

## INDUSTRY OVERVIEW

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We present information in this section in respect of iron ore and iron ore pellets, nickel and copper, being the three commodities (other than aluminium, our principal interests in which we have agreed to transfer) which currently account for the greatest proportionate contribution to our total operating revenues and fertilizer nutrients and coal, being the two commodities which we intend to focus on developing in the near term, together with information on mining industry competition, long-term mining industry trends and exchange rate fluctuations.

### I. IRON ORE AND IRON ORE PELLETS

#### Overview

Iron ore is the primary component of the world's production of iron and steel with essentially all iron ore produced worldwide consumed in steelmaking. Iron ore demand, and therefore pricing, depends largely on the global steel industry.

There are two basic manufacturing processes that account for the vast majority of modern steelmaking:

*Integrated Process:* The integrated process is the blast furnace/basic oxygen furnace (or BOF) process, which currently accounts for approximately 66% of world steel production. Lump ore and processed fines are fed directly into a coke-fed blast furnace, together with coke and limestone, to produce pig iron. Pig iron, together with some scrap steel, is then integrated with oxygen in a basic oxygen furnace to produce crude steel.

*EAF Process:* According to the World Steel Association, the electric arc furnace (or EAF) process currently accounts for approximately 25% of world steel production. Scrap steel is melted in an electric arc furnace and then alloyed in a ladle furnace to produce crude steel.

There are three major iron ore products: fines, lumps and pellets.

- *Fines:* Fines usually measure less than 4.75 millimetres (less than 5/26 inch). A sintering plant will heat layers of fines until partial melting occurs and individual ore particles fuse together resulting in a higher iron grade feedstock (usually around 62%+) and up to two inches in diameter. Sintering plants are usually located in proximity to the blast furnace.
- *Lumps:* Iron ore lumps can go directly into a blast furnace, but can potentially lead to decrepitation. Lumps generally contain 62%+ iron content and act as a substitute for pellets and do not require any additional grinding or processing. Lumps usually measure over 4.75 millimetres (over 5/26 inch). Lumps have historically traded at a higher price than that of fines, reflecting its use a direct feed to blast furnace.
- *Pellets:* Iron ore pellets improve the productivity of blast furnace. Pellets are formed as lower content iron ores are crushed and ground into a powder so the waste material (gangue) can be removed. The remaining iron-rich powder (concentrate) is then rolled into

## INDUSTRY OVERVIEW

balls and fired in a furnace to produce marble-sized pellets that typically contain 60 to 65% iron. Pellets usually measure from 9.55 to 16 millimetres (up to 5/8 inch). Pellets are typically priced at a 60 to 70% premium over fines.

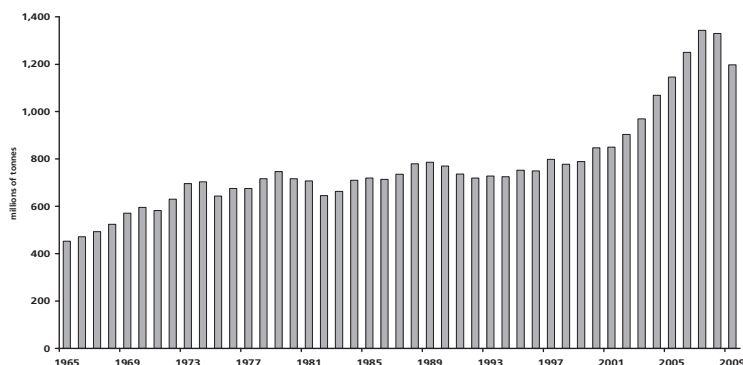
After being melted in a blast furnace with coke and other aggregates like limestone, the resulting molten iron goes directly into a BOF where it is eventually converted into steel by removing most of the remaining carbon. The molten iron can also be poured into moulds and sold as pig iron to third parties including EAF producers like mini mills.

### Demand

Demand for iron ore is dictated by the global steel industry, which consumes substantially all of the iron ore produced worldwide.

Global steel production rose at an average rate of 2.3% per annum from 1965 to 2009, as shown in the chart below. However, the most intense growth has been happening since 2000, when global steel output grew at 4.4% per annum, mostly due to the significant rise in steel production in China. Consequently, iron ore consumption has also been largely driven by China's economic growth, where the ongoing industrialisation and urbanisation processes have seen significant increase in the consumption of large volumes of raw materials, specifically steel.

**World steel production (Mt)**



Source: ABARE

The world steel industry produced 1,219.7 million metric tons of crude steel worldwide in 2009, according to World Steel. The largest producing country was China, accounting for 47% of total world production.

**Crude steel production (Mt)**

	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>
China . . . . .	127	151	182	222	280	356	423	490	500	568
EU 27 . . . . .	187	188	188	193	202	196	207	210	198	139
Japan . . . . .	106	103	108	111	113	112	116	120	119	88
Russia . . . . .	<u>59</u>	<u>59</u>	<u>60</u>	<u>61</u>	<u>66</u>	<u>66</u>	<u>71</u>	<u>72</u>	<u>69</u>	<u>60</u>
<b>World . . . . .</b>	<b><u>848</u></b>	<b><u>850</u></b>	<b><u>904</u></b>	<b><u>970</u></b>	<b><u>1,069</u></b>	<b><u>1,147</u></b>	<b><u>1,251</u></b>	<b><u>1,351</u></b>	<b><u>1,329</u></b>	<b><u>1,220</u></b>

Source: World Steel Association

Demand for crude steel is primarily driven by the automotive and construction industries, both of which are affected by the general state of the world economy. Therefore, demand for steel depends ultimately on global economic conditions. From 2002 to 2008, the global economy

## INDUSTRY OVERVIEW

experienced one of the largest and strongest expansion cycles in history. In particular, global industrial production, the main driver for steel production, showed steady growth with a CAGR of 2.9% between 2002 and 2008. After the global economic downturn in 2009, the global economy has begun to show signs of recovery. We believe the two factors underlying the recovery — financial conditions and the inventory cycle — will continue to sustain growth in the near future while the monetary and fiscal stimuli gradually diminish.

With the global economy likely to return to growth from 2010, the Australian Bureau of Agricultural and Resource Economics (**ABARE**) forecasts world crude steel production between 2009 and 2014 to rise by a CAGR of 6.8%, as the following chart shows. Regional growth rates are expected to vary in line with regional economic growth. Emerging Asian crude steel production is expected to grow at a higher rate as a result of high rates of investment in industry, transportation, infrastructure, construction and an overall improvement in standards of living. In particular, Chinese crude steel production is forecasted to grow at a higher 5-year CAGR of 7.6% to 819 Mt in 2014, according to ABARE. We believe such robust steel production and, therefore, global iron ore demand growth, would directly benefit the major iron ore producers.

