GLOBAL NON-FERROUS SCRAP FLOWS **2000-2015**

with a focus on Aluminium and Copper

Bureau of
International Recycling
Non-Ferrous Metals Division

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EXECUTIVE SUMMARY

The purpose of this report is to demonstrate the importance of recycling in the metals industries. Aluminium and copper have been selected because they are the two largest of the non-ferrous metals and because scrap for both metals is widely traded internationally; furthermore, both metals have a broadly similar pattern of scrap recovery. Recycling of other base metals, including lead, zinc, nickel and tin, are not considered in this study but may be the subject of future reports.

Most of the data shown cover developments since 2000. This period has seen enormous growth in Chinese demand for both raw materials and finished metal but virtual stagnation in many developed economies. In order to feed the growing domestic demand, China has needed to import increasing quantities of all forms of raw materials, including scrap. Chinese consumption of all metals was historically low and it will be some time before the end-of-life products produce significant quantities of scrap. An analysis of the international trade in copper- and aluminium-based scrap shows huge imports into China, mainly from the large, mature economies of NAFTA and the European Union. There are, however, some issues about precisely what products are included in the Chinese import data. It seems likely that the Chinese import data cover a mix of other metal scrap and, as a result, the copper and aluminium contained in these imports is overstated. Comparing exports to China by trading partners indicates that the Chinese imports of copper and aluminium scrap are overstated by around 65% and 25%, respectively.

Global scrap usage for copper, both for secondary refined copper production and direct use of scrap, increased by 41% from 5.9 million tonnes in 2000 to 8.3 million tonnes in 2015. In addition, over the same period the LME price of copper rose from US$ 1814 to US$ 5502 per tonne, resulting in a more than fourfold increase in the value of copper recycling from US$ 10.7 billion to US$ 46 billion.

Production of aluminium metal from scrap increased by 86% from 8.4 million tonnes in 2000 to 15.6 million tonnes in 2015. Direct use of aluminium scrap is not recorded. The increase in the average price of aluminium was more modest, from US$ 1595 to US$ 1663 per tonne, while the value of recycled aluminium more than doubled from US$ 12.8 billion to US$ 26 billion.

CHAPTER 1

INTRODUCTION

1.1 Economic benefits of recycling

Metals are an essential part of modern life and are largely made from ores which have to be mined from the earth's crust. With the world's population constantly expanding, it is essential that we conserve the scarce resources for future generations. Fortunately, metals are almost infinitely recyclable and the industry is increasingly using scrap to provide the metal that society needs.

There are strong economic arguments for recycling, with the low cost of producing secondary metal compared with the cost of refining new metal being the most compelling. For aluminium, one of the largest costs is the electricity used in the final smelting process. For secondary metal, the cost of electricity is about 90% less than for primary metal from the raw material, bauxite, according to the US Aluminum Association. For copper, the energy saving is more than half.

Over time, it has become increasingly difficult to find new mines with high grades and long life in accessible locations with good transport links and a political framework to exploit the resources. These factors and increasing demand have encouraged producers to look at "urban mining" for metal in the form of scrap.

In addition to the economic pressure to recycle metal products, governments are introducing legislation to encourage industry and individuals to recycle more of all our resources. Not only do these policies preserve resources but they also reduce the need for landfilling of obsolete products. Many consumer products must now be designed so that, at the end of their life, it is possible to recycle the majority of the components.

1.2 Uses of copper and aluminium

Both copper and aluminium are vital resources for most of the key industrial sectors, in particular:

- Building and construction
- Electrical
- Transportation
- Packaging (for aluminium)

In some applications, there has been substitution by other materials such as plastics. In many of these sectors, copper and aluminium are usually the best materials available.

1.3 Macroeconomic background

In the last 70 years, there has been generally favourable growth in GDP and industrial production compared with the decades that preceded the Second World War. After that war, there was a golden period of reconstruction and high growth for a quarter of a century until the first energy crisis when the oil price quadrupled in November 1973. Western Europe, the USA and Japan accounted for most of the economic growth but the other Asian tigers, South Korea and Taiwan, also grew strongly. The deep recession in the mid-1970s was followed by another energy price hike and subsequent deep recession at the end of the 1970s and in the early 1980s. This was followed by a period of slower growth in the 1980s which, as far as the metals industry was concerned, resulted in low demand growth, low metal prices, and consequently low profitability and lack of investment in new capacity.

