

## COPPER

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The copper market was, by its own standards, relatively quiet in 2000. As the recovery started in 1999 was continued, consumption forged ahead, but prices moved relatively little, as by the end of the year concern over future demand dominated earlier stock drawdowns.

Western world consumption posted its best annual growth rate since 1994, and global consumption growth was the fastest in over 20 years as demand growth in the former Eastern bloc outpaced that in the West. The continuing boom in the US economy fed through to rapid growth in Asia, and there was also unexpectedly fast growth in Europe. China continued to grow rapidly, reflecting strong internal demand as the programme to complete the electricity grid(s) moved to its

final stages, but also reflecting its growing role as an Asian manufacturing hub.

While demand boomed, growth in production slowed down. There were fewer large increases in mine production than the year before, as well as fewer mine closures, and Western world mine production increased by just over 3%. In large part the changes in mine output in 2000 were the result of changes in 1999 working through for a full year, and no major new mines came onstream, for the first time in many years. Tightness in raw materials, and smelter disruptions, held back the level of refined production, which grew much more slowly than mine output.

As a consequence of the acceleration in

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consumption and fall in production growth, the market shifted from a large surplus to an equally large deficit, more rapidly than all but the most bullish forecasters expected. It was the first deficit since the Asian crisis struck in 1997. Stocks started to fall late in the first quarter, the fall accelerated during the second, and continued in the third quarter, which is normally a weak time of year for demand.

However, while stocks fell sharply, prices only managed a weak recovery from 1999 levels. Indeed over the year, in dollar terms, there was no improvement at all, with the January and December averages the same at US\$0.84/lb. The failure of prices to rise further reflected growing concern over economic growth and US dollar strength.

**Prices, Market and Stocks**

Following a sharp improvement in 1999, copper prices did little more than move sideways during 2000. For most of the year the price fluctuated between 80-85 c/lb, dipping below this level in the first quarter, and rising above it briefly in the third quarter, but the annual average of 82c was the highest since 1997.

For the first two months of the year, fund buying kept prices up, but the physical market was lacklustre, partly the result of a Y2K stock hangover, and exchange stocks rose with the delivery of material which had been held back during the cathode premium mating season at the end of 1999. In early March, exchange stocks reached a record level, of just over 1 Mt, but the uptrend in stocks was soon reversed with a vengeance. A combination of high Chinese imports, partly driven by arbitrage, and accelerating consumer demand, caused stocks to start falling from mid March. Prices also fell! Fund liquidation, including the withdrawal of a major hedge fund from metals altogether, pushed prices down through April.

Trends in Reported Stocks ('000 t cathode)				
	1998	1999	2000	change in 2000
LME	592	790	357	-433
Comex	85	83	59	-24
Exchange stocks	677	873	416	-457
Producer	289	234	244	10
Consumer	176	146	160	14
Merchant	30	22	21	-1
<b>Western Total</b>	<b>1,172</b>	<b>1,275</b>	<b>841</b>	<b>-434</b>
SHME	88	63	108	45

Data: WBMS

From May through until early September, economic growth exceeded expectations, consumption growth remained strong, and the ongoing fall in exchange stocks triggered a recovery in prices, which rose from under 75c in mid-April to a peak of 90c in mid September.

The peak was brief, the US economy started to weaken in September, stocks fell more slowly in September and November, and

## NEW INSIGHTS INTO THE COPPER MARKET

Since its formation in 1993, Bloomsbury Minerals Economics (BME) has developed a reputation for continuous innovation in copper market analysis. BME's existing publications, the monthly "Copper Briefing Service" and the "Quarterly Report on Copper", were amongst the first analytical services to switch to truly global analysis, instead of focusing just on the Western World, and both are renowned for the completeness of their coverage of international trade, market balances, stocks and prices for copper concentrates, blister and refined metal.

In 2001-2002, BME will be launching a third publication, "Copper Price

Risk Analysis" which will model and forecast the entire price structure of copper from the cash quotation out to 27 months, three years ahead, using market balances, stock levels, rates of economic (IP) growth, exchange rates and interest rates as the main drivers. In developing these forecasts, BME will be looking at the full range of economic views, from the most bearish to the most bullish. The aim is to provide a rigorous analytical reference for price risk managers.

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there were persistent rumours of off-warrant stocks increases. High oil prices, and the strong US dollar, also weighed on copper prices, which quickly slipped back towards 80c.

For many in the copper industry the failure of prices to respond more positively to falling stocks was either puzzling, or slightly sinister, speculation was keeping prices below the level justified by fundamentals. The US slowdown in the final quarter quickly fed through into metals demand, this was less dramatic for copper than for aluminium, but was still noticeable. As a result, stocks stopped falling in the final quarter, and this was reflected in a fall in prices, which also reflected the considerable uncertainty about future demand levels and fundamentals.

