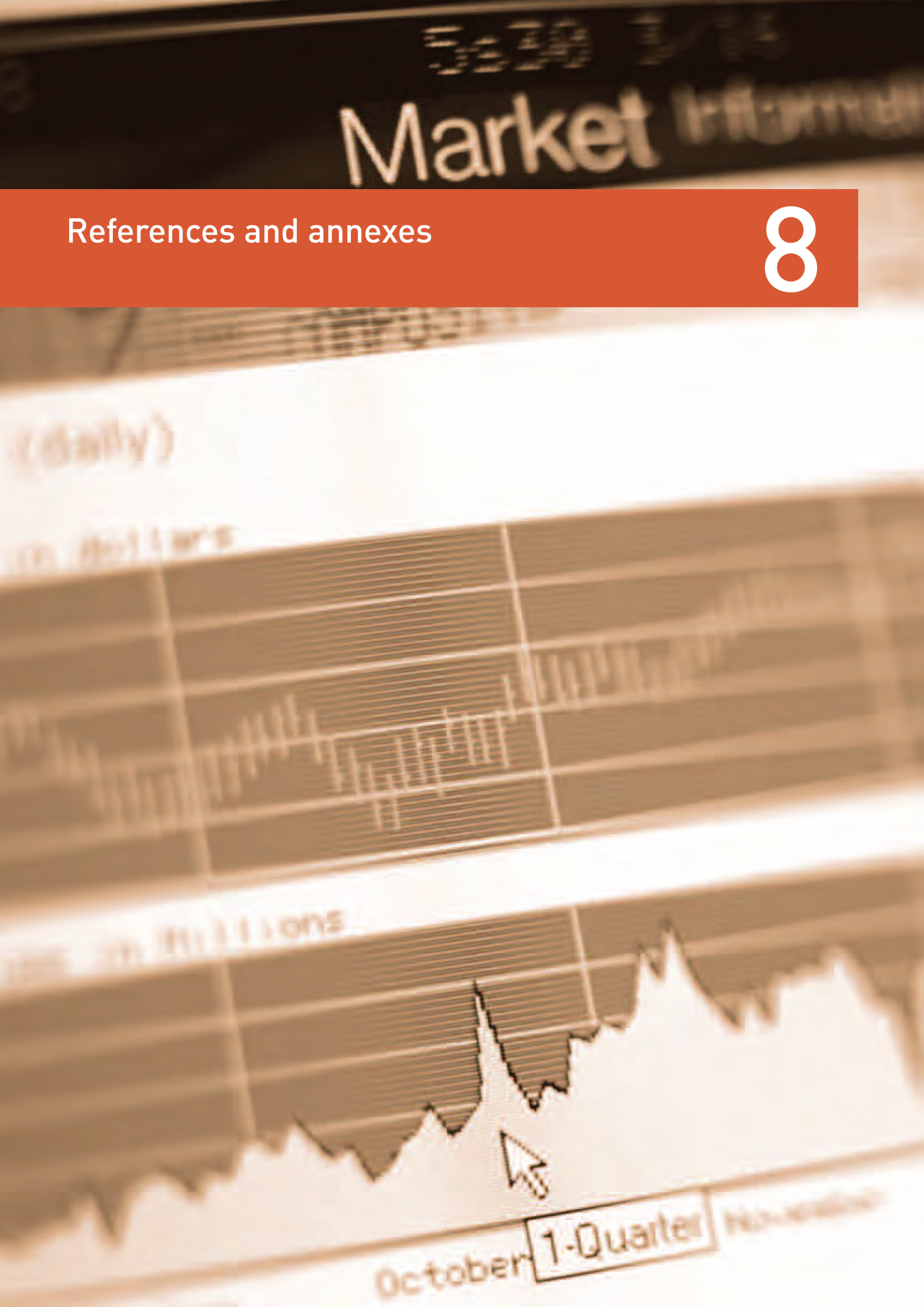
Through its generation and from the many contributors, we have learnt a great deal. At the same time, we recognize that there remains a great deal of potential for strengthening this work in future years.

Looking forward, we believe that a new version every two years would be desirable. There are many individuals and organizations across the world that could contribute. In the ideal, we would like to build a collaborative effort to bring the insights of more experts to bear on this effort. It is through such collaboration that we will not only understand mining and metals' contribution more clearly – but also it is through such collaboration that we will bring the industry contribution in line with the imperative of sustainable development.