By the 1990s, world economic growth was recovering and China emerged as a major global player both in terms of rapid industrialisation and economic growth. The scale of the switch from an agricultural economy to a major consumer of investment and consumer goods represented a huge market for Western producers in the period 2000 to 2010. China invested in massive infrastructure projects from ports, airports, power stations to buildings, road construction and industrial plants to produce steel, chemicals and eventually consumer goods. Initially, China represented a massive market for suppliers of raw materials as the country has been well blessed with a few raw materials (e.g. rare earths) but remains a large importer of metal ores, concentrates and other raw materials. In building new infrastructure, China invested in large, often fully-integrated metals plants, some based at deep-water ports where internal freight costs could be minimised. Thus, China may be a net importer of raw materials but became an efficient producer and exporter of metal-containing finished products.

1.4 Stages of economic growth and scrap usage

Since 2010, there have been signs that the economic growth in China is moving to the next stage where the major investments in infrastructure have been largely made for the time being and some of the growth will be replacement demand; also, service industries in the economy are expected to play a greater role. China is no longer the low-cost producer of 10 years ago and some economic activity has moved to lower-cost producers in Asia such as Vietnam which, with a population of 100 million, is a thriving economy. India has also emerged as an engine of economic growth in Asia but, as yet, not on the scale of China.

In general, there is a positive correlation between the level of economic activity and the use of recycled materials, so major economies like the USA and China will be leading users of recycled materials.

There is also a relationship between the stage of economic growth and the generation or supply of recycled materials. In mature economies including the USA, Japan and much of Western Europe, over half a century of high economic activity means that replacement demand and service industries are a large part of growth, so end-of-life recycling of consumer and capital goods is well established because much of the demand is to replace the car, washing machine or TV with a newer model. Among the mature economies, there is also a pattern of net exporters of consumer goods (Japan) and net importers (the USA). This can lead to patterns of some recycling of finished goods in the country to which they were exported rather than in which they were produced. So in some metals, even among mature economies, there were periods of net exporters of recycled materials (the USA) and net importers (Japan). The charts of the trade flows show the current situation.

Finally, in the less mature economies particularly in Asia, including China, there is the aspirational growth in demand. The aspiring consumer who has moved from an agricultural job to a higher-paid industrial or administrative job starts with public transport or a bicycle before moving on to a motorbike and, a few years later, to a small car. He is not trading in old for new; he is a first-time buyer and so the pool of recycled obsolete goods does not yet exist. These economies are places of strong demand for recycled materials and this too can be seen from the trade flows.

CHAPTER 2

HISTORICAL GROWTH OF COPPER PRODUCTION AND CONSUMPTION

2.1 Copper demand

Demand for refined copper has grown dramatically over the last 50 years with the construction of infrastructure, the development of electronics and the need for better transport links. Copper is an essential part of modern life and the increased demand has led the industry to search for new sources of supply which include opening new mines, expanding existing mines and developing methods of reusing old metal in the form of scrap.

In 1970, total world demand for refined copper was just over 7 million tonnes. By 2015, this total had more than trebled to almost 23 million tonnes. Traditionally, copper demand is measured at the point where a copper ingot or cathode is converted into a sheet, a rod, a tube or a piece of wire. The regional patterns of demand have changed dramatically over the last half century. Early in the industrialisation process, countries need to develop large infrastructure projects such as airports and housing which require enormous quantities of copper. Later in the cycle, demand for consumer goods including white goods, cars and computers become the norm but these sectors have a reduced need for copper. As the economy matures, the service industries become more important and demand is largely for replacement goods which reduces the rate of growth for copper. This regional pattern can be seen clearly in the table on the following page with the decline in importance of Europe and the USA and the dramatic increases in China and the rest of Asia.

TABLE 1: REGIONAL DEMAND FOR COPPER (% OF TOTAL)

	Europe	Africa	China	Other Asia	USA	Other America	Australasia	Global demand million tonnes
1970	52	1	2	13	25	5	2	7.3
1980	50	1	4	16	20	8	1	9.4
1990	43	1	5	25	20	5	1	10.8
2000	30	1	13	27	20	8	1	15.2
2010	20	1	38	25	9	6	1	19.3
2015	16	1	50	20	8	5	0	22.8

Source: WBMS

Whilst the increase in demand for refined copper encourages higher production, it is also a factor in the availability of old scrap for secondary refining. Old scrap from obsolete products can take between 10 and 50 years to become available for secondary refining. Hence it may be some time before China can generate the amount of scrap it needs for its refineries and will continue to need to import it from around the world.