### Crude steel production forecasts (Mt)

	2010E	2011E	2012E	2013E	2014E
China .....	613	659	709	762	819
EU 27 .....	149	158	165	170	175
United States .....	70	77	84	89	90
Brazil .....	30	34	37	41	45
Russia .....	62	64	67	69	72
<b>World</b> .....	<b>1,336</b>	<b>1,436</b>	<b>1,529</b>	<b>1,616</b>	<b>1,698</b>

Source: ABARE

### Supply

Worldwide, iron ore is mined in about 50 countries. The five largest producing countries are China, Australia, Brazil, India and Russia, accounting for approximately 80% of total world production. The following table presents iron ore production from 2000 to 2009 by the five largest producers worldwide:

### World iron ore production by country (Mt)

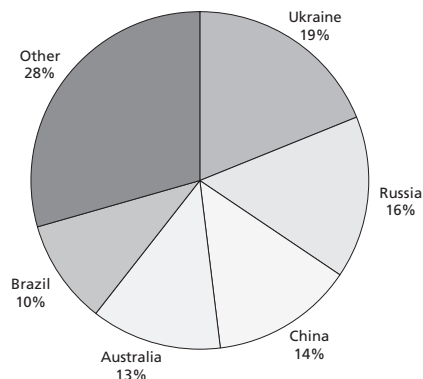
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
China .....	105	102	109	208	214	285	356	399	321	234
Australia .....	176	181	187	212	235	258	275	299	350	394
Brazil .....	209	210	225	246	271	292	319	337	346	300
India .....	75	79	86	99	121	143	181	207	223	257
Russia .....	87	83	84	92	97	95	103	105	100	91
<b>World</b> .....	<b>959</b>	<b>930</b>	<b>987</b>	<b>1,159</b>	<b>1,250</b>	<b>1,394</b>	<b>1,572</b>	<b>1,699</b>	<b>1,693</b>	<b>1,587</b>

Source: United Nations Conference on Trade and Development (UNCTAD)

## INDUSTRY OVERVIEW

The majority of the global iron ore reserves are concentrated in five countries: Ukraine, Russia, China, Australia, and Brazil, which together account for 71% of total reserves.

### Global crude ore reserve base 2009 – 160 billion metric tons



Source: United States Geological Survey (USGS)

### Competition

The top 10 iron ore producers in the world are listed below. The three major companies in the global iron ore industry are Vale, Rio Tinto Ltd. and BHP Billiton plc. In terms of production, these three producers accounted for 30% of global iron ore production in 2009, showing a high degree of supply concentration. In 2009, Vale's production was 238 Mt, making us as the largest iron ore producer in the world with a market share of 12.4%.

#### World top 10 iron ore producers — 2009 (Mt)

Rank	Company	Mt prod.	Market share
1	Vale <sup>(1)</sup>	238	12.4%
2	Rio Tinto Ltd.	204	10.6%
3	BHP Billiton plc	137	7.1%
4	Metalloinvest	48	2.5%
5	Kumba/Anglo American	44	2.3%
6	ArcelorMittal	39	2.0%
7	FMG	34	1.8%
8	Metinvest	30	1.6%
9	Cliffs NR	28	1.4%
10	NMDC	24	1.2%
<b>Word total</b>		<b><u>1,924</u></b>	<b><u>100.0%</u></b>

(1) The Directors believe the different figures for our iron ore production provided by CRU as compared to those disclosed in the section of this Listing Document headed "Business — Mining and Exploration Operations" are mainly due to different statistical methodology adopted by CRU to that utilised for preparing those figures.

Source: CRU

### Seaborne iron ore market

The majority of world iron ore production is sold through seaborne export-import trade. Steel mills in China, Japan, South Korea, Taiwan and Western Europe depend on this seaborne flow due to

## INDUSTRY OVERVIEW

a lack of sufficient domestic iron ore supply. Iron ore seaborne trade volumes increased rapidly from 507 Mt in 2000 to 955 Mt in 2009, driven mainly by China, whose imports have risen significantly from 70 Mt in 2000 to 628 Mt in 2009, accounting for almost all the increase in world seaborne iron ore trade since 2000.

China's dependence on imported iron ore has increased significantly. Imports accounted for approximately 60% of its total consumption in 2009. This was primarily the result of sound growth in domestic demand combined with limited domestic supply. In addition, high coke prices also helped elevate the value of high-quality imported ores as high productivity is required by the steel mills.

On the supply side, Australia and Brazil are the two major exporters of iron ore. Together, they accounted for approximately 66% of the world market in 2009, as shown in the table below. Typically, Australia supplies the Asian market, while Brazil supplies both the Asian and Western European market.

Looking forward, China is expected to continue to drive the seaborne iron ore market in the near term, as it continues to embark on its process of industrialisation and urbanisation. According to ABARE (as shown in the table below), total iron ore imports in China will reach 815 Mt in 2014, accounting for approximately 63% of total world seaborne imports.

### Iron ore imports and exports by country (Mt)

	2004	2005	2006	2007	2008	2009	2010E	2011E	2012E	2013E	2014E
<b>Imports</b>											
China . . . . .	208	275	326	383	444	628	634	685	738	776	815
Japan . . . . .	135	132	134	139	140	105	122	135	141	142	144
South Korea . . . . .	44	44	44	46	50	44	53	57	60	63	65
Germany . . . . .	46	42	45	46	45	NA	NA	NA	NA	NA	NA
France . . . . .	21	20	20	20	18	NA	NA	NA	NA	NA	NA
<b>Exports</b>											
Australia . . . . .	221	239	247	267	309	363	397	422	486	523	540
Brazil . . . . .	201	223	248	274	274	266	305	370	399	427	444
India . . . . .	63	81	89	94	106	115	94	87	81	74	66
South Africa . . . . .	25	27	26	30	33	45	41	44	48	51	54
Canada . . . . .	23	28	28	28	28	31	29	28	27	27	28
<b>Total world</b>											
<b>imports/exports . . . . .</b>	<b>646</b>	<b>717</b>	<b>763</b>	<b>823</b>	<b>889</b>	<b>955</b>	<b>1,019</b>	<b>1,103</b>	<b>1,186</b>	<b>1,244</b>	<b>1,284</b>

Source: UNCTAD and ABARE

The competition among producers and exporters in the seaborne iron ore market is primarily dictated by quality and freight costs. A secondary competitive factor is the demand for particular iron ore products, which also tends to vary among different parts of the world. For example, steel mills in North America are generally configured to process predominantly iron pellets, while blast furnace steel makers in Asia are configured to process predominantly sinter fines and lump ore. However, the ability to provide iron ore products tailored to individual customers' specifications — such as high-grade, low-impurity blending ores, pellets — and the metallurgical properties of particular ores allow producers to increase their presence in more distant markets.