Looking at prices in US dollars alone can be misleading. The US dollar has been exceptionally strong against other currencies, which helps keep production costs down in US dollar terms, and means that for consumers prices have risen more in their local currencies than in dollars. When measured in euros, for example, the copper price had recovered by September 2000 to levels not seen since the first half of 1997, before the Asian crisis.

### Raw Materials

After the extreme tightness of 1999, the concentrate market eased somewhat in 2000, with contract terms similar to the previous year, lower in the first half and then higher in the second, averaging about a combined 16-17 c/lb (excluding PP). A high level of smelter disruptions played a part in this easing, but high levels of output from the new Los Pelambres and Batu Hijau mines, in their first full year of production, and from some other operations in the final quarter, also played a role. As spot availability increased spot TCRCs moved up, from under 10 c/lb combined seen for some of 1999 to

<b>Western World Consumption ('000 t)</b>				
	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>% change</b>
<b>Europe</b>	<b>3,728</b>	<b>3,756</b>	<b>4,058</b>	<b>8.0</b>
Belgium	324	353	347	-1.7
France	553	550	576	4.7
Germany	1,147	1,138	1,310	15.1
Italy	590	635	674	6.1
Spain	235	255	289	13.3
UK	374	305	323	5.8
Scandinavia	279	293	319	8.9
Other	225	227	220	-3.1
<b>Africa</b>	<b>110</b>	<b>111</b>	<b>116</b>	<b>4.5</b>
<b>Asia</b>	<b>3,382</b>	<b>3,816</b>	<b>4,008</b>	<b>5.0</b>
India	200	230	245	6.5
Japan	1,255	1,294	1,351	4.4
Malaysia	133	158	166	5.3
Saudi Arabia	160	160	160	0.0
South Korea	560	784	862	10.0
Taiwan	584	655	628	-4.1
Thailand	84	110	151	37.1
Turkey	208	201	241	19.9
Other	199	224	216	-3.6
<b>America</b>	<b>4,004</b>	<b>4,148</b>	<b>4,338</b>	<b>4.6</b>
Brazil	298	285	335	17.5
Canada	246	266	271	1.9
Mexico	341	395	523	32.4
US	2,883	2,987	2,979	-0.3
<b>Oceania</b>	<b>265</b>	<b>165</b>	<b>168</b>	<b>1.8</b>
<b>Former east bloc</b>	<b>1,969</b>	<b>2,057</b>	<b>2,480</b>	<b>20.6</b>
China	1,402	1,484	1,850	24.7
Russia	150	175	200	14.3
Poland	263	268	290	8.2
Other former east bloc	154	130	140	7.7
<b>World</b>	<b>13,458</b>	<b>14,053</b>	<b>15,168</b>	<b>7.9</b>

16c or more, much closer to contract terms. Chinese purchases of concentrate increased sharply in the second half of the year mopping up much of the potential oversupply.

Scrap was tight in the US and in Europe, causing the closure of some secondary refineries. The largest change was the closure of Southwire's 200,000 t/y Carrolton refinery in July. Tightness in scrap reflected shifts in trade with former East bloc countries,

as well as faster demand growth and low dollar prices. Chinese imports continued to rise, with many qualities of scrap being imported, but much of the material is low grade or material requiring hand sorting, and it is very difficult to estimate the copper content of what is reported. CIS exports also fell, not only were restrictions imposed on scrap exports, which were only partly successful, but there were also indications that lower scrap availability reflected at least a partial depletion of the scrap pool.

### Consumption

2000 saw the fastest Western world consumption growth since 1994 and, unlike that year, it followed a period of relatively strong demand. On a global basis, total world demand rose faster than any year since the early 1980s, as consumption growth in the Former East bloc outpaced that in the Western world.

This exceptionally rapid growth was the result of the conjunction of factors. First, the world economy showed synchronised strong growth in all regions, for the first time in many years. World trade grew by some 12%, reflecting the globalisation of business. Second, economic growth was biased towards electrical and electronics products, communications infrastructure, and in the US towards construction, all areas in which copper usage figures highly. Lastly, some more specific developments augmented this underlying growth: in China the development of a power grid boosted demand; in Europe, Japan and the US coinage programmes gave copper consumption a boost.

European consumption rose by 8%, with German demand up 17%, and most other countries posting strong growth. This was almost twice as fast as growth in the

Americas or in Asia, and reflected a mixture of factors, including strong demand overseas for European products.

After years of poor performance, Japanese demand rose 4%, and many other Asian exporting countries grew rapidly including a 37% jump in Thailand. Taiwan bucked the trend, registering a fall of just over 4%. On the surface, the fall reported in Taiwanese demand is surprising, but this reflected the relocation of manufacturing capacity to mainland China, and had been expected for some time.

