

# Setting the Stage: Global context for mining and extractive industries

## Richard Schodde

Adjunct Professor at University of Western Australia  
and Associate Consultant at CRU Strategies

**Keynote Paper for the First International Mining Conference,  
Phnom Penh, Cambodia, May 26, 2010**

### Executive Summary

The following paper reviews the financial performance of the world's mineral industry over the last 30 years. Based on a detailed analysis of 303 major mining companies (that represent 70% of world production by revenue and 80% by profits) CRU estimates that in 2009 the minerals industry generated \$800 billion in sales, \$100 billion in profits and paid \$75 billion in direct taxes (excluding royalties and import duties).

A key characteristic of the mineral industry is that its returns are very volatile, with changes of +/-30% not uncommon – driven by fluctuations in commodity prices. Another characteristic is that the industry is very capital-intensive and spends most of its profits on growing the business.

The analysis found that during the period 1980-2000 the industry generated an average return on capital no better than investing in US Government Bonds. This situation has improved in the last five years, due to the rising prices caused by strong demand from China (which accounted for 70 to 90% of all growth in world demand for commodities).

Although the Global Financial Crisis significantly affected the minerals industry, CRU forecasts that demand will recover to pre-crisis levels by 2013. Those commodities that will perform the best include iron ore, coking coal, copper and nickel.

In order for Cambodia to maximise the benefits of mining it first needs to attract foreign companies to explore – as it is only through exploration that new mines are found. To make the country attractive the Government needs to have competitive investment rules and demonstrate that Cambodia is a safe and low risk country to operate in. To earn the right to mine, companies need to demonstrate good environmental and social responsibilities.

## Background

The purpose of the First International Mining Conference in Cambodia is to provide an effective forum for participating countries, companies and mining stakeholders to share practical experiences and international best practices for the successful development of the mining sector for sustainable socio-economic development. The aim is to enable Cambodia to better prepare to manage the anticipated growth in its nascent mining exploration and development sector.

The first step involves developing a good understanding of the overall scale of the international mining industry, both terms of its size and profitability. The following paper analyses the revenues, costs, profits, taxes and capital expenditures of the industry over the last 30 years. From this several key characteristics of the industry are identified. The paper also looks at the rising importance of China and other developing countries in driving future demand for minerals. It includes an assessment of which commodities will perform best over the next few years. The paper concludes with some brief recommendations on how Cambodia can best benefit from developing a mining industry.

Note: Unless otherwise specified all costs and prices referred to in this paper are in constant 2010 US dollars (ie the data has been adjusted for inflation).

## Size and profitability of the minerals industry

This section discusses the revenues and profitability of 303 resource companies from 1980 to 2009. These companies collectively represent around 90% of all mineral production (as measured in terms of sales revenues) in the western world or approximately 70% of global mineral production. These figures rise to 95% and 80% respectively when measured in terms of industry profits. The data came from CRU's MICA database (see box for more information).

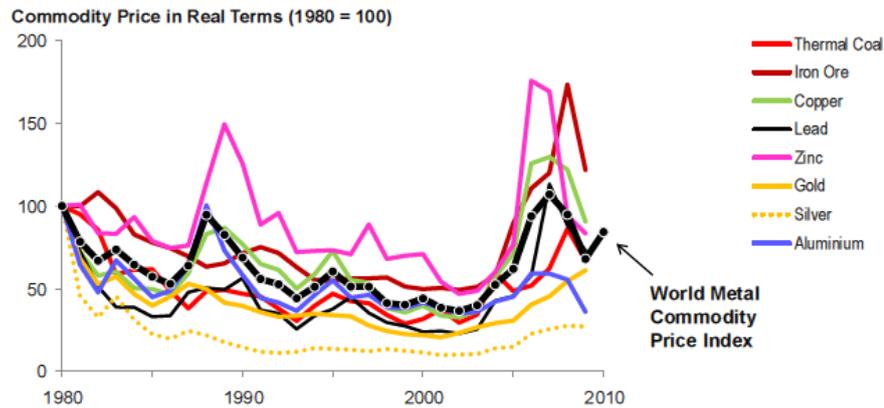
This was broken down into the following six industry sectors.

1. Base Metals (which includes copper, lead, zinc, nickel, aluminium and tin producers)
2. Precious metals (which includes gold, silver and platinum producers)
3. Coal (both thermal and metallurgical coal producers)
4. Other (made up of diamonds, uranium and iron ore producers)
5. Diversified Companies - *these are companies that produce a wide range of commodities. Examples of such companies would be BHP Billiton and Rio Tinto*
6. Mining Finance Houses - *these are companies that own shares in other mining companies. The Mining House provides finance and management expertise to other companies in return for a management fee and a steady dividend. Such companies were popular in the 1970s, but have since been largely replaced by Diversified Companies*

These sectors cover a wide range of commodities. The following chart shows how price of these commodities has changed over time (in real terms).



### Mineral commodity prices are very volatile



Note: The World Metal Commodity Index is made up of a basket of six commodities - copper, aluminium, iron ore, tin, nickel, zinc, lead, and uranium

Data: IMF and LME

As can be seen, commodity prices are very volatile – and can vary by up to 30% from one year to the next. This is associated with changes in the supply and demand of the mineral. Notwithstanding the large year-on-year variability, the general trend over period 1980 to 2002 was a steady decline in real prices. This situation has reversed in recent years – and prices have now returned to levels similar to that achieved back in 1980. The rapid rise in prices was due to several factors including:

- A rapid and sustained increase in world metal demand – particularly from China
- Delays in building new mines – which constrained new supplies, and
- Rising costs for mining inputs (such as fuel, truck tyres, chemicals and construction materials)

#### MICA Database

The Mineral Industry Competitor Analysis (MICA) database was developed by the CRU Group over 20 years ago.