### Pricing mechanism and prices

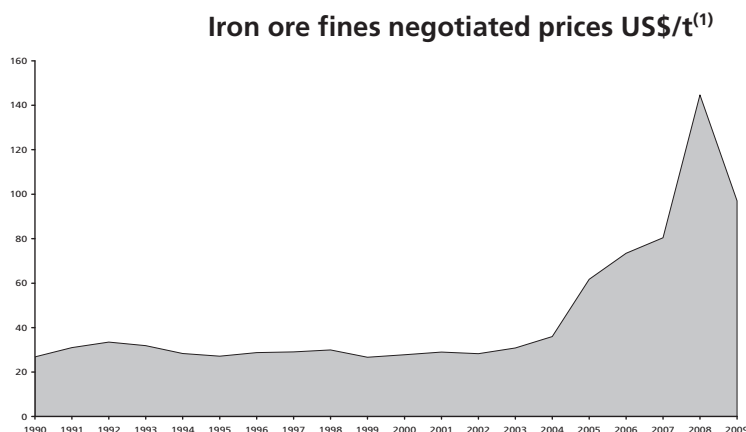
A benchmark pricing mechanism has prevailed for many years, under which suppliers and customers negotiated annual price references that, once agreed, would be adopted by the whole

## INDUSTRY OVERVIEW

market. Nevertheless, since 2003, China's impressive demand growth has been a major factor driving the rising importance of the iron ore spot market. In 2009, it reached an estimated share of 40% of global seaborne trade.

More recently, a new pricing mechanism has been adopted which establishes a quarterly iron ore price based on a three-month average of price indices for the period ending one month before the onset of the new quarter. While retaining flexibility, this quarterly pricing mechanism has an important key feature - the ability to account for product quality differences. More valuable products now command a transparent, publicly traded price premium over the more basic products, whilst previously premia had to be individually negotiated with customers by reference to the annual benchmark price. Accordingly, lump ores, blast furnace and direct reduction pellets generally enjoy a price premium over iron ore fines. As prices under the new pricing mechanism are now based on a landed equivalent basis, they will also recognise differences in geographical distance between suppliers and customers.

The following chart shows the iron ore contract prices from 1990 to 2009. From 2004 to 2008, iron ore prices went up by more than 200%, reflecting strong growth driven mainly by demand from China. After a price decline due to the world economic downturn in 2009, the iron ore spot prices have recovered strongly on the back of robust demand recovery since mid-2009. We believe the iron ore market will remain undersupplied for an extended period of time.



(1) Negotiated Japanese fiscal year hematite ores, FOB  
Source: ABARE

## II. NICKEL

### Overview

Nickel has a diversified usage base. Its main application is in stainless steel production, which accounts for approximately 65% of total nickel demand. Stainless steel constitutes a group of corrosion-resistant steel that contains at least 10% chromium and other alloying elements such as nickel and manganese. Their main applications are in the process industry, in catering and in the household and transport sectors.

Plating is another important first-use application of nickel. It is basically an electrolytic deposition of a nickel layer onto a substrate to provide resistance to corrosion and/or a decorative finish. Plating is used in the automotive, sanitary, household electronics and batteries industries.

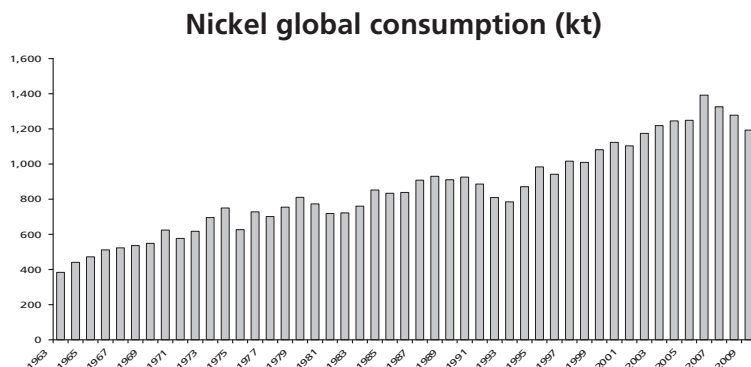
Nickel resources occur in two distinct economically extractable ore forms: sulphide ores and lateritic ores. Nickel sulphides are generally located in deep deposits of massive size, requiring underground mining. The average nickel grade of known sulphide ores is approximately 0.5%.

## INDUSTRY OVERVIEW

Nickel laterites occur predominately in the surface level, having originated from ground water movements, which makes it easier for open mining. This also results in great variability in thickness, grade and mineralogy. The average nickel grade of known laterite ores is approximately 1.2%.

### Demand

Global consumption reached 1,193 million metric tons in 2009, down by 6.7% from 2008 amid the global economic downturn. However, in 2010 the demand for nickel has recovered well, driven by strong demand for nickel in industrial applications, such as stainless steel and superalloys.



Source: ABARE

Nickel consumption pattern varies between countries and regions. As shown in the table below, China has been the main driver for global nickel demand. Between 2001 and 2009, Chinese nickel consumption grew rapidly at an average rate of 23.3% per annum to 360 kt in 2008. In contrast, Europe, North America and Japan have experienced continuous declines in primary nickel consumption. As a result of the strong demand growth from China, its share in total global nickel consumption rose significantly from 7.5% in 2000 to 28.2% in 2008.

### Refined nickel consumption by country (kt)

	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>
China . . . . .	83	94	125	150	190	255	330	360
Japan . . . . .	162	191	193	193	173	183	169	158
United States . . . . .	129	121	118	129	136	145	135	127
Germany . . . . .	110	107	100	100	96	106	97	91
South Korea . . . . .	75	83	98	103	99	93	63	56
<b>World . . . . .</b>	<b>1,104</b>	<b>1,175</b>	<b>1,219</b>	<b>1,246</b>	<b>1,248</b>	<b>1,392</b>	<b>1,326</b>	<b>1,278</b>

Source: ABARE

According to ABARE, nickel consumption is projected to grow steadily by approximately 6.9% a year to around 1.7 million metric tons by 2014. This growth is mainly attributable to the increase of industrial production in emerging economies, where strong economic growth is expected to result in increased construction activities and consumption, driving demand for stainless steel and, therefore, demand for nickel. In particular, China is expected to remain the largest contributor of demand growth for nickel in the medium term. Meanwhile, India is also projected to become increasingly important for stainless steel production, supporting an approximate 40% increase in

## INDUSTRY OVERVIEW

nickel consumption over the outlook period to 2014 when compared with 2009 consumption according to the table below.