Lastly, ICMM, OPM and RMG are very appreciative of all those who have contributed to date, especially the experts who provided peer review input and the commentary in Section 6 of the report. The richness of this work is much due to them; the limitations that remain are the responsibility of the authors.

References and annexes

8



SECTION 8

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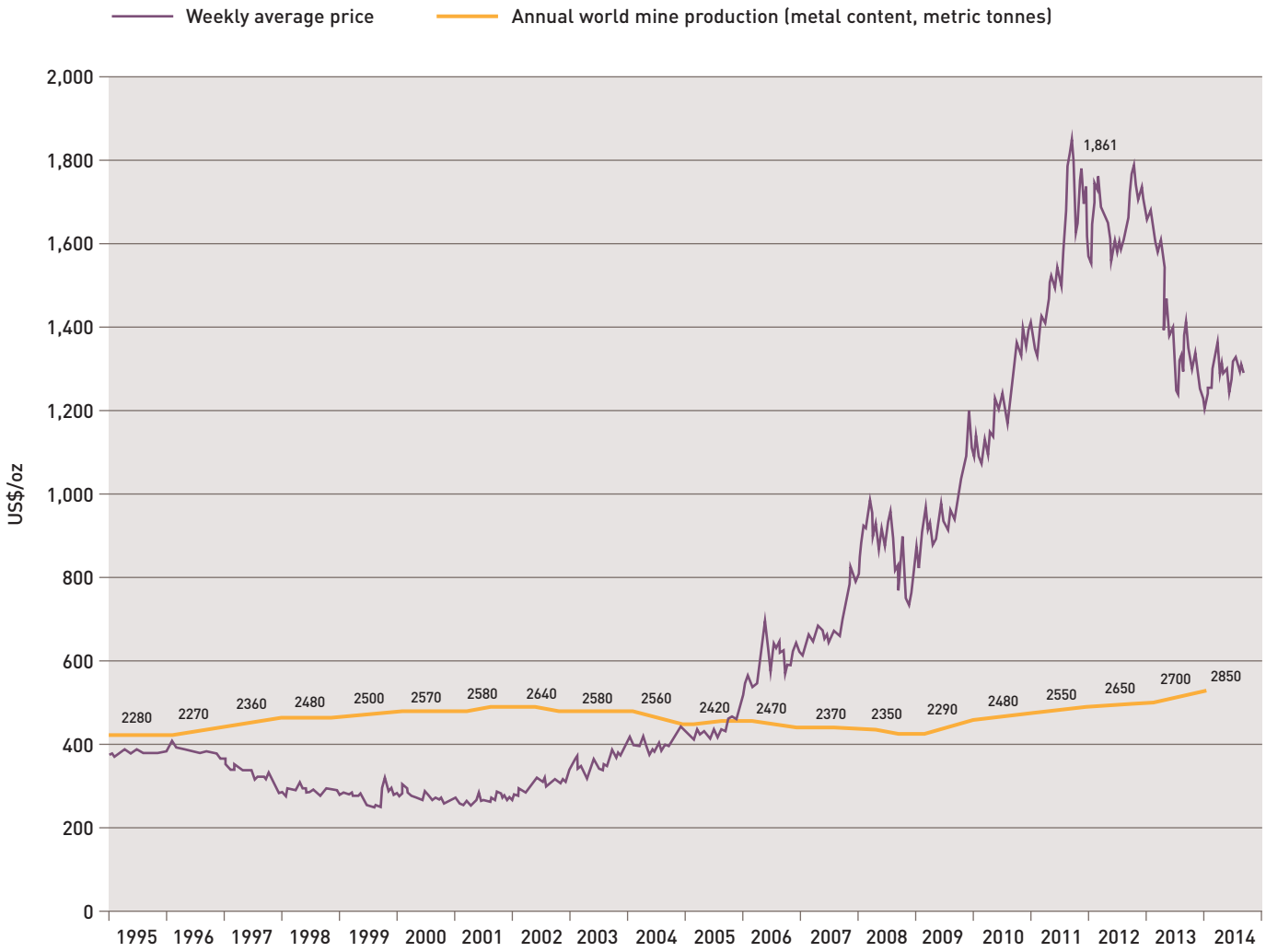
Annex A

8

Price developments in major metals

Figures 14, 15 and 16 show monthly average price graphs for gold, nickel and iron ore. In particular iron ore shows greatly increased volatility reflecting the move since 2007 towards a free market (previously prices were set in annual negotiations between sellers and buyers).