CRU's Mineral Industry Competitor Analysis (MICA) database contains detailed information on one hundred financial and economic variables for 323 major mining and resource companies that operated in the world from 1978 to present (2009).

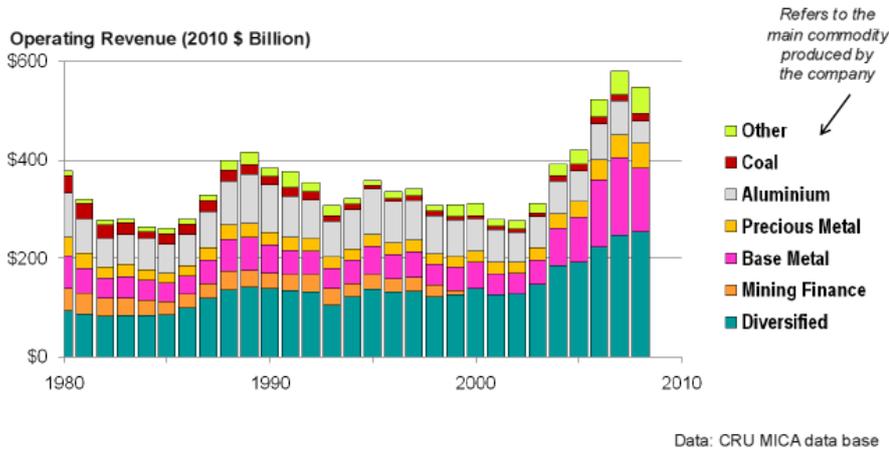
Included within the 323 companies in the MICA database is information on 20 iron & steel producers. For purpose of this study, these companies were left out of the analysis - as this sector is not viewed as being part of the mining and extractive industries.

The MICA database is routinely used by CRU to carry out detailed analysis of the relative financial performance of mining companies against their competitors and other industry sectors.

The higher commodity prices directly led to higher sales revenues for the mining industry. After adjusting for the 30% of mining companies not captured in the MICA database, CRU estimates that the world’s mining industry generated around US\$800 billion per annum in sales in 2009. Most of these sales are associated with diversified companies – such as BHP Billiton, Rio Tinto, Vale and Anglo American.



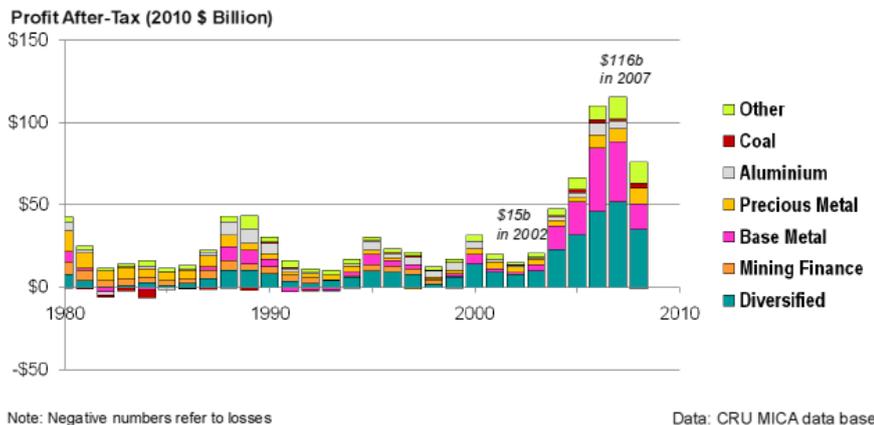
**This has led to higher sales revenues for mining companies**



Given the strong rise in revenues, it is not surprising that profits have also increased. After adjusting for companies not captured in the MICA database, CRU estimates that the global mining industry made around US\$145 billion in profits after tax in 2007. Due to the Global Financial Crisis (GFC), industry profits fell by ~35% in 2008 and are now around \$100 billion.



**And significantly higher profits ...**



## Taxes paid

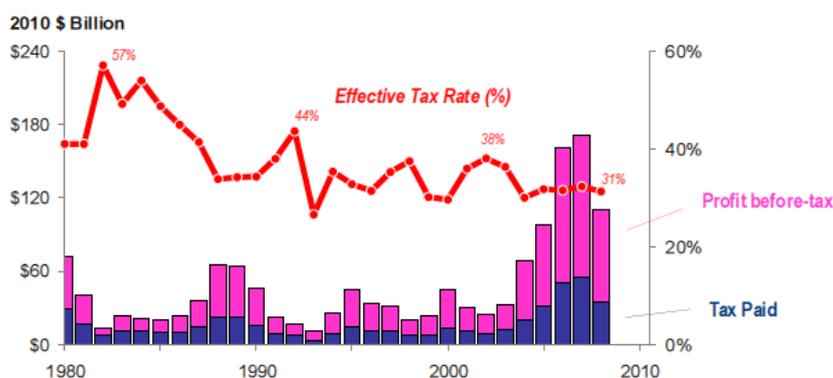
The higher profits have resulted in mining companies paying more taxes. After adjusting for companies not captured in the MICA database, CRU estimates that the global mining industry paid around US\$75 billion in direct taxes in 2009.

CRU | STRATEGIES



### The higher profits have translated into higher tax revenues for Governments

... and the effective corporate tax rate is now around 31%



Data: CRU MICA data base

Caution: Taxes Paid exclude Royalties and Indirect Taxes

On a percentage basis, the effective tax rate paid by the global mining industry has dropped from a peak of 57% in 1982 to 31% in 2008. Most of the reduction occurred in the 1980s and was due to governments adjusting their corporate tax rates to be internationally competitive. This reduction applied to all industries – not just mining.