Underlying this positive cocktail of the worldwide and the copper specific was exceptionally rapid growth in the US economy. The relative importance of US growth does not show through in the data on refined copper consumption, which was virtually flat.

This is misleading partly because this measure excludes all the copper containing products imported by the US, and so understates final consumption. For example, rapid growth in Mexican demand reflects an increase in wire rod production, much of which found its way over the border into US

<b>Copper Overview 2000 ('000 t)</b>				
	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>% change</b>
<b>Mine Production</b>				
Western World	10,180	10,622	10,955	3.1
NAFTA	2,938	2,582	2,439	-5.5
Latin America	4,401	5,221	5,394	3.3
Other WW	2,840	2,819	3,122	10.8
Former east bloc	2,104	2,185	2,347	7.4
<b>Total World</b>	<b>12,284</b>	<b>12,807</b>	<b>13,302</b>	<b>3.9</b>
<b>Refined Production</b>				
Western World	11,023	11,567	11,655	0.8
Europe	1,850	1,862	1,879	0.9
NAFTA	3,375	3,069	2,813	-8.4
Asia excl China	2,142	2,491	2,753	10.5
Latin America	2,892	3,304	3,323	0.6
Other Western	763	840	887	5.6
Former east bloc	2,835	2,887	3,111	7.8
<b>Total world</b>	<b>13,858</b>	<b>14,454</b>	<b>14,766</b>	<b>2.2</b>

wire and cable mills, it also reflects copper used by maquilladores (making products such as wiring harnesses for US vehicle manufacturers).

Also it does not measure the more general economic stimulus provided through trade by the US boom to the rest of the world. The growth in Asia reflects, among other things, rapid export growth, with the US the key market.

A lively debate continues as to the underlying trend in copper consumption growth. There is no doubt that it has improved compared to the situation seen in the 1980s, when a number of factors together reduced offtake for refined copper, including a reduction in inventories through the chain, and miniaturisation and substitution of some products. Taking a global view, the first half of the 1990s saw consumption grow slowly, because an improvement in Western world intensity of use was offset by a collapse in consumption in the former Eastern bloc.

Growth accelerated in the second half of the 1990s as former Eastern bloc demand grew quickly, augmenting Western world growth, most importantly because of rapid growth in China.

A second view of the acceleration in consumption can be built on copper's uses, notably its role as an enabler of the new economy, channelling electrical power and signals, and being embodied in a wide range of electrical and electronic products themselves. In addition, copper's use in air conditioning has been a strong source of growth, with higher standards of comfort expected as standard, rapid income growth in many hot and humid places, and of course the fact that offices are hotter places because of all the computers, and other electronic devices!

### Mine Production

Western world mine production grew by just over 3% in 2000, the slowest rate since 1993-94. Few new projects and expansions added to output, and these were partly offset by closures and cutbacks, the lagged effects of the closure of mines in 1999, and some fresh cuts. Most of the increase in mine output in 2000 was in the form of concentrate, growth in SX-EW cathode slowed to barely 0.5% after five years during which it had averaged an annual average growth rate of 20% or greater.

<b>Summary of Mine Production</b> ( <b>'000 t contained copper</b> )				
	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>% change</b>
South Africa	192	156	159	2.3
Zambia	339	319	285	-10.8
Other Africa	92	94	91	-3.5
<b>Africa</b>	<b>623</b>	<b>569</b>	<b>535</b>	<b>-6.0</b>
Indonesia	809	790	1,006	27.3
Other Asia	302	308	296	-3.9
<b>Asia</b>	<b>1,111</b>	<b>1,098</b>	<b>1,302</b>	<b>18.5</b>
Argentina	154	200	145	-27.3
Chile	3,732	4,448	4,663	4.8
Peru	476	536	547	2.2
Other S America	40	38	38	1.6
<b>South America</b>	<b>4,402</b>	<b>5,222</b>	<b>5,393</b>	<b>3.3</b>
Canada	701	611	626	2.4
US	1,877	1,632	1,475	-9.6
Mexico	360	339	338	-0.2
<b>North America</b>	<b>2,938</b>	<b>2,582</b>	<b>2,439</b>	<b>-5.5</b>
Australia	625	714	827	15.8
PNG	152	188	203	8.1
<b>Oceania</b>	<b>777</b>	<b>902</b>	<b>1,030</b>	<b>14.2</b>
Portugal	114	100	76	-23.8
Other	216	150	179	19.6
<b>Western Europe</b>	<b>330</b>	<b>250</b>	<b>255</b>	<b>2.2</b>
China	489	520	589	13.3
Russia	518	510	525	2.9
Kazakhstan	338	373	433	16.1
Poland	436	464	480	3.4
Other FEB	323	318	320	0.6
<b>Former east bloc</b>	<b>2,104</b>	<b>2,185</b>	<b>2,347</b>	<b>7.4</b>
<b>Total World</b>	<b>12,284</b>	<b>12,807</b>	<b>13,302</b>	<b>3.9</b>

The resilience of mine production in the face of low dollar prices reflects how much marginal production costs have been reduced. In part this reflects the closure of high cost operations, in part low TCRCs and, for many producers, the US dollar is strong compared with their local currencies, helping keep costs down in US dollar terms.