### World refined nickel consumption (kt)

	<u>2009</u>	<u>2010E</u>	<u>2011E</u>	<u>2012E</u>	<u>2013E</u>	<u>2014E</u>
<b>Total</b> .....	1,193	1,317	1,447	1,532	1,620	1,667
<b>Year-on-year % change</b> .....	(6.7)%	10.4%	9.9%	5.9%	5.7%	2.9%

Source: ABARE

### Supply

Almost 67% of total global nickel production in 2008 was concentrated in five countries: Russia, Canada, Australia, Indonesia and New Caledonia (France), as shown in the table below. In terms of reserves, almost 62% of total global nickel reserves at the end of 2008 were located in three countries: Australia, New Caledonia and Russia.

### Nickel primary production by geography (kt)

	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>
Russia .....	235	235	240	264	280	286	288	268
Canada .....	194	189	163	187	198	234	255	260
Australia .....	196	188	191	187	189	185	185	199
Indonesia .....	102	122	144	143	150	150	188	180
New Caledonia (France) .....	118	100	112	118	112	103	125	103
<b>World total</b> .....	<b>1,225</b>	<b>1,248</b>	<b>1,264</b>	<b>1,327</b>	<b>1,388</b>	<b>1,486</b>	<b>1,595</b>	<b>1,509</b>

Source: ABARE

### Nickel Reserves (at the end of 2008) (kt)

	<u>Total</u>	<u>Share of total</u>
Australia .....	<b>26,000</b>	28.9%
New Caledonia (France) .....	<b>7,100</b>	19.0%
Russia .....	<b>6,600</b>	13.9%
Cuba .....	<b>5,600</b>	9.2%
Canada .....	<b>4,900</b>	7.1%
<b>World</b> .....	<b>70,000</b>	<b>100.0%</b>

Source: USGS

We believe the high level of nickel prices is expected to further encourage primary and refined nickel producers to increase production. According to ABARE, there is an estimated 465 Mt of primary nickel production expected to become available from 2010 to 2014. Much of this production is expected to come from laterite ore deposits. However, significant costs associated with project development and production may hamper laterite projects to meet ramp-up and capacity targets.

### World primary nickel production (Mt)

	<u>2009</u>	<u>2010E</u>	<u>2011E</u>	<u>2012E</u>	<u>2013E</u>	<u>2014E</u>
Mine production .....	1,302	1,405	1,515	1,630	1,725	1,767

Source: ABARE



## INDUSTRY OVERVIEW

Refined nickel production is forecast to follow increases in primary nickel mine production, with producers developing integrated projects including both mines and refineries, or negotiating agreements with existing refineries to expand capacity. According to ABARE, refined nickel production is projected to grow at an average rate of approximately 5% per year over the medium term to reach 1.7 Mt by 2015.

### Competition

The top 10 nickel producers in the world are listed below. In 2009, Vale's production was 181 kt, giving us a third-place market share of 13.8%. Apart from us, the largest suppliers in the nickel industry (each with their own integrated facilities, including nickel mining, processing, refining and marketing operations) are Mining and Metallurgical Company Norilsk Nickel, Aneka Tambang, Jinchuan Nonferrous Metals Corporation, BHP Billiton plc and Xstrata plc.

#### World top 10 finished primary nickel producers — 2009 (kt)

Rank	Company	Production (kt)	Market share
1	Norilsk	253	19.3%
2	Aneka Tambang	214	16.3%
3	Vale <sup>(1)</sup>	181	13.8%
4	BHP Billiton plc	173	13.2%
5	Jinchuan	62	4.7%
6	Eramet	52	4.0%
7	Cubanique	48	3.7%
8	Xstrata plc	47	3.5%
9	Minara Resources	33	2.5%
10	Nickel Asia	33	2.5%
World total		1,313	100.0%

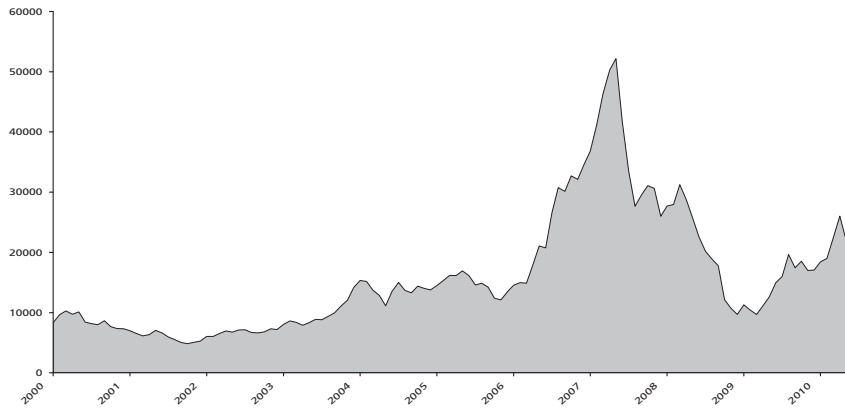
(1) Finished nickel processed in Vale's facilities using feeds purchased from unrelated parties have not been included.  
Source: CRU

### Prices

Nickel is traded on LME and the prices of its products are generally referenced to the LME prices. Nickel prices are usually very volatile: prices rose from US\$9,696 per ton in March 2009 to over US\$17,000 per ton at the end of 2009. For the year of 2009, prices averaged at US\$14,655 per ton, representing a 31% decline from 2008. According to ABARE, nickel spot prices are forecast to increase by 26% to an average of US\$18,400 per ton in 2010, in line with an expected recovery in world economic and industrial production growth.