It should be noted that the taxes reported in the above chart refer only to direct taxes such as corporate tax and dividend withholding tax. It excludes indirect taxes such as import duties, royalties or land-use fees which tend to be treated by the companies as an operating expense.

From previous studies done by the author, adding back in these indirect taxes increases the overall government share of mining profits by a further 10 to 20 percentage points. The rate depends on the country and the commodity. More importantly, the percentage rate varies with the business cycle. In detail, import duties and royalties are generally levied on revenues, not profits - and so, during times of low profitability (ie during times of low commodity prices), these royalty charges will make up a larger proportion of the reported profits

Given the above, CRU estimates that the overall tax rate (as made up of direct and indirect taxes) paid by the global mining industry is currently around 40 to 45%.

On more general note, due to differences in business risk and mineral endowment between countries, there is no single “best” tax rate for the mining industry. Instead, governments need to fine-tune their tax rate to match local circumstances. In particular, countries with high business risk need to offer lower tax rates to attract industry.

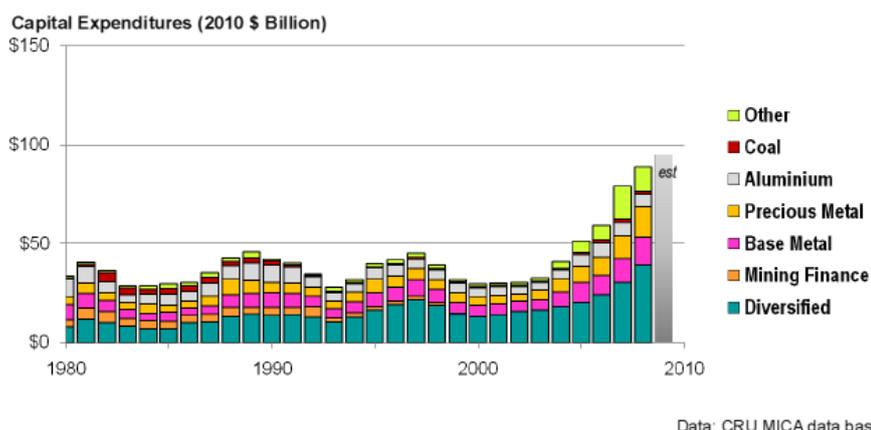
## Capital investment

A key characteristic of the mining industry is the fact that it is very capital-intensive. As a general rule, to generate an extra dollar in annual revenues the company needs to invest 3 to 6 dollars in capital.

The recent rise in commodity prices has encouraged companies to expand their operations and build new mines. This, coupled with rising input costs for steel and construction materials has led to an equally dramatic increase in capital investment by the industry.



**However, the mining industry is very capital-intensive ... requiring large amounts of investment to grow**



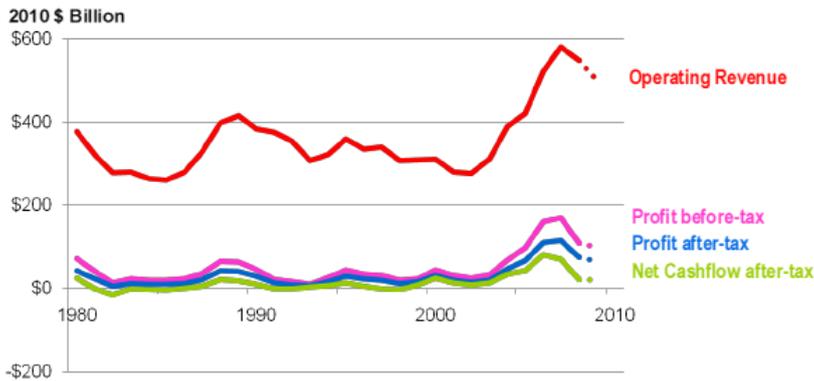
After adjusting for companies not captured in the MICA database, CRU estimates that the global mining industry is currently spending around US\$130 billion on capital programs.

## Profits and cash generated

One consequence of the high level of capital investment is that the industry doesn't generate large amounts of surplus cash – even during the so-called “boom” times. As shown in the following chart, during periods of low commodity prices, companies cut back their expenditures to conserve cash. Conversely, during periods of high commodity prices, companies actively build new projects with the aim of profiting from the higher prices. After adjusting for companies not captured in the MICA database, CRU estimates that over the last 30 years the global mining industry only generated an average of US\$17 billion (in constant 2010 dollars) per year in surplus cash.



**The end result being that the industry doesn't generate large amounts of surplus cash ...  
... even during the "boom times"**

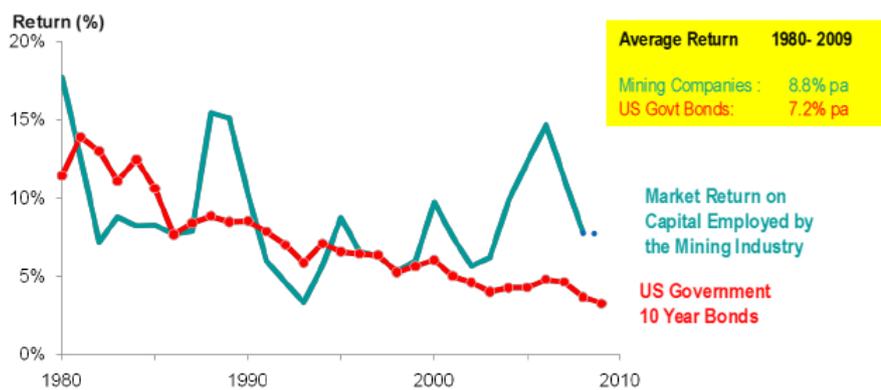


Data: CRU MICA data base

Given the high level of capital involved, the mining industry (on average) doesn't make a huge return on its investment. The following chart shows that, over the last 30 years the market return on capital employed was only 8.8%. By comparison, someone investing in US Government 10 year Treasury Bonds over the same period would have achieved a return of 7.2%. It should be noted that US Government Bonds are known to be one of the safest investments available. It is pleasing to see that industry returns have significantly improved in recent years. This was due to the large increase in commodity prices.