Three countries registered growth of more than 100,000 t of contained copper in 2000, and in each case one mine was the key factor. Indonesian output rose 216,000 t due to the first full year of operation at Newmont's Batu Hijau copper/gold mine. Chilean output also rose over 200,000 t, with Los Pelambres producing almost 300,000 t more in its first full year of production. Taken together, output at other Chilean mines fell, mainly due to reductions caused by grade changes, notably a 50,000 t drop at Escondida. Lastly, Australian output rose over 100,000 t, with an expansion at Olympic Dam adding 70,000 t to output, augmented by a number of minor increases at other operations.

Closures, cutbacks and reopenings made during 1999 had an effect on production changes in 2000 as well. The 150,000 t fall in US output, the third successive drop, took US output to more than 500,000 t below 1997 levels. The fall was largely an echo of the previous year's tough decisions (including shutdowns at Robinson, Continental, and the concentrator operations at San Manuel). However decisions made in 2000 also had an impact. Phelps Dodge made the decision to turn its Morenci mine into an SX-EW only operation, shutting down its concentrators completely in 2001. The Morenci mine is the world's fifth largest copper mine and was brought onstream in 1949. SX-EW output will be 370,000 t/y, a little lower than recent total production. High energy prices also caused some cuts, a taste of things to come in 2001. Phelps Dodge stopped pre-stripping at its Miami SX-EW operation in June, although the impact on output would not be felt until 2001 - 2002. Elsewhere Grupo Mexico/Montana Resources' Butte mine shut temporarily in

July, and its planned reactivation was postponed in November 2000 as the energy situation in the US deteriorated. Then, in November, Grupo Mexico cut back marginal production at its Mission mine, recently acquired as part of its takeover of Asarco, reducing output by 20,000 t/y.

Canadian production growth reflected the reopening of Highland Valley in the second half of 1999, this adding about 80,000 t to 2000 production.

Labour disruptions were perhaps greater than in recent years, with a protracted industrial dispute affecting by product copper output at Falconbridge's nickel operations, a strike at Neves Corvo in Portugal at the end of the year augmented the effects of earlier problems caused by equipment failure at the concentrator.

Output in Zambia fell last year with the shut down of Luanshya, and losses at most of the other operations. The situation in Zambia remains one of the great uncertainties in copper production. The two largest parts of the Zambian operations are now owned by Anglo American and Mopani Mines (First Quantum, Glencore and the Zambian Government). In addition there is Indian involvement in Luanshya/Baluba, and Chinese interest in Chambishi. There is potential for a substantial rise in production, but delays and disappointments seem part of the natural order of things, the most recent being an awful pit-wall collapse at the Nchanga operation.

Some new mines did not maintain the high production levels achieved at the start of their lives. Collahuasi saw its copper production in concentrate fall 50,000 t, from an unexpectedly high rate in 1999. Alumbraera, in Argentina, also saw production down by about 50,000 t, as the operators grappled with its complex metallurgy.

MRT's 30,000 t/y Rio Tinto mine in Spain was brought back onstream in the first quarter of

2000, but shut again in November as prices fell back in the second half, and the concentrate market eased, pushing it back into heavy losses.

**New Projects**

The pace of new project development has slowed down from a frantic rate in the 1990s, but there is still about 400,000 t/y of new capacity under development at present, and more than that amount again in planned expansions.

The largest new project, Antamina in Peru, is an open-pit copper/zinc concentrator operation. Progress to date has been ahead of schedule, and start up is anticipated in September 2001 with an output of 300,000 t/y of copper. El Tesoro in Chile is the next largest project. It has also been developed ahead of schedule, and production is expected to start in the second quarter, building to 80,000 t/y of SX-EW cathode.

The largest project of all is the phase 4 expansion of Escondida's concentrate operation, given the go ahead last year when water rights were secured in the final quarter, and due on stream in 2002. Without this expansion, Escondida's production would fall, due to falling head grades, but with the expansion output of copper in concentrate should rise from 750,000 t in 2000, to 1,150,000 t in 2004. This expansion will maintain Escondida's place as the world's largest copper mine by some margin. Additional production will come from leach projects at Escondida, including an expansion of the oxide leach, and the leaching of marginal ore.