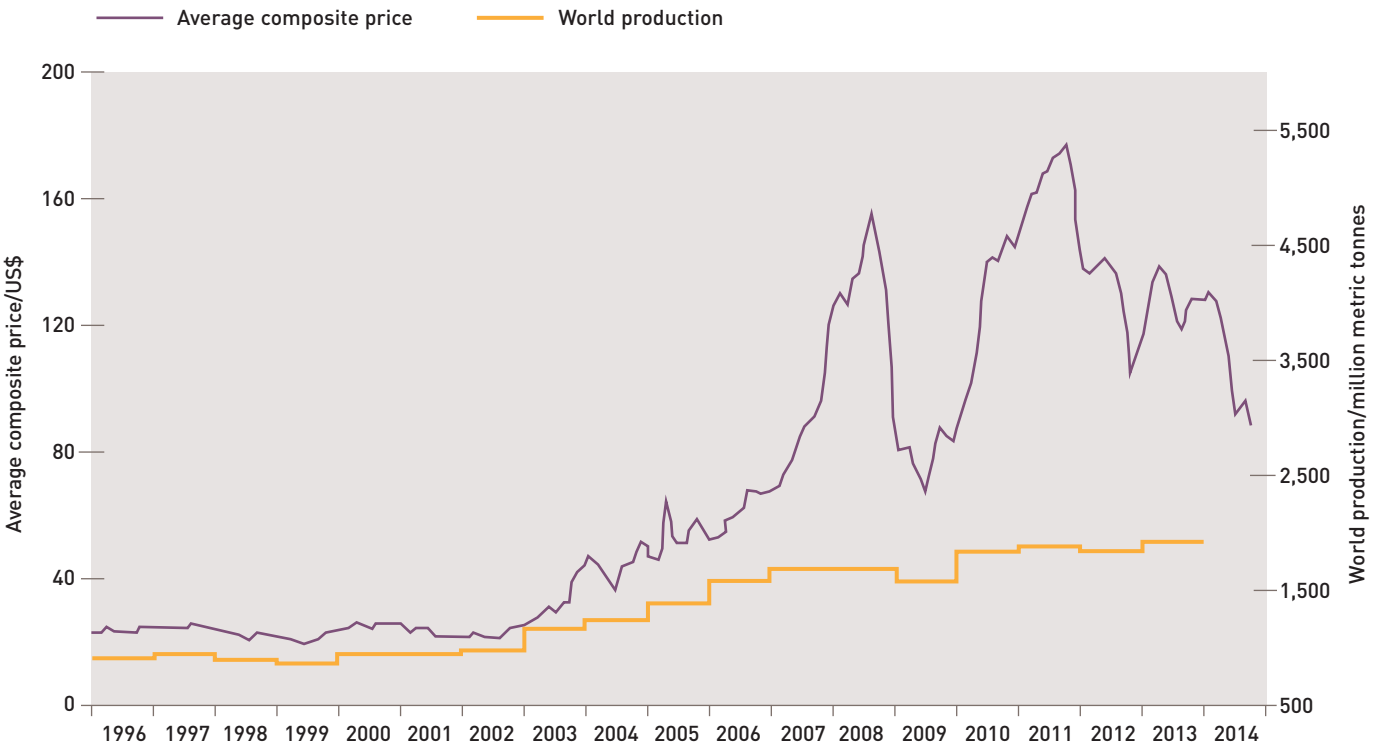
Figure 14: Gold prices and production volumes



Source: Raw Materials Data, Stockholm 2014.