**In spite of the risks involved, the mining industry doesn't make a high return on its investment .... and it is only in the last 5 years that it has performed significantly better than investing in US Government Bonds !**



Data: IMF, CRU MICA data base

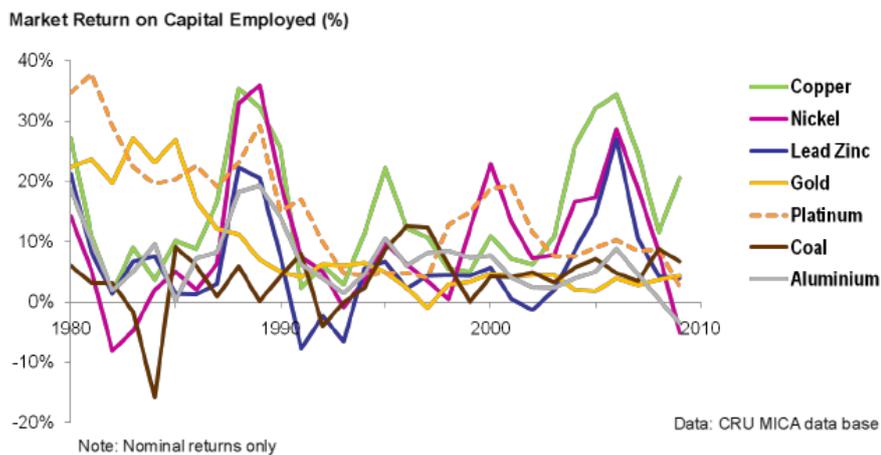
Note: Nominal returns only

It should be noted that the previous chart is based on industry averages. Individual companies achieved significantly higher or lower returns than the industry average.

As indicated below, some commodities perform better than others. In the last five years, the best performing sectors were copper, nickel and lead/zinc – though the returns on latter two have been very low in the last year.



**A key feature of mining is that the economic returns for individual commodities are extremely volatile ... and explains why “Diversified Companies” dominate the industry (they have more stable earnings)**



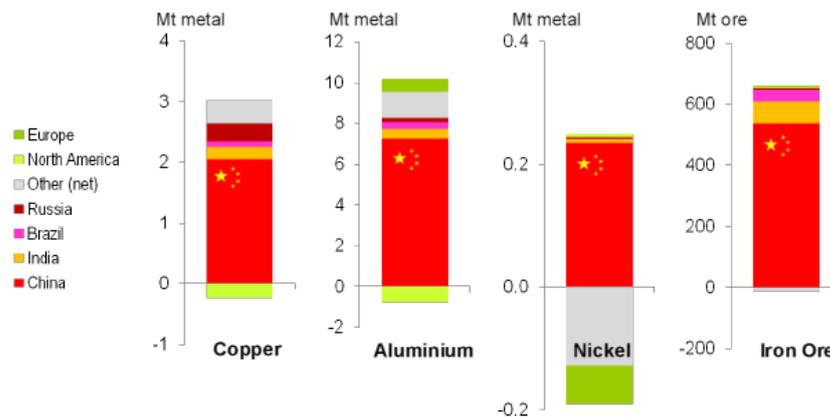
The above chart also highlights another key characteristic of the world’s minerals industry – namely that the returns are extremely variable – with massive swings in profitability from year-to-year. The metals most exposed to volatile changes in profitability are nickel, copper and lead/zinc. In contrast, earnings from gold, coal and aluminium are generally lower but more stable.

## Impact of the Global Financial Crisis and the importance of the China in future metal demand

As discussed above, there has been a significant improvement in the mining industry’s profits in recent years. This is due to strong prices for commodities - which, in turn, was driven by the rising importance of China in the world’s economy. The following chart shows that China accounted for 70 to 90% of the net increase in the world’s demand for key mineral commodities over the period 2003 to 2008.



### In the last 5 years most of the growth in the world’s metal demand came from China



Note: Charts refer to the incremental increase in metal consumption between 2003 and 2008

Data: CRU

It should be noted that while most of the minerals imported by China was used for domestic consumption, around 20-40% of the metal is ultimately re-exported in the form of manufactured goods to the rest of the world. Consequently, part of China’s demand for minerals is impacted by changes in economic conditions in other countries.

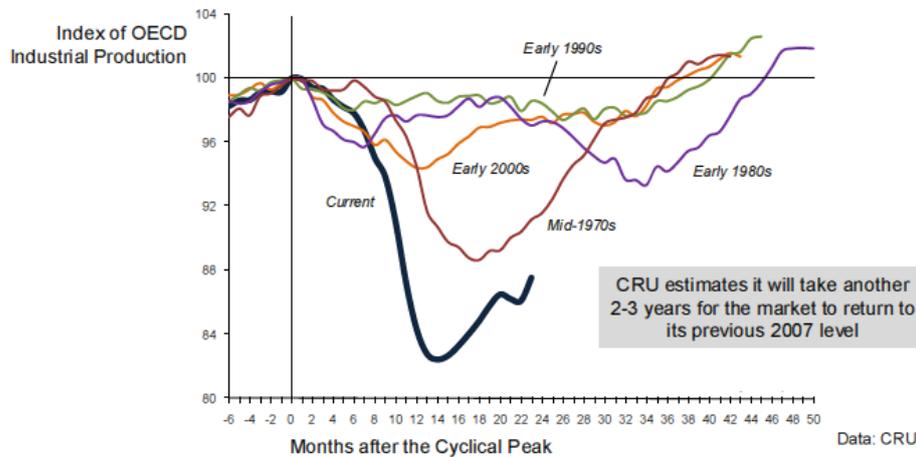
In the months immediately following the Global Financial Crisis (GFC), world demand for minerals was severely reduced. This led to a substantial decrease in commodity prices and industry profitability.