Codelco is looking at several expansion opportunities, as part of its commitment to realise the value of its copper resources. Codelco has approved the expansion of its El

Teniente mine, with output planned to rise from 340,000 t/y to 480,000 t/y. An expansion at Andina is also planned, as is a smaller increase at the relatively new Radomiro Tomic SX-EW only operation. Evaluation of Codelco's Gaby Sur oxide deposit is continuing, and it offers the company another possible capacity increase, capacity might be 110-160,000 t/y.

Also in Chile, Atacama Kozan, 60% owned by Nittetsu of Japan, started construction on its 30,000 t/y El Bronce mine, due onstream in late 2001. Possible increases, including ones needed to offset grade declines, include Los

Refined Copper production ('000t)				
	1998	1999	2000	% change
Belgium	368	388	423	9.0
Germany	696	696	710	2.1
Spain	304	305	316	3.7
Other	482	474	430	-9.3
<b>Europe</b>	<b>1,850</b>	<b>1,862</b>	<b>1,879</b>	<b>0.9</b>
Zambia	306	260	252	-3.1
Other	172	162	148	-8.6
<b>Africa</b>	<b>478</b>	<b>422</b>	<b>400</b>	<b>-5.2</b>
India	102	208	259	24.5
Indonesia		91	155	70.3
Japan	1,277	1,342	1,437	7.1
South Korea	369	450	470	4.3
Other Asia	394	444	432	-2.7
<b>Asia</b>	<b>2,142</b>	<b>2,491</b>	<b>2,753</b>	<b>10.5</b>
Canada	562	540	551	2.0
Chile	2,303	2,661	2,670	0.3
Mexico	447	399	459	15.0
Peru	406	434	452	4.1
US	2,366	2,130	1,803	-15.4
Other	183	209	201	-3.8
<b>America</b>	<b>6,268</b>	<b>6,373</b>	<b>6,136</b>	<b>-3.7</b>
<b>Oceania</b>	<b>285</b>	<b>418</b>	<b>487</b>	<b>16.5</b>
China	1,211	1,174	1,325	12.9
Russia	640	736	790	7.3
Kazakhstan	324	362	395	9.1
Poland	447	470	485	3.2
Other former east bloc	213	145	116	-20.0
<b>Former east bloc</b>	<b>2,835</b>	<b>2,887</b>	<b>3,111</b>	<b>7.8</b>
<b>World Total</b>	<b>13,858</b>	<b>14,454</b>	<b>14,766</b>	<b>2.2</b>

Pelambres and Collahuasi in Chile.

In Canada, Cominco has signed an agreement with Taseko, to test Cominco's hydrometallurgical process on ore from the 35,000 t/y Gibraltar mine which shut in 1999.

In Australia, WMC is already planning a further 40-50,000 t/y expansion at Olympic Dam, following its recent successful move from 80,000 t to 200,000 t. Expansions are planned or possible in Peru. BHP is adding a 35,000 t/y SX-EW operation at Tintaya, which currently produces 80,000 t/y of copper in concentrate. It has also been looking at the possibility of developing its new Antapaccay deposit, which is near Tintaya, with possible output put at 80-90,000 t/y of copper in concentrate. SPCC, now part of Grupo Mexico, is planning to raise output at its Toquepala mine by 50,000 t/y, with further expansion likely.

In Brazil, the discovery of a new copper province, with iron oxide deposits in Carajas, has become widespread knowledge. Details on four deposits have been released by CVRD. Taken together projected output would be in the order of 400,000 t/y. The most advanced is Sossego, a joint venture with Phelps Dodge, with 1.5%, and potential output of 150,000 t/y. Two other possible concentrate projects are also known, Alemão (100-150,000 t) and Cristalinho (100-150,000 t), but further reserves would need to be proven to support these production levels. Lastly, there is a SX-EW prospect 118, which might produce 50,000 t/y if more reserves can be found. There has been no further advance on the longstanding, large, but mineralogically complex, Salobo project. While there have been suggestions that it might be developed as a leach operation, detail is limited, and the newer prospects seem to have moved ahead in the race to be on stream.

Interest in the US has not entirely stopped, in spite of the low copper price and high energy prices. Phelps Dodge continues to look at the

possibility of developing SX-EW operations in the Safford district, with production of 100-200,000t/y eventually. Some believe that the new Bush administration could make development easier.

The situation in Zambia remains one step forward and one backwards, but several mines are being refurbished or are planned to be brought back onstream, including Chibuluma (40,000 t/y) and Chambishi (20,000 t/y), and Anglo American is planning to develop Konkola Deeps. No progress seems imminent in DR Congo.