## INDUSTRY OVERVIEW

### LME spot nickel prices – US\$ per ton



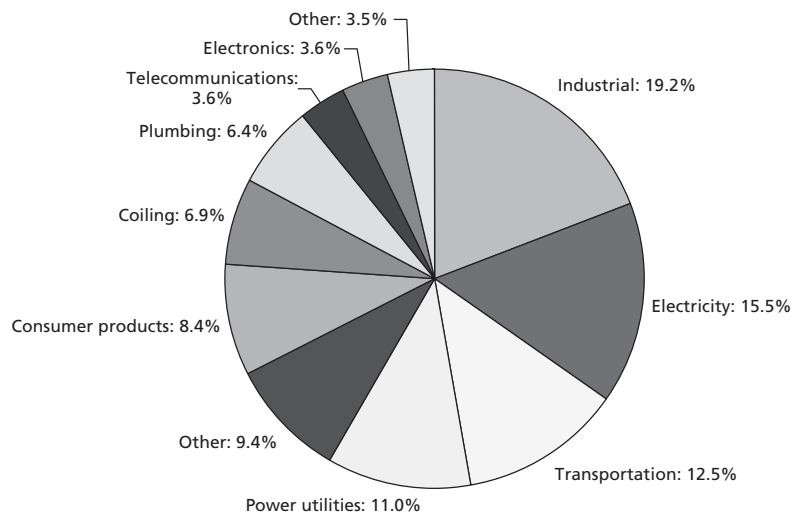
Source: LME

### III. COPPER

#### Overview

Copper is the third most utilised metal in the world, followed by iron and aluminium. Copper's chemical, physical and aesthetic properties make it a primary material used in a wide range of industries, including automotive and other durable consumer goods (for example, fine wire, magnet wire and certain specialty brass mill products), as well as construction (for example, tubing), electrical products and transmission (for example, wire), and general industrial (for example, wire rod and other milled brass). A breakdown by major end-uses of copper is shown in the chart below.

### Copper: major uses by end uses (2008)



Source: ABARE

## INDUSTRY OVERVIEW

Intermediate products of copper metallurgy that can be traded, such as black copper, blister copper and copper anodes, are characterized by their different stages of refinement, as described below:

- Copper concentrates — an intermediate mine product, where ore mined is processed to create a bulk concentrate with copper content (grade) typically ranging between 30% and 35% by volume. It is sold to smelters which further process and refine the material into blister or cathode.
- Blister or anode copper — depending upon the smelter technology employed, blister or anode copper may be the final smelter product, requiring an additional stage of refining to produce copper cathode.
- Copper cathode — cathode is copper metal refined to 99.9% purity and is the copper product quoted by LME and other major commodities exchanges generally acceptable to manufacturers. It is sold directly to mills or foundries.

### Demand

Copper consumption has been growing since 2000 at an average annual rate of 2.2% to reach 18.1 Mt in 2008. Global copper demand is driven mainly by China, who accounted for approximately 28% of total world consumption in 2008, followed by the United States, Germany, Japan and South Korea. The following table shows the main copper consuming countries from 2000 to 2008.

**Refined Copper: Top 5 consuming countries (kt)**

	2000	2001	2002	2003	2004	2005	2006	2007	2008
China . . . . .	1,928	2,307	2,737	3,084	3,364	3,656	3,614	4,863	5,134
United States . . . . .	3,025	2,619	2,364	2,290	2,410	2,257	2,096	2,123	2,123
Germany . . . . .	1,307	1,120	1,067	1,010	1,100	1,115	1,398	1,392	1,398
Japan . . . . .	1,349	1,145	1,164	1,202	1,279	1,229	1,282	1,252	1,184
South Korea . . . . .	862	849	936	901	940	868	828	856	815
<b>World Total . . . . .</b>	<b>15,191</b>	<b>14,686</b>	<b>15,037</b>	<b>15,315</b>	<b>16,671</b>	<b>16,639</b>	<b>16,974</b>	<b>18,109</b>	<b>18,102</b>

Source: ABARE

With a wide range of end-use markets, copper consumption is closely linked to economic growth. As a result of the recent economic expansion in China and India, copper consumption of those two countries increased by 166% and 114% between 2000 and 2008, respectively. According to ABARE, global copper consumption is expected to grow at an average annual rate of approximately 5% for the next five years, as shown in the table below.

**Refined Copper: Forecast of world consumption (kt)**

	2009	2010e	2011e	2012e	2013e	2014e
Consumption . . . . .	18,367	18,650	19,367	20,242	21,188	22,328

Source: ABARE

### Supply

Supplies of refined copper depend on raw materials, smelting and refining capacity and also on stock availability. The largest refined copper producing countries in the world are China and Chile, which together accounted for approximately 37% of total world production in 2008. Other important producers are Japan, the United States and Russia. World total copper production has

## INDUSTRY OVERVIEW

been steadily growing at an average rate of 2.4% per year since 2001 to almost 18.5 Mt in 2008, as shown in the table below.

<b>Refined Copper: Top 5 producing countries (kt)</b>								
	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>
China .....	1,523	1,632	1,836	2,199	2,600	3,003	3,499	3,779
Chile .....	2,882	2,850	2,902	2,837	2,824	2,811	2,937	3,060
Japan .....	1,426	1,401	1,430	1,380	1,395	1,532	1,577	1,540
United States .....	1,800	1,512	1,310	1,310	1,260	1,250	1,226	1,280
Russia .....	888	861	855	909	968	959	923	913
<b>World Total .....</b>	<b><u>15,675</u></b>	<b><u>15,336</u></b>	<b><u>15,221</u></b>	<b><u>15,828</u></b>	<b><u>16,610</u></b>	<b><u>17,343</u></b>	<b><u>18,029</u></b>	<b><u>18,484</u></b>

Source: ABARE

Major seaborne trade of copper originates from the Americas (including Chile, Peru and Canada), with China as its main destination. In 2008, China and Chile represented approximately 22% and 38% of world total imports and exports, respectively.

According to United States Government Services (USGS), global copper reserves are estimated to be 540 Mt as at the end of 2009, 30% of which are located in Chile. Other countries with large copper reserves include Indonesia, the United States, Mexico and Peru. Together with Chile, these five countries account for more than 60% of total global copper reserves, making copper a geographically concentrated metal.

<b>Copper Reserves (at the end of 2009) (kt)</b>		
	<u>Total</u>	<u>Share of total</u>
Chile .....	<b>160,000</b>	29.6%
Peru .....	<b>63,000</b>	11.7%
Mexico .....	<b>38,000</b>	7.0%
United States .....	<b>35,000</b>	6.5%
Indonesia .....	<b>31,000</b>	5.7%
<b>World Total .....</b>	<b><u>540,000</u></b>	<b><u>100.0%</u></b>

Source: USGS

Driven by the strong and sustained demand growth from emerging countries, we believe global copper production will continue to grow. According to ABARE, copper production is expected to grow at an average annual rate of approximately 5% for the next five years and reach 22.5 Mt by 2014, as shown in the table below.