Production of refined copper has grown by an average of 2.4% per annum since the turn of the century whilst mine production has risen by 2.2% per annum. As a result, the requirement for scrap at refineries and smelters, which is the difference between the two series, has grown on average by 3.6%.

TABLE 2: GLOBAL PRODUCTION OF COPPER 2000 TO 2015 IN THOUSAND TONNES

	Mine Production	Refined Production	Difference
2000	13 244	14 798	1 554
2001	13 762	15 657	1 895
2002	13 549	15 318	1 769
2003	13 636	15 215	1 579
2004	14 676	15 812	1 136
2005	15 099	16 652	1 553
2006	15 173	17 344	2 171
2007	15 538	17 997	2 459
2008	15 653	18 422	2 769
2009	15 864	18 550	2 686
2010	16 114	19 215	3 101
2011	16 263	19 818	3 555
2012	16 963	20 355	3 392
2013	18 264	21 083	2 819
2014	18 476	22 926	4 450
2015	19 320	23 054	3 734

Source: WBMS

Most of the refined copper production increase between 2000 and 2015 was in China. Chinese production was just 1.4 million tonnes in 2000 but rose to almost 8 million tonnes in 2015, which was almost a third of the world output. Mine output in China has risen by 180% over the same period and now accounts for about a quarter of the world figure. In absolute terms, the gap between mine production plus imported new raw materials and refined production in China grew from 0.2 million tonnes in 2000 to almost 2.7 million tonnes in 2015 and this can only be filled by the recovery of metal from scrap. For the rest of the world, mine production grew by 33% to 17.7 million tonnes and refined production by 12% to 15 million tonnes.

2.2 Flow of copper through the value chain

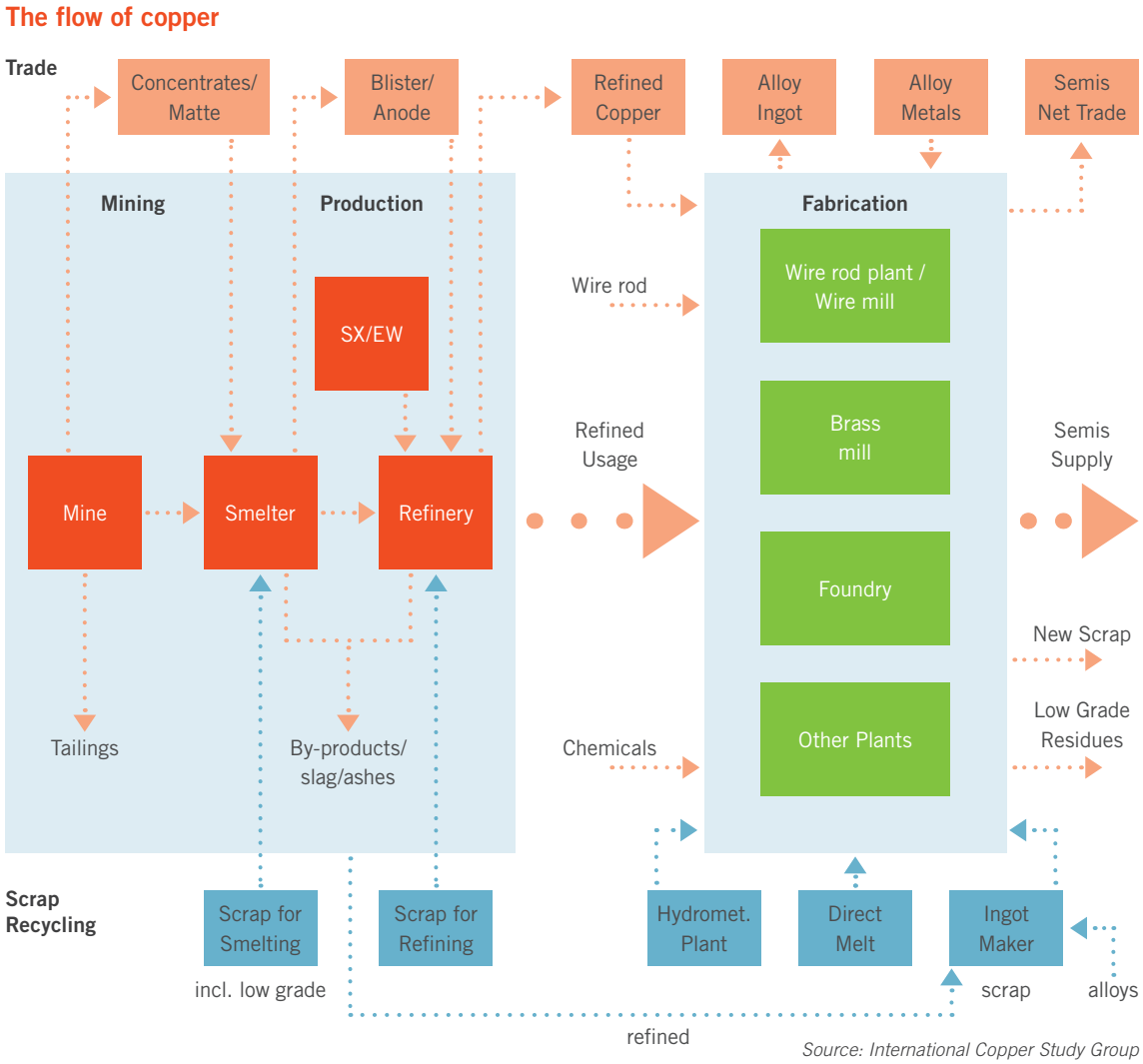
The International Copper Study Group (ICSG) has prepared a comprehensive flow diagram of the inputs in the form of raw materials and scrap throughout the supply chain. This is reproduced on the following page and illustrates where scrap can be used in the refining and use of copper metal.