### Smelter and Refinery Production

Refined production rose in Asia and Australia, but was flat or down elsewhere. In Asia, the largest increase was in Japan, where custom smelters took advantage of the better availability of concentrate, recent capacity expansions and higher Asian demand, to push output up by nearly 100,000 t. Interestingly, Japanese smelter production has outstripped refinery capacity, and anode is now being shipped to LG in Korea for refining.

The first full year of production at Freeport's Gresik smelter/refinery in Indonesia resulted in an additional 70,000 t of production there. Output also rose at custom smelter/refineries in India and South Korea, following recent capacity additions. In India, the start up of Binani's smelter has been extremely smooth. LG's Onsan smelter/refinery increased production by 20,000t, following an expansion, and is planning a further, small, expansion at Onsan, which will take smelter capacity to 520,000 t/y. In Australia, extra output from Olympic Dam was the major factor behind production growth. However, Southern Copper's Port Kembla operations continued to underperform expectations.

The US registered the largest fall in refined output, of over 300,000 t, with the impact of the closures of integrated plants in 1999 being felt for a full year, and the closure of some secondary capacity as well.

In Europe, refined production rose quite sharply in the custom smelting countries, but fell elsewhere. In the UK, IMI shut its 50,000 t/y secondary plant, which was the last copper refined copper producer in the country. Norddeutsche Affinerie brought its East smelter onstream at its Hamburg operation in November, adding 35,000 t/y of additional capacity. At the same time, it switched scrap processing to the Lunen secondary plant, which had been acquired in 1999. Boliden's Ronnskar smelter expansion from 140,000 t/y to 240,000 t/y came on stream in the final quarter, and achieved a rapid ramp up to its new capacity.

Output in former East Bloc countries rose faster in percentage terms than it did in the West, by almost 8%, with the fastest growth in China, where a number of expansions had added to capacity, but also in the CIS, with increased capacity utilisation in Kazakhstan and Russia.

China remains the largest source of potential capacity additions over the next two to three years, with most of the major operations planning expansions. Jianxi Copper received approval for an expansion to 350,000 t/y from 220,000 t/y. Yunnan Copper is expanding from 90,000 t/y to 150,000 t/y using Isasmelt technology. Tongling is replacing an old unit with a new Ausmelt furnace, taking capacity up 20,000 t/y to 100,000 t/y. Jinlong is intending to add another 50,000 t/y to reach 150,000 t/y by 2002. The government intends that these new additions to capacity, using modern less polluting technology, will be accompanied by the closure of smaller more polluting plants, but the past record of Chinese non-ferrous production suggests that smaller operations may continue.

A fair number of smelter/refinery expansions are planned or under consideration. In India, SWIL financed its 50,000 t/y smelter in 2000, with the aim of completing the project, which would mainly use scrap, in 2001. In Chile, Noranda has given the go ahead for expansion of its Altonorte operation from

160,000 t/y to 290,000 t/y, which had been delayed in 1999 due to the effects of the Asian crisis. Codelco and Outokumpu are co-operating over a plan to revamp Chuquicamata, with a possible expansion of over 100,000 t/y, and have also revived interest in a new smelter at Mejillones in Northern Chile. Caraiba in Brazil is studying the feasibility of an expansion from 220,000 t/y to 380,000 t/y, and Pasar of the Philippines is considering an expansion from 160,000 t/y to 250,000 t/y. In Finland, Outokumpu is considering converting its soon to be redundant nickel flash smelter at Harjavalta to copper smelting. In Bulgaria, Union Minière is expanding its Pirdop smelter, from 185,000 t/y to 210,000 t/y (recent production is about 165,000 t/y).

Thai Copper's 150,000 t/y smelter at Rayong remains in suspended animation, having had US\$350 million invested, including work on the main smelter vessel, before the projected was halted in 1997.

### Corporate Activity

The most important takeover in 2000 was the acquisition of Rio Algom by Billiton. Rio Algom had taken an aggressive growth path in copper, with its 25% share in the new Argentinian copper/gold mine Alumbrera, and a 33.75% share in the Antamina project which was under development. It also owned the new Spence prospect in Chile, seen as one of the brightest new copper mine prospects, and the 100,000 t/y SX-EW Cerro Colorado project in Chile. It also owned a third of Highland Valley in Canada.

The takeover was noteworthy for two reasons. First, the initial bid for Rio Algom came from Noranda and Codelco together. The appearance of Codelco as a potential corporate acquirer was intriguing, confirming that the company was prepared to act in a larger role than managing and developing its own properties. However, the companies quickly dropped out of the bidding as Rio Algom's share price soared, leaving Billiton the victor. Billiton had no previous stake in

copper, and the acquisition was part of an aggressive growth strategy in other products as well.