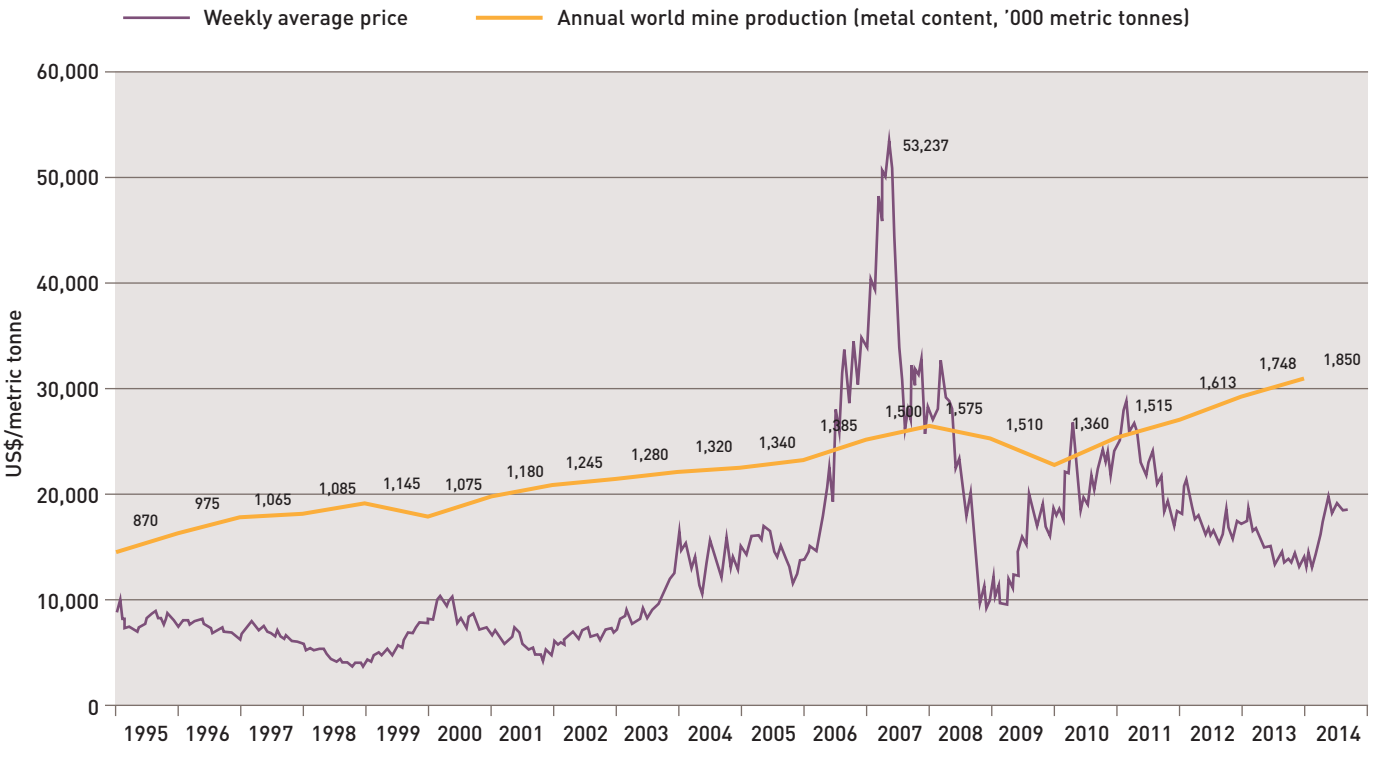
Annex A

Figure 15: **Iron ore prices and production volumes**



Source: Raw Materials Data, Stockholm 2014.

Figure 16: **Nickel prices and production volumes**



Source: Raw Materials Data, Stockholm 2014.

Annex B

8

Definitions and scope

B.1

Minerals included in production data

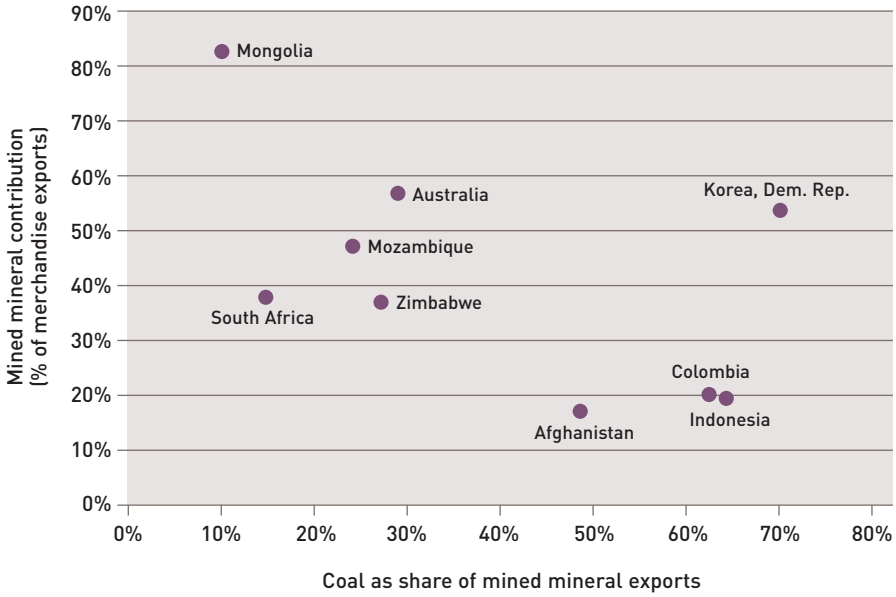
The revised MCI is based on an expanded dataset of production value, using a wider scope of minerals. Most importantly, the revised MCI includes coal[20] and industrial minerals.