<b>Refined Copper: Forecast of world production (kt)</b>						
	<u>2009</u>	<u>2010e</u>	<u>2011e</u>	<u>2012e</u>	<u>2013e</u>	<u>2014e</u>
Consumption .....	<u>18,765</u>	<u>18,846</u>	<u>19,311</u>	<u>20,226</u>	<u>21,359</u>	<u>22,516</u>

Source: ABARE

### Prices

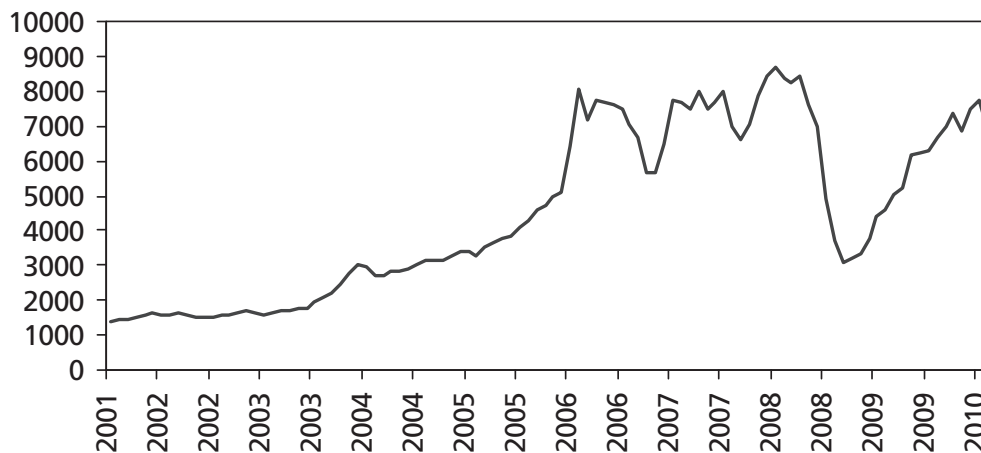
Copper is sold in an active global marketplace and traded on commodity exchanges, such as LME and NYMEX. Copper prices are affected by many factors, including actual and expected global macroeconomic conditions, supply and demand levels, availability and cost of substitutes, inventory

## INDUSTRY OVERVIEW

levels, investments made by commodity funds and others and actions of participants in the commodity markets.

Copper spot prices experienced a major increase between 2004 and 2008, as shown in the chart below, reaching the peak of US\$8,655 per ton in April 2008, after which a sharp decline took place at the onset of the global economic crisis, and prices returned to a level of around US\$3,106 per ton in January 2009. In the first six months of 2010, copper prices averaged US\$7,094 per ton, which was approximately 33% higher than the 2009 average of US\$5,337 per ton. This increase in copper prices was mainly due to the ongoing economic recovery in and strong demand from China.

**Copper Spot Prices (LME Cash, US\$ per ton)**



Source: LME.

## IV. FERTILIZER NUTRIENTS

### Overview

There are a total of 16 nutrients necessary for plant growth. Nitrogen (N), phosphorus (P) and potassium (K) are called the "primary nutrients" or "macronutrients", since they are most essential to plant growth:

- Nitrogen is necessary for the production of amino acids (proteins), chlorophyll, enzymes and nucleic acids (genetic materials). Additionally, nitrogen improves crop yield.
- Phosphorus is important for energy transfer, storage reactions (electrons are moved by biochemical reactions involving phosphorous compounds) and nucleic acids. Phosphorus speeds up crop growth and yields.
- Potassium controls turgidity of cells, helps transport sugars and starches, and enables protein synthesis and activates enzymes. Potassium improves taste, colour and disease and drought resistance of plants.

Of the three macronutrients, nitrogen must be reapplied every year (through clay particles or residual metal in the soil, for example) and is thus susceptible to leaching or washout. Application of phosphorus and potassium would depend on the quantity of nutrients left in the soil.

The vast majority of phosphate fertilizers are derived from phosphoric acid, which is produced by the conversion of insoluble phosphate rock with the addition of sulphuric acid. The most common phosphate fertilizers are:

- Diammonium phosphates (DAP) and monoammonium phosphates (MAP), which are produced by reacting phosphoric acid with ammonia.

## INDUSTRY OVERVIEW

- Triple superphosphates (TSP) and single superphosphates (SSP), which are produced by the action of sulphuric acid or phosphoric acid on phosphate rock, respectively.

Potash refers to various potassium containing salts, such as muriate of potash (KCl) or potassium sulphate (K<sub>2</sub>SO<sub>4</sub>). Potash can be extracted by using conventional shaft mining, continuous mining, which extracts ore directly from the vein or solution mining, which involves pumping hot water into the ore, dissolving the salts and pumping back the brine for further processing. The main product is the high-grade potassium chloride (60 to 62% K<sub>2</sub>O).

### Demand

Demand for fertilizers grew steadily at a CAGR of 3.2% between 2004 and 2007. China, the United States, India and Brazil are the most important consumers of fertilizers, representing approximately 61% of total global consumption in 2007, according to United Nation's Food and Agriculture Organization (FAO). China is the world's largest consumer, accounting for approximately 26% of total global consumption in 2007.

#### Total fertilizer consumption<sup>(1)</sup> (Mt)

	2004	2005	2006	2007	2007 share
China . . . . .	40.4	43.6	50.4	46.6	25.9%
United States . . . . .	27.8	28.5	25.2	29.2	16.3%
India . . . . .	18.4	20.3	21.7	22.6	12.6%
Brazil . . . . .	10.3	8.3	8.6	11.3	6.3%
Canada . . . . .	2.5	2.8	3.6	4.7	2.6%
<b>World . . . . .</b>	<b>163.3</b>	<b>165.4</b>	<b>170.3</b>	<b>179.5</b>	<b>100.0%</b>

(1) N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O

Source: FAO

Demand for fertilizers is driven by global agricultural production, which is a function of food demand and is driven mainly by population growth, age distribution, economic development and dietary preferences. Rising population and declining arable land will continue to drive fertilizer application to increase yield and productivity. Rapid growth in per capita income in emerging economies is changing diet behavior towards an increasing intake of proteins that ultimately contributes to create additional demand for grains and fertilizer use. In addition, biofuel has emerged as an alternative source of energy to reduce world reliance on fossil fuel, being the main source of climate-changing greenhouse gases. The cultivation of sugar cane, corn and palm, being the main crops used for the production of biofuels, involves intensive use of fertilizers. We believe the rising global demand for food and biofuels will be key to the continued growth in demand for fertilizers.

## INDUSTRY OVERVIEW

### Supply

China is the largest producer of fertilizers in the world and accounted for approximately 28% of the total global production in 2007. Other important producers are the United States and India, who accounted for approximately 10% and 9% of total global production in 2007, respectively.