Billiton also signalled its ambitions in copper by taking over the large, but low grade and complex, La Granja prospect in Peru from Cambior. It hopes that its BioCop leaching process will enable the deposit to be exploited economically. At present it is being used at a 20,000 t/y pilot plant at Mansa Mina, near Chuquicamata, in a joint venture with Codelco. The ore at Mansa Mina is high in impurities which would cause problems in smelting concentrate, but the resource is large and fairly high grade.

Rio Tinto also acquired some new copper assets, but these were a spin off from an iron ore driven bid for North Ltd. The main asset acquired was 80% of North Parkes, a 60,000 t/y block cave mine in Australia. A 25% stake in Alumbreira was also included.

Since the end of 2000, Billiton itself has merged with BHP, and this brings together a substantial haul of copper assets. As noted above, Billiton gained control of the Spence deposit in Chile through its takeover of Rio Algom, as well as a share in the new Antamina mine in Peru, the Cerro Colorado SX-EW operation in Chile, a third of Highland Valley in Canada. BHP still owns the Magma assets in the US, which are largely shut, and a majority share of Ok Tedi in Papua New Guinea, which it wants to exit from or close. Its core copper operation is the Escondida joint venture in Chile, with Rio Tinto, which has had its phase 4 expansion approved. BHP has also recently committed to expanding the SX-EW operation at its Tintaya mine in Peru, but had also been examining the possibility of developing another nearby sulphide deposit, Antapaccay. The combined group will benchmark the potential projects against each other, leading some to believe

that the less attractive ones may be delayed.

### China Focus

In recent years Chinese demand growth has, along with US demand, been a key driver of world consumption. There is considerable debate over the actual level of Chinese refined copper consumption in 2000. Calculated on an 'apparent' basis it grew 25% to 1.85 Mt. However many observers believe that actual consumption was lower, due to a build up in unreported stocks, with estimates as low as 1.75 Mt. The precise level of usage will never be known, as indeed is true elsewhere. However, China is also a major importer of copper in copper semis. Adding this to refined consumption would increase usage by another 500,000 t.

China's mine production has lagged well behind growth in copper demand, and China is a very substantial importer of copper in all forms. Excluding scrap, China's imports last year were estimated to have been close to 1.7 Mt, about 400,000 t higher than in 1999. This was a major factor behind the turnaround in the world copper market. Imports of cathode and blister rose 170,000 t, to 540,000 t. Imports of copper in concentrate increased by 160,000 t to 560,000 t, the sixth successive annual rise. Growth in net imports of copper in copper and copper alloy semis rose by about 70,000 t to 500,000 t. Imports of scrap were also very high, but there remains considerable confusion as to the copper content of reported scrap imports.

Chinese Trade ('000 t)				
	1998	1999	2000	% change
Net Imports				
Concentrate (gross)	1,186	1250	1,801	44
Blister and anode (gross)	83	126	110	-13
Cathode	250	367	548	49
Semis (gross)	428	488	565	16
Scrap (gross)	944	1700	2494	47
Copper content (exc. scrap)	1,062	1,289	1,690	31

Data: China Trade Statistics

With consumption continuing to grow, and a dearth of high quality geological resources, China's imports look set to increase rapidly in future. In order to secure resources China is looking for involvement in foreign mines, but so far the only concrete result is the Chambishi reactivation in Zambia (mentioned above), which could yield 40,000 t/y of copper in concentrate. During 2000 an agreement was signed with Atlas of the Philippines over reopening its 45,000 t/y Cebu mine, but by the end of the year the agreement had been annulled. More recently, China's Metallurgical Construction Corp. is reported to have leased Pakistan's 16,000t/y Saindak mine/ smelter/refinery for ten years. The operation shut in 1996, soon after it opened.

China's larger smelters continue to add capacity, as mentioned earlier, and this suggests that higher imports of concentrate will be an important part of the growth in imports, although if smaller more polluting operations are shut, as the government would like, it would reduce this growth considerably.

**Looking to the Future**

Last year's dramatic turnaround in fundamentals looks more like a step in the right direction rather than a real turning point. It reduced stocks substantially, leaving the possibility of better prices greater than before. However, a sharp slowdown in demand has pushed the market back into surplus, and stocks have risen again as a result. Western world exchange stocks rose by 150,000 t by mid year, and a 30,000 t fall on the Shanghai metal exchange only partly offset this.