The global production of coal is significant and dwarfs, in terms of production values, most other minerals. The inclusion of coal in the dataset means that large coal-producing countries are ranked more highly on the production value-based indicator in the MCI. Although coal is also included in the two export-based indicators, the inclusion of coal does not – for most countries – materially change country rankings. The reason is that coal is a bulky commodity with low value-to-volume, and is therefore normally mined close to its end markets. There are however a few countries where export contributions from mining are large, and where coal is a significant share of this export contribution (see Figure 17).

Although industrial minerals represent a small part of the total value of minerals production compared to metals (11.7 per cent in 2012), they are highly important in individual countries. In Germany industrial minerals account for over 98 per cent of the value of mine production, in Israel and Jordan 100 per cent, in Morocco 69.4 per cent and even in Canada 30.1 per cent. European countries are more important producers of industrial minerals than metals.

In addition, several other minor minerals have been added. See Table 9 for a comparison of the mineral scope in production value data.

Figure 17: Countries with large coal export sectors



Source: UNCTADstat.

Table 9: Mineral coverage of the original and revised production value dataset

Mineral	Original MCI (2010 data)	Revised MCI (2012 data)	Mineral	Original MCI (2010 data)	Revised MCI (2012 data)
Antimony	●	●	Nickel	●	●
Bauxite	●	●	Niobium	●	●
Boron		●	Palladium	●	●
Chromite	●	●	Phosphate rock		●
Coal		●	Platinum	●	●
Cobalt	●	●	Potash		●
Copper	●	●	Rhodium	●	●
Diamond		●	Salt		●
Feldspar		●	Silver	●	●
Fluorspar		●	Sulphur		●
Gold	●	●	Talc		●
Graphite		●	Tantalum	●	●
Gypsum		●	Tin	●	●
Iron ore	●	●	Titanium	●	●
Lead	●	●	Tugsten	●	●
Manganese	●	●	Vanadium	●	●
Mercury	●	●	Zinc	●	●
Mica		●	Zirconium	●	●
Molybdenum	●	●			

20 The term coal is used here to mean thermal as well as coking coal.

Annex B

B.2

Countries in production value dataset

Production value data per country was taken from the Raw Materials Data database. The list for which this data was provided (production values 2007–2012) included several countries that were not included in the original MCI list – reflecting the expanded scope of minerals above. 37 countries were added to the MCI's production value based indicator (Table 10).

Table 10: Countries in 2012 production value dataset not included in the 2010 dataset

Countries		
Afghanistan	El Salvador	Nepal
Bahamas, The	Eritrea	Netherlands
Bahrain	Iceland	Paraguay
Bangladesh	Iraq	Puerto Rico
Belarus	Jordan	Qatar
Benin	Kuwait	Slovenia
Bhutan	Latvia	Somalia
Cabo Verde	Lebanon	Switzerland
Congo, Rep.	Lesotho	Syrian Arab Republic
Croatia	Libya	Turkmenistan
Czech Republic	Lithuania	United Arab Emirates
Denmark	Malta	Yemen, Rep.
	Moldova	

B.3

Countries used in the revised MCI

Like the original MCI, the revised MCI uses the country names from the World Development Indicators (WDI), the World Bank's primary collection of development indicators compiled from officially-recognized international sources. In the dataset used for the revised MCI the list of countries has changed, with two deletions (Gibraltar, Mayotte) and four additions (Curacao, St Martin (Dutch part), St Martin (French part), South Sudan), bringing the number of countries from 212 to 214.

The WDI database includes a more complete range of countries and territories than the list of UN members (193 countries).

B.4

Minerals included in export data

The revised MCI uses export data from UNCTAD, including the same export categories as in the 2012 report, with one exception: the inclusion of coal (see Table 11).

For a full list of export sub-categories covered by the above, see Annex C.