CRU’s view is that the reduction in demand is temporary and that the responses by various governments to re-start their economies through major fiscal stimulus packages will be successful. Much of this expenditure is focused on encouraging consumption on consumer goods and building new infrastructure – which requires a lot of minerals and metals.

As shown below, current indications are that the economies have bottomed-out and are now re-growing. Based on experience from previous economic recessions, CRU estimates that it will take another two to three years (ie 2012 -2013) before the world’s economy returns to its pre-GFC level. It should be noted that the path to recovery may not necessarily be smooth.



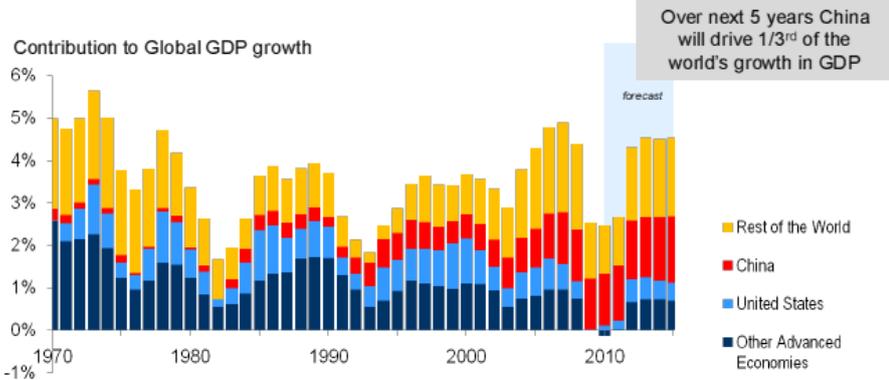
**The Global Financial Crisis compared to previous downturns**  
 ... Things got worse, but a recovery is now underway



The International Monetary Fund forecast similar trends in the world’s economy - with the global GDP returning to its historic trend growth rate of 4.5% pa by 2013 onwards (see chart on following page). The IMF estimates that three-quarters of this will come from China and the rest of the world (principally other developing countries).



### China and the other developing countries have now become the engine of the world's economy



Note: GDP calculated in terms of Power Pricing Parity basis smoothed using a three year moving average

Data: IMF April 2010

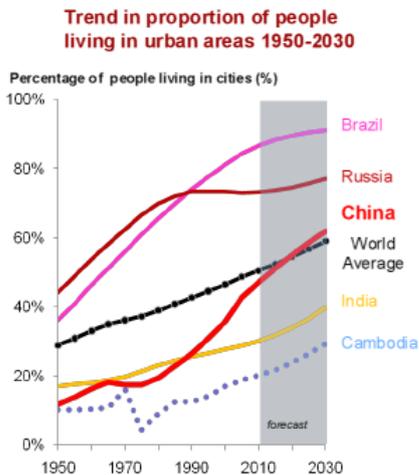
The above chart also highlights the rising importance of China and other developing countries on the world's economy over the last two decades.

A key driver behind the rise in importance of the developing countries has been the ongoing movement of people from the countryside to the cities. They are attracted by better job prospects. The resulting higher wages from these jobs drives demand for better housing and services – thereby stimulating the economy. In turn, the increased housing and infrastructure requirements drives increased demand for metals and minerals.

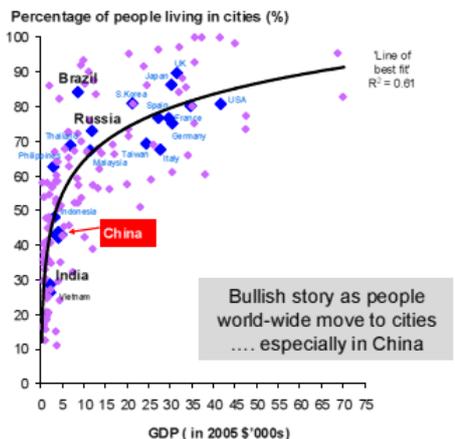
As shown below, this trend to urbanisation will continue to grow over the next two decades – particularly in China.



### Impact of urbanisation on GDP



Proportion of population that is urban versus GDP/capita at PPP exchange rates in 2005