Demand has weakened considerably. The US, the engine of so much of the world's demand growth in recent years, has run sharply into reverse and, contrary to many optimistic expectations, the downturn has not been over quickly. Much of Asia, with the notable exception of China, has seen demand slow sharply or even more recently start falling, as the slowdown in the US, and in fast growth

<b>Projection for Total World Copper Balance ('000 t)</b>				
	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>
Mine Production	12,807	13,302	13,504	13,879
Yearly change (%)	4.3	3.9	1.5	2.8
Refined Production	14,454	14,766	15,421	15,645
Yearly change (%)	4.3	2.2	4.4	1.5
Consumption	14,053	15,168	15,295	15,750
Yearly change (%)	5.2	7.9	0.8	3.0
Balance	401	-402	126	-105

Source: WBMS, ICSG, Rio Tinto

technology businesses, is felt worldwide. More recently, European demand has faltered, after a strong first quarter led many to hope that it could shrug off the effects of economic slowdown elsewhere. Japan is on the brink of recession, or is even in recession already. This year it looks probable that Western world demand could fall, for the first time since the 1980s, although global consumption could still grow, albeit slowly if Chinese demand remains strong.

On the supply side, the most notable development has been the impact of the growing US energy crisis, as well as continuing low copper prices, on mine production. Phelps Dodge has been forced to make cuts amounting to some 80-90,000 t/y of mine production, on top of ones it made in 1999-2000. Rio Tinto has shut its older North concentrator at Bingham. The impact of the cuts made so far on refined production will be small this year, as spare concentrate will be used. In addition there have been some labour driven supply disruptions, and short-lived threats, but in total, so far they do not add up to much. Without substantial changes to current plans mine output looks likely to grow by less than 2% this year, but closer to 3% in 2002. Of course, with the price now in the low 70s again, further cuts cannot be ruled out.

Forecasts for the 2001 market balance, which were unanimous in looking for a deficit last year, have become more bearish. Although few are predicting a substantial surplus, few now expect a deficit, and most are based on the assumption that the economic slowdown in the US is over by the final quarter of 2001, which is possible, but

not certain. As long as consumption grows reasonably in 2002, the market should move back into deficit again, as refined production is likely to be held back by a shortfall in raw materials. Additional cuts could amplify the deficit. The extent of the recovery in consumption next year is only guesswork, as we still do not know the pattern of demand for the second half of 2001. With total stocks still low compared to demand, in historical terms, the market could easily look quite different again in a years' time, as has happened over the last year.

While short-term concern is about the cyclical weakness of demand, longer term the industry remains committed to market promotion, building among other things on the greater use of copper in more energy efficient motors and wiring. Through the CDA, the industry is funding specific projects in areas with real promise, where the effects of promotion can be measured. These include China, India and Eastern Europe.

<b>Main Reductions in Production ('000 t contained copper)</b>						
<b>Mine</b>	<b>Location</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>Change</b>	<b>Reason</b>
Alumbrera	Argentina	154	200	145	-54	below plan
Escondida	Chile	850	827	776	-51	Grade changes
Morenci	US	477	442	391	-50	Cutback at concentrator
San Manuel	US	106	49	0	-49	temporary closure
Robinson	US	66	30	0	-30	temporary closure
El Abra	Chile	199	221	195	-25	Grade changes
Neves Corvo	Portugal	114	100	76	-24	Disruption
La Caridad	Mexico	157	153	130	-23	Disruption
Falconbridge (Nickel Ops)	Canada	49	43	22	-21	Disruption
Butte	US	43	37	18	-19	temporary closure
Candelaria	Chile	223	235	216	-19	Grade changes
Gaspé	Canada	25	19	0	-19	reserve exhaustion
Collahuasi	Chile	29	383	365	-19	Grade changes
Cerro Dominador	Chile	21	25	11	-14	
Louvicourt	Canada	56	65	51	-14	
Kidd	Canada	67	67	55	-13	Disruption
Luanshya/Baluba	Zambia	35	19	6	-12	Disruption
Mt Gordon	Australia	2	11	0	-11	temporary closure
Nchanga	Zambia	72	90	80	-10	Disruption
Cyprus Miami SX-EW	US	75	64	55	-10	cutback
Mamut	Malaysia	14	7	0	-7	reserve exhaustion
Mission	US	116	91	85	-5	cutback
<b>Main Increases in Production ('000 t contained copper)</b>						
Los Pelambres	Chile	0	15	309	294	new mine
Batu Hijau	Indonesia	0	23	236	213	new mine
Highland Valley Copper	Canada	172	110	191	81	reopened
Olympic Dam	Australia	84	135	206	71	expanded
Bingham Canyon	US	293	274	294	20	grade changes
Cerro Colorado SX-EW	Chile	75	100	119	19	
Cobar - CSA	Australia	2	12	31	18	
Ernest Henry	Australia	78	89	107	18	
El Teniente	Chile	346	353	370	17	
Minas Rio Tinto	Spain	33		16	16	temporary reopening
Cananea	Mexico	106	84	100	16	recovery
Ok Tedi	PNG	152	188	203	15	recovery