#### Total fertilizer production<sup>(1)</sup> (Mt)

	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2007 share</u>
China .....	40.8	43.0	50.0	50.0	28.5%
United States .....	20.5	19.9	17.9	18.2	10.4%
India .....	15.2	15.3	13.1	15.5	8.8%
Canada .....	13.7	11.5	12.8	15.2	8.7%
Russia .....	12.4	13.1	13.0	14.0	8.0%
<b>World</b> .....	<b><u>165.0</u></b>	<b><u>167.2</u></b>	<b><u>169.5</u></b>	<b><u>175.6</u></b>	<b><u>100.0%</u></b>

(1) N, P2O5, K2O

Source: FAO

Canada, Russia and Belarus account for just over two-thirds of world potash production capacity and more than 80% of estimated reserves. Due to the geographic concentration of potash resources, the high level of investment required for production and the long period of time required for a project to mature, it is unlikely that other regions will emerge as major potash producers in the near future. Compared to potash, phosphate is more widely available, with China, the United States and Morocco, the three largest producers, together accounting for two-thirds of world production. All major phosphate exporters are located in the northern region of Africa (Morocco, Algeria and Tunisia). Morocco alone accounts for more than 40% of world exports.

### Brazilian fertilizer market

Brazil is one of the largest agri-business markets in the world due to its high production and consumption of grains and biofuels. It is the fourth largest consumer of fertilizers in the world and also one of the largest importers of phosphates, potash, urea and phosphoric acid. Brazil imports 90% of its potash needs (6.8 Mt) from Canadian, Russian and German producers, and also imports 49% of its total phosphate nutrient needs in the form of both phosphate fertilizer products and phosphate rock. Given its abundant supply of water and arable land and hence, the significant potential for growth in agricultural production, we believe Brazil is expected to play a key role in the global agri-business market going forward.

### Prices

Price negotiations for fertilizers are mainly held on a spot basis, while some large importers such as China and India often sign annual contracts. Seasonality is an important factor for price determination throughout the year, since agricultural production in each region depends on climatic conditions.

## V. COAL

### Overview

Coal is the most abundant fossil fuel in the world. It is present in over 70 countries and its reserves are estimated at 826 billion metric tons as at the end of 2009.

Coal can be classified into four main categories, based on the carbon content, heating value, and other characteristics: lignite (or "brown coal"), sub-bituminous, bituminous coal and anthracite. Thermal and metallurgical coals are two types of bituminous coal, which is a soft, intermediate grade coal.

## INDUSTRY OVERVIEW

Total world coal reserves are mainly concentrated in the United States, Russia and China, as shown in the table below. However, China has a relatively shorter reserve life (the length of time that the remaining reserves would last if production were to continue at the previous year's rate) than the other major countries.

### Total Coal Reserves at the end of 2009 (Mt)

	Total	Share of total	Reserve life years
United States . . . . .	<b>238,308</b>	28.9%	229
Russia . . . . .	<b>157,010</b>	19.0%	498
China . . . . .	<b>114,500</b>	13.9%	45
Australia . . . . .	<b>76,200</b>	9.2%	195
India . . . . .	<b>58,600</b>	7.1%	122
<b>World</b> . . . . .	<b>826,001</b>	<b>100.0%</b>	<b>130</b>

*Source: Survey of Energy Resources, World Energy Council*

Due to its relative abundance, ease of recovery and low cost, thermal coal accounted for approximately 29% of world primary energy supply in 2009, making it the second most important fuel after oil, according to the 2010 BP Statistical Review. The main use of thermal coal is as fuel for steam electric power generation. According to the International Energy Agency (IEA), thermal coal accounted for 42% of fuel used for total electricity generation worldwide in 2007 and that proportion is forecast to increase to 44% by 2030.

Metallurgical coal is a high-quality, high carbon content, and very black type of bituminous coal used to make coke, which is the main fuel for the blast furnace steel production process, in which iron ore is turned into metal. Coke, which is nearly 100% carbon, is also necessary for the production of steel, which requires carbon for reduction.

### Demand

Thermal coal demand is closely related to electricity consumption, which is driven by global economic and population growth, particularly in emerging economies. World total consumption of thermal coal grew at a steady pace at a CAGR of 5.6% from 2000 to reach 5 billion tons in 2008. China and India, together, accounted for approximately 80% of the increase in world consumption during this period, and their aggregate share in total consumption rose from 43% in 2000 to 56% in 2008.

Metallurgical coal demand is driven mainly by steel production, which is strongly linked to growth in industrial output, particularly in emerging economies. Total global consumption of metallurgical coal grew, reaching a level of 814 Mt, according to the Coal Industry Advisory Board. According to ABARE, demand for metallurgical coal is expected to remain strong in the medium term, mainly driven by higher steel production in the OECD economies and strong growth of imports in the key emerging economies with high levels of steel consumption.

### Supply

According to IEA, the largest thermal coal producing countries in the world are China and the United States, who together accounted for approximately 66% of total world production in 2008. Total thermal coal production increased steadily at a CAGR of 6.0% from 2000 to almost 5 billion tons in 2008. China has been the key driver in the increase in world production, with its output expanding at a CAGR of 9.8% during this period.