Table 11: Export categories used to calculate the MCI

Export categories	MCI 2012	MCI 2014
SITC 27 Crude fertilizers, other than those of SITC 56, and crude minerals	•	•
SITC 28 Metalliferous ores and metal scrap	•	•
SITC 68 Non-ferrous metals	•	•
SITC 667 Pearls, precious and semi-precious stones	•	•
SITC 971 Gold, non-monetary	•	•
SITC 321 Coal		•
SITC 325 Coke		•

Annex C

Detailed export categories used in calculating the MCI

The following detailed export categories were included in the definition of mineral and metal exports used in the MCI:

SITC 27
Crude fertilizers, other than those of SITC 56, and crude minerals

- SITC 272: Crude fertilizers
- SITC 273: Stone, sand and gravel
- SITC 274: Sulphur and unroasted iron pyrites
- SITC 277: Natural abrasives not elsewhere specified (including industrial diamonds)
- SITC 278: Other crude minerals

SITC 28
Metalliferous ores and metal scrap

- SITC 281: Iron ore and concentrates
- SITC 282: Ferrous waste, scrap, remelting iron/steel ingots
- SITC 283: Copper ores and concentrates, copper mattes, cement
- SITC 284: Nickel ores and concentrates, nickel mattes
- SITC 285: Aluminium ores and concentrates (incl. alumina)
- SITC 286: Ores and concentrates of uranium or thorium
- SITC 287: Ores and concentrates of base metals (not elsewhere specified)
- SITC 288: Non-ferrous base metal waste and scrap (not elsewhere specified)
- SITC 289: Ores and concentrates of precious metals

SITC 667
Pearls, precious and semi-precious stones

SITC 68
Non-ferrous metals

- SITC 681: Silver, platinum, other metals of the platinum group
- SITC 682: Copper
- SITC 683: Nickel
- SITC 684: Aluminium
- SITC 685: Lead
- SITC 686: Zinc
- SITC 687: Tin
- SITC 689: Miscellaneous non-ferrous base metals

SITC 971
Gold, non-monetary

SITC 321
Coal

SITC 325
Coke

Further information

Acknowledgements

This publication was developed by Dan Haglund and Alan Roe (OPM), Magnus Ericsson (SNL/RMG) and Anthony Hodge (ICMM). OPM compiled the macroeconomic data sets and undertook the synthesis and analysis and SNL/RMG provided the production value and cost data as well as commodity price analysis.

Philip Daniel and Oana Luca (International Monetary Fund), Holger Grundel (UK Department for International Development), Terry Heymann (World Gold Council), David Humphreys (Independent consultant), Olle Östensson (Caromb Consulting, France) and Antonio Pedro (UNECA) served as expert external reviewers.

It was edited by Ben Peachey and designed by Duo Design. Thanks should also go to the team that worked on the 2012 edition of this report including Gemma James (ICMM) and Hugh Leggatt.

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Publication details

Published by the International Council on Mining and Metals (ICMM), London, UK.

ISBN: 978-1-909434-11-0

Available from: ICMM, www.icmm.com, info@icmm.com

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The International Council on Mining and Metals (ICMM) was established in 2001 to improve sustainable development performance in the mining and metals industry. Today, it brings together many of the world's largest mining and metals companies as well as national and regional mining associations and global commodity associations. Our vision is one of leading companies working together and with others to strengthen the contribution of mining, minerals and metals to sustainable development.

Oxford Policy Management

Oxford Policy Management (OPM) began as a research group within Oxford University. Since 1996 it has been an independent research-based development consultancy. It has over 30 years' experience in providing analysis, policy advice, management and training services to national governments, international aid agencies and other organizations in over 90 countries. Rapid growth has taken its full-time staff complement to over 190 with a further 40 UK and international associates. Although firmly based in Oxford, UK, OPM operates country offices in South Africa, Tanzania, Nigeria, Indonesia, Bangladesh, Nepal, India and Pakistan. In-depth analytical work on extractive industries has been one of OPM's core strengths for over ten years.

Raw Materials Group

Since the start of this project Raw Materials Group (RMG) has been acquired by SNL Financial and is now part of SNL Metals & Mining. SNL Metals & Mining integrates the three largest global mineral sector databases – Raw Materials Data, IntierraLive and the former Metals Economic Group (MEG) Database – with in-depth coverage of exploration and mining activity in all countries of the world. Since early 2014 SNL Metals and Mining's consultancy unit includes RMG. The unit has over three decades of experience in the resource sector, working with the mining industry, governments, international financial institutions and other stakeholders, providing a data driven, holistic assessment of global and national mineral markets and policies. There are offices in Stockholm, London and Halifax (Canada).

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