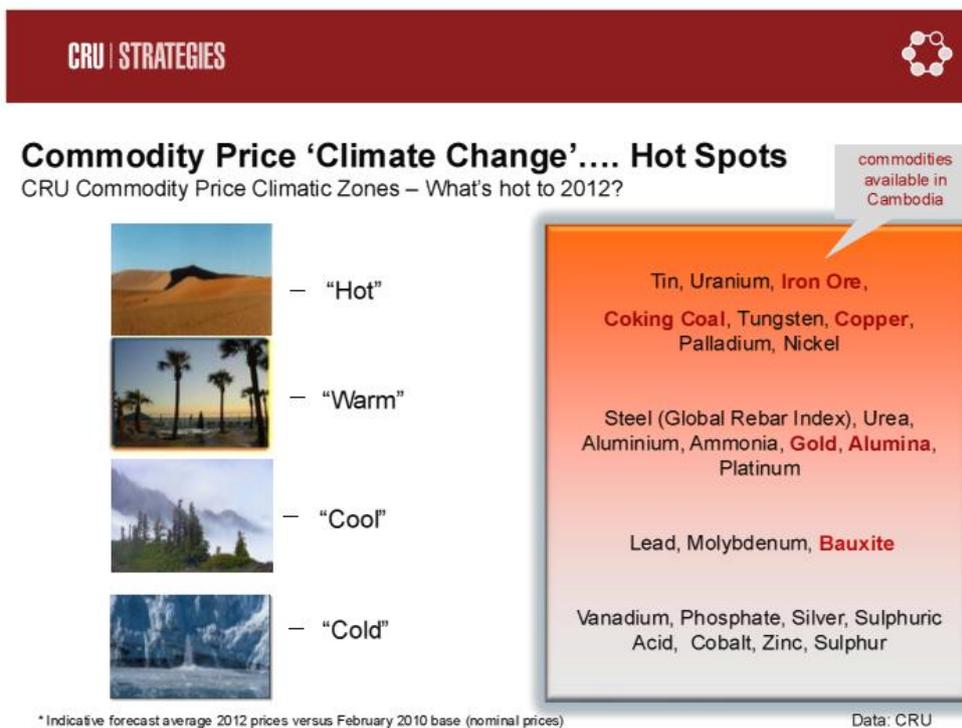


Data: NBS, Japan Statistics Bureau, UN, ICP, Taiwan National Statistics, CRU

## Which metals will perform well in the future?

CRU’s view is that, as the world’s economy recovers over the next two to three years, commodity prices will also rise – though some minerals will perform better than others.

The following chart summarises CRU’s view on the future strength in demand (and prices) for the various minerals of major commercial importance.



Of relevance to Cambodia, CRU believes that the demand for iron ore, copper and coking coal will be very strong over the medium term. The main customer for this will be China.

There will also be reasonably strong demand for alumina and gold.

Although not covered in the above chart, CRU acknowledges that there is currently very strong speculative interest in the so-called “strategic” minerals like Lithium and Rare Earth Elements (REE). These minerals typically only sourced from a handful of countries and are critical inputs to high technology consumer goods that are rapidly growing in demand.

### Lithium

Lithium is an essential element in the manufacture of high capacity batteries used in the next generation of electric cars (such as Toyota’s Prius hybrid petrol-electric car).

### Rare Earth Elements (REE)

REE are made up of scandium, yttrium and the various different elements that make up Lanthanide Series within the periodic table. Some of these elements are of critical importance to making certain consumer and industrial products. For example, some of them are used to produce the colours in the LCD TV screens, whereas others, such as neodymium, are used to make special magnets as used in high-performance electric motors on cars and electric generators for wind turbines. Other REEs are used in lasers for commercial and military applications.

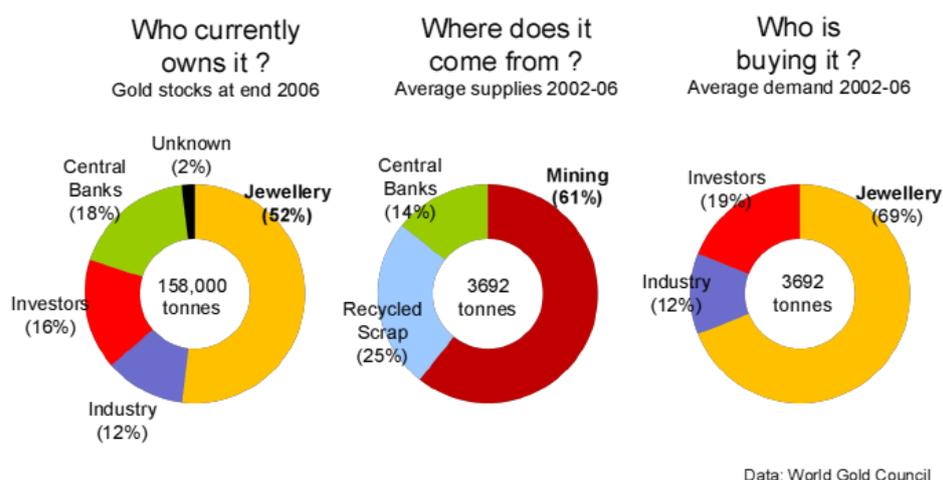
At present 95% of the world’s REE production comes from China.

### Gold

Of particular interest to Cambodia is the future demand and price for gold. As shown in the following chart, over the period 2002-2006 world demand for gold averaged 3692 tonnes per annum. Around 69% of the demand was for jewellery – with the main markets being India and China. The second largest buyer were private investors who view gold as a store of wealth. Given the current uncertain times and rising gold prices, interest in hording gold has been rising.



### Gold: The Supply and Demand Story



Over the 2002-2006 the mining industry produced on average 2239 tonnes per annum of gold. This accounted for 61% of all sources of gold. The remaining 39% of supplies came from sales from the Central Banks and recycling of old jewellery (as scrap).

Given the high value of gold, plus the fact that it is not “consumed” (in the same way as oil or food is consumed), almost all of the 158,000 tonnes of gold produced in all history is still available for re-use. Half of this is in the form of jewellery.

The dynamics of the gold market have significantly changed over the last decade. In the period 2001 to 2007 (ie prior to the Global Financial Crisis) there was steady rise in demand for jewellery. This was due to the rise in people's disposable income – particularly in China, India and Europe. Although physical production from mining declined slightly over this period (down from 2645 tonnes in 2001 to 2476 tonnes in 2007) supplies were augmented by large sales of gold bullion by the Central Banks. These sales dampened the gold price.

As discussed above, investment demand for gold has rapidly risen in the last five years. Assisting this has been the recent development of Exchange Traded Funds (ETF). These funds are financial securities that track the price of gold. In many cases the ETF physically holds the gold on behalf of the investor – which means that the individual investor no longer needs to physically collect and store the gold. This makes it cheaper, quicker and more secure for the investor to buy and sell his gold. ETFs were first introduced in 2003 and, as at March 2010, gold reserves under their control have now grown to around 1750 tonnes. From this it is clear that investors buying shares in ETFs have been the main driver behind the recent rise in gold prices. The key issue going forward will be what will happen if/when these investors decide to sell down their positions.