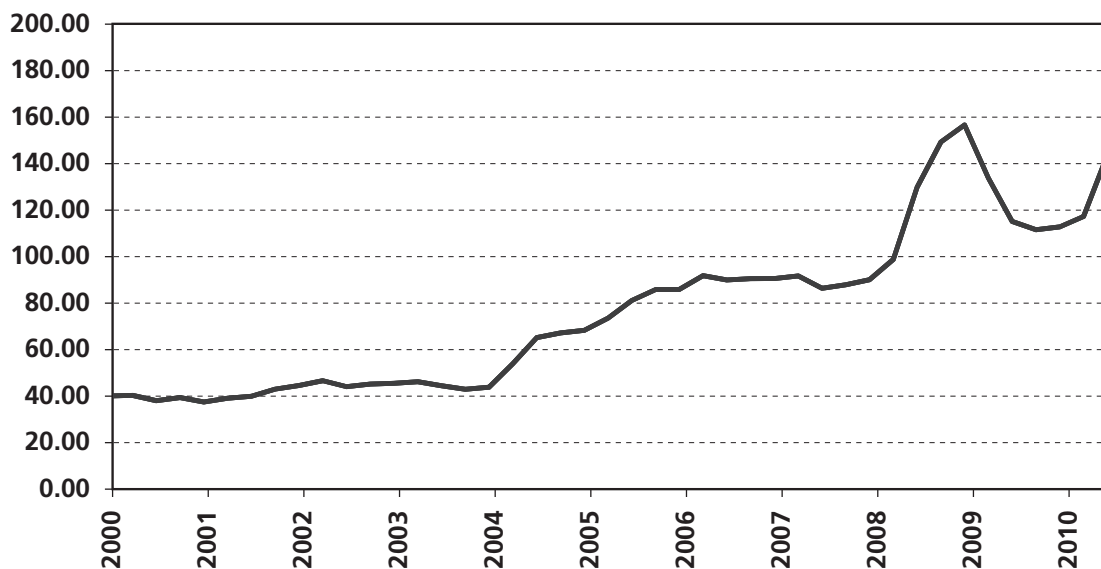


## INDUSTRY OVERVIEW

### Prices

Coal is commonly traded by contracts, especially in the Japanese market, which is supplied mainly by Australia. Contract prices are set annually according to the Japanese fiscal year. In recent years, coal spot trading has been growing steadily, becoming relatively more important. The following chart shows metallurgical coal contract prices in the period 2000 to 2010:

**Average Price of US Metallurgical Coal Exports<sup>(1)</sup>  
(US\$/t)**



(1) based on the free alongside ship value of US exports worldwide

Source: US Energy Information

### VI. MINING INDUSTRY COMPETITION

In general, the global mining industry is highly competitive. Competition is primarily based on price, quality, range of products, reliability, production and transportation costs, and geographic location of supply bases.

The main entry barrier in the mining industry is capital intensity. Investment in mining requires a substantial amount of funds in order to explore resources, replenish reserves, expand production capacity, build infrastructure and preserve the environment. Also, it usually takes a relatively long time for return on investments to materialise. The risks and technologies involved in mining operations, the requirement for government concessions and licences and environmental approvals, and the time required to achieve economies of scale in production also constitute important barriers of entry in the mining industry.

### VII. LONG-TERM MINING INDUSTRY TRENDS

In general, the continued growth in demand for minerals and metals depends increasingly on economic growth in emerging economies, given the increasingly significant share of global consumption accounted for by those economies and their faster economic growth when compared to that of the developed economies.

We believe growth in demand for iron ore, nickel and copper in the near term will be mainly driven by China's infrastructure development from its continued urbanisation and its increasing demand for key metals-intensive goods such as motor vehicles and consumer durables. In other

## INDUSTRY OVERVIEW

developing economies such as India, Russia and Brazil, we believe metal consumption has the potential to increase over the medium term, reflecting the growing demand for infrastructure, housing and consumer durables in those countries.

On the supply side, certain geological and institutional factors will continue to constrain the ability of suppliers of minerals and metals to respond to price incentives. These factors include:

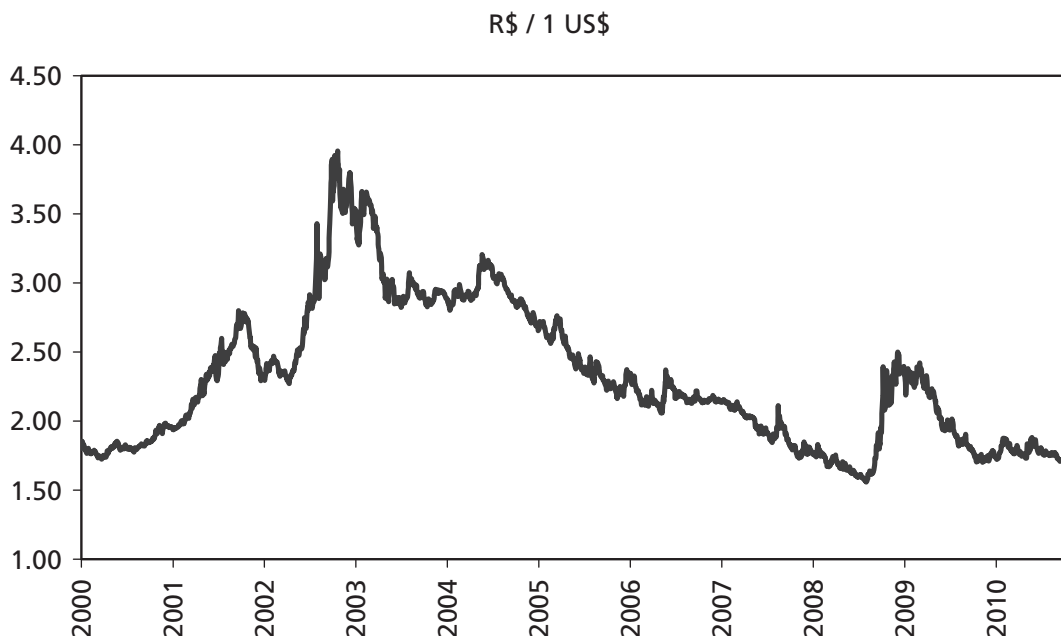
- grades of minerals are declining while stripping ratios are increasing;
- good quality supplies, especially for nickel and copper, become increasingly dependent on sources which are more difficult to access;
- restrictions on environmental permits are becoming a major cause of delay for mining projects;
- natural resources nationalism hampers mining investment; and
- higher taxes also deter mining investment.

The iron ore sector, in particular, is currently undergoing a period of consolidation, where producers are focusing on economies of scale in order to improve production efficiency and increase return on investments. We believe this will have a positive impact on large-scale producers, such as Vale.

The fertilizers industry is seeing a rise in global consumption, which we believe will continue as farmers, striving to satisfy the rising global demand for food, try to increase productivity on a declining per-capita arable land base. Continuing efforts by developing countries to address yield-limiting nutrient imbalances will further increase structural demand for fertilizers in the long term.

### VIII. EXCHANGE RATE FLUCTUATIONS

As further disclosed in the section in this Listing Document headed "Financial information", the revenues we can command from sales of our commodities are susceptible to fluctuations in currency exchange rates, in particular as between the U.S. Dollar and the Real. Please see below a chart indicating the fluctuation in exchange rates between 1 US\$ and *Reais* in the period from 2000 to 2010 as determined by the Central Bank of Brazil (PTAX Option 5):



Source: Bloomberg

## INDUSTRY OVERVIEW

As described in the section in this Listing Document headed "Risk factors", investors in Depository Receipts are subject to exchange rate risk between Reais and Hong Kong Dollars. Please see below a chart indicating the fluctuation in spot exchange rates between 1 R\$ and HK\$ in the period 2000-2010.



Source: Bloomberg