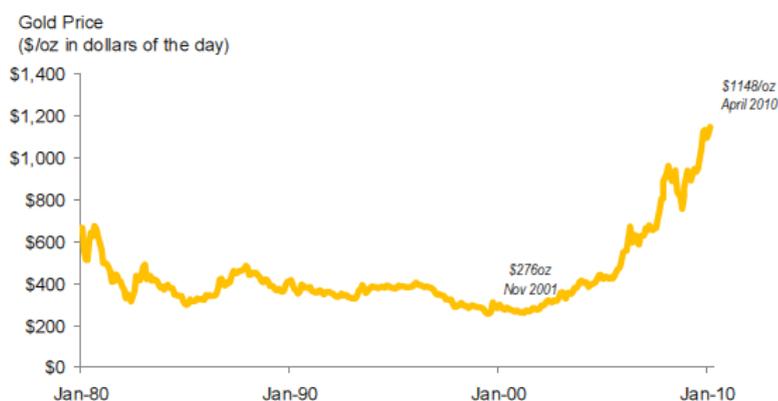
Although the Global Financial Crisis increased the demand for investment, it adversely affected the demand for jewellery. In 2009 worldwide demand for jewellery fell by 20%. The overall level varied from country to country, with the largest drops being experienced in Europe and the United States. Jewellery demand in China was flat, whereas India rose by 20%.

The Global Financial crisis also affected the supply of gold from the Central Banks. Many of the major countries cut back on sales and developing countries like India, Sri Lanka, Mauritius and China started buying gold. The overall effect was that the Central Banks are currently no longer net sellers of gold. This helped support a stronger gold price.

CRU | STRATEGIES



## Nominal gold price from January 1980 to April 2010



Data: LME

## Success rate for exploration

In addition to the price volatility and capital-intensive nature of the resources industry, two other key characteristics are (1) the low likelihood that a given exploration program will result in an economic discovery and (2) the long delays between discovery and building a mine.

With regard to the first point, the likelihood that a given exploration program will be successful depends on:

- The Commodity
  - Bulk minerals like iron ore and bauxite are relatively easy to find. This is less so for copper deposits, and large gold deposits are relatively rare. The most difficult commodity to find are diamonds!
- Ore Grade.
  - While it is relatively easy to find a bauxite deposit, it is much more difficult to find one that has a high enough grade to be profitable to develop
- Size of the target
  - There are many more small deposits than giant deposits. For example, for every hundred Sepon-sized copper deposits there will only be one Escondida-sized copper deposit. As a general rule, the larger the deposit, the likely it will be profitable to develop. Unfortunately, giant deposits are very rare.
- Mineral Endowment
  - The number and size of deposits varies from country-to-country. This is because some countries have better geological characteristics than other countries
- The company
  - Some companies have better geologists than others
- Luck and persistence!

As a general rule, the average success rate for a gold or copper exploration project turning into a large mine (of the size of Sepon) is around one chance in 100 to 400 (say 1 in 200). If you are looking for a giant mine (like Escondida) the odds are 50 to 100 times worse! In other words, exploration is a high-risk activity and most exploration programs will fail.

It should be noted that not all discoveries turn into mines. On average, less than half of all discoveries turn into mines. Even if it is successful, on average it takes 10 to 15 years to convert a discovery into a producing mine. The reasons for the delay are many-fold and include the need to:

- Drill-out the deposit to determine how big / good it is
- Do technical and feasibility studies on the how the mine might be best developed and how profitable it will be
- Carry-out out studies to assess the environmental and social impacts
- Negotiate with the government gain the various permits required to build the mine
- Secure financing from the banks

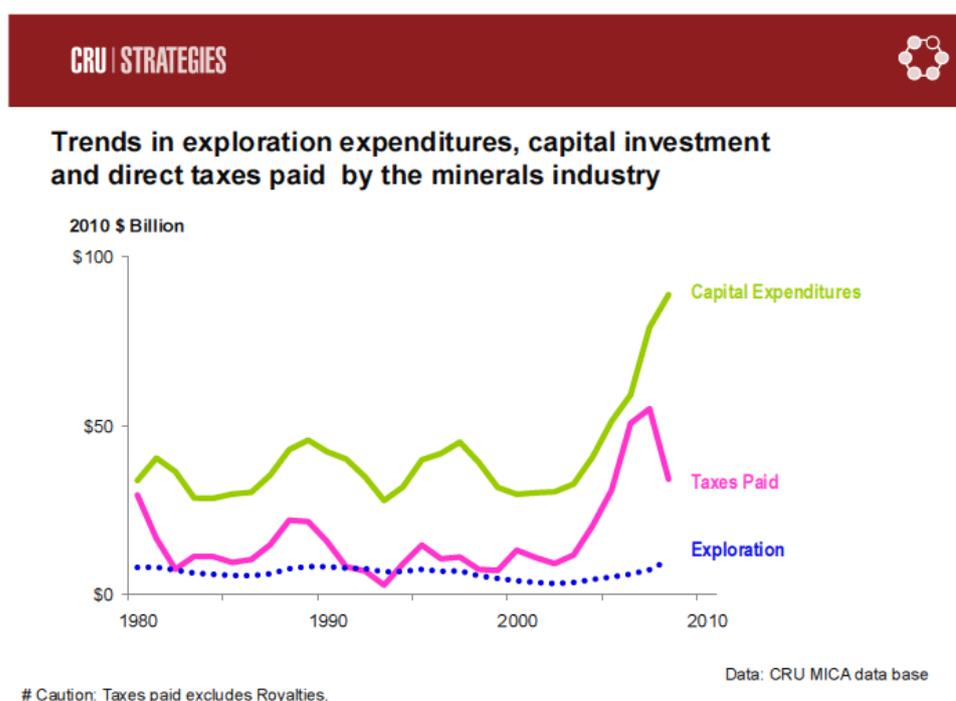


## Policy issues for developing a viable mining industry in Cambodia

The above analysis highlights the fact that the global minerals industry is huge. In 2009 CRU estimates that the global minerals industry generated around \$175 billion in pre-tax profits. Depending on the business cycle, the industry pays 40-50% of its profits in the form of taxes, royalties and import duties.

As reported before, another key feature of the industry is the fact that it is very capital-intensive – and is currently spending over \$100 billion per annum on expansions and new mining projects. The minerals industry is also currently spending ~\$12 billion per annum on exploration<sup>1</sup>.

The following chart shows the general trends in exploration expenditures, capital investments and direct taxes paid by the 303 companies covered in the MICA database over the last 30 years. Based on this, CRU estimates that on average, every dollar spent by the industry on exploration ultimately results in \$6 worth of capital expenditure which, in turn will generate \$55 of revenues over the life of the mine (typically 10-20 years). From this, the industry will eventually pay around \$3 on direct taxes and a further \$1 to 3 dollars in indirect taxes (in the form of royalties and import duties).



<sup>1</sup> The Metal Economics Group annual survey of exploration expenditures reports a figure of \$8.4 billion for 2009, down from a peak of \$14.4 billion in the previous year. These figures exclude expenditures from government-owned enterprises in China and the Former Soviet Union, and it also excludes expenditure on bulk minerals such as coal, bauxite and iron ore. CRU estimates that these increase the total reported spend by \$3 - \$5 billion per annum .

Of vital importance to Cambodia is how it can fully capture its share of the benefits of mining.

The first, and most important step, is that it needs to attract overseas companies to explore there. Secondly, once the discovery has been made, the government needs to demonstrate that it will support responsible development of a mine.

To achieve a successful minerals industry, the Government needs to demonstrate that:

- The country has the potential to host world-class mineral deposits
- Companies have secure title over any discoveries made by them
- The government will support the development of new mines
- The tax and investment rules are competitive
- Low business risks – ie good governance and transparency in decision-making

In turn, for Cambodia to achieve maximum benefit from mining , the company needs to demonstrate:

- Its seriousness to exploring and operating there – ie it is committed to being in the country for the long term
- Its strong support for the local community – as these are the people most affected by the mining activity
- Its commitment to protecting the environment and operating in a sustainable way

Achieving the above will lead to a win-win situation for all parties.

## Summary

The key characteristics of the mining industry are that it is:

- Global in nature – with companies operating across several countries and products being sold around the world
- Huge in scale – producing over \$800 billion per annum in sales, \$100 billion in after-tax profits and paying 40 to 55% of its profits in the form of taxes, royalties and duties
- Very cyclical – with commodity prices (and profits) varying by over +/- 30% in a year
- Very capital-intensive - requiring large amounts of cash to grow. In practice, most of the profits get re-invested back in the industry to build new mines
- On average only generates a modest return on its investment – especially given the business risk involved. For much of the last 30 years the average return was no better than investing in (risk-free) US Government Bonds. This has improved in the last 5 years
- The industry's profitability is closely tied to the Chinese economy. In the last 5 years, 80 to 90% of the total increase in world mineral demand came from China. This is set to continue for at least the next two decades as China urbanises

Furthermore:

- CRU forecasts that the world's economy will return to its pre-GFC levels by 2012-2013
- Commodity prices are set to remain strong over the next few years - with the "hottest" minerals of interest to Cambodia being - iron ore, copper, coking coal. Gold will also do reasonably well

And for Cambodia to maximise the benefits of mining it needs to encourage:

- Foreign companies to explore – as it is only through exploration that new mines are found
- Companies to convert their discoveries into mines. This is best done by offering a competitive tax rate and lowering the level of business risk – which requires good governance and transparency
- Companies to act in a socially and environmentally responsible manner

-----ooOOoo-----

## Background Information on the Author

### Mr Richard Schodde

Richard Schodde holds an Honours Degree in Materials Engineering and an MBA. He has over 30 years experience in a wide variety of project analysis and strategic planning roles within the international resources industry – including 15 years at WMC (in their Business Development Group and as Strategic Planning Manager for the Exploration Division) and more recently 4 years at BHP Billiton (as Minerals Economists in their Global Exploration Team).

Over this period Richard has written over 30 papers and public presentations, and is recognised by his peers as an international leader in the area of mineral economics.

In 2008 Richard set up his own business (MinEx Consulting) to provide strategic and economic advice on exploration issues to industry and government. He also works part-time as an Associate Consultant for CRU Strategies - a leading international consulting firm headquartered in London. The main focus of his work with CRU is on mining projects and commodity markets. In 2009 Richard was appointed to be a part-time Adjunct Professor at the School of Earth Sciences at the University of Western Australia. He also serves on a number of editorial boards and industry committees - including the Australasian Institute of Mining & Metallurgy and the Melbourne Mining Club.

## Background Information on CRU Strategies

CRU Strategies is the management consulting arm of CRU Group, which is one of the world's leading providers of information, research, forecasting and business advisory services to the global metals, mining and fertilizer industries. Formed in 1969, CRU employs over 150 staff world-wide from its head office in London and various offices around the world including Beijing, Santiago, Mumbai, North America and Australia.

The CRU Group has a deep understanding of the supply and demand issues across a wide range of mineral commodities including:

- Aluminium & Bauxite
- Lead & Zinc
- Gold & Silver
- Copper
- Uranium
- Iron Ore
- Ferro alloys
- Tin
- Tungsten

For more information go to [www.crugroup.com](http://www.crugroup.com)