Primary copper production starts with the extraction of copper-bearing ores. There are three basic ways of copper mining: surface, underground mining and leaching. Open-pit mining is the predominant mining method in the world. After the ore has been mined, it is crushed and ground, and then followed by a concentration by flotation. The obtained copper concentrates typically contain around 30% copper, but grades can range from 20 to 40%. In the following smelting process, sometimes preceded by a roasting step, copper is transformed into a "matte" containing 50-70% copper. The molten matte is processed in a converter, resulting in a so-called blister copper of 98.5-99.5% copper content. In the next step, the blister copper is fire-refined in the traditional process route or, increasingly, remelted and cast into anodes for electro-refining. The output of electro-refining is refined copper cathodes, assaying over 99.99% copper. Alternatively, using the hydrometallurgical route, copper is extracted from mainly low-grade oxide ores, and also some sulphide ores, through leaching (solvent extraction) and electrowinning (SX-EW process). The output is the same as through the electro-refining route – refined copper cathodes. The ICSG estimated that, in 2013, refined copper production from SX-EW represented 18% of total refined copper production.

Refined copper production derived from mine production (either from metallurgical treatment of concentrates or SX-EW) is referred to as "primary copper production", as obtainable from a primary raw material source.

However, there is another important source of raw material which is scrap. Copper scrap derives either from metals discarded in semis fabrication and finished product manufacturing processes ("new scrap"), or from obsolete end-of life products ("old scrap"). Refined copper production attributable to a recycled scrap feed is classified as "secondary copper production". Secondary producers use processes similar to those employed for primary production. The ICSG estimated that, at the refinery level in 2013, secondary copper refined production reached 18% of total refined copper production.

FIGURE 1: THE STAGES OF COPPER PRODUCTION



Source: International Copper Study Group

2.3 Copper scrap usage at smelters and semi manufacturers

The flow sheet on the following page demonstrates where scrap enters the process for copper.

Scrap is generated at all stages of the metal production and usage process. It is not waste but remains a valuable and re-usable resource. Processing of scrap is always less expensive than the production of new metal from raw materials extracted from the earth. For this reason, where quality standards permit, scrap will always be used before new mined materials.

Scrap is generally divided into three types – old scrap, new scrap and runaround scrap. **Old scrap** is collected from obsolete goods like washing machines and cars. It generally requires re-processing into new metal through a smelter or a refinery. This is called secondary metal and is usually close in quality to primary metal which is refined from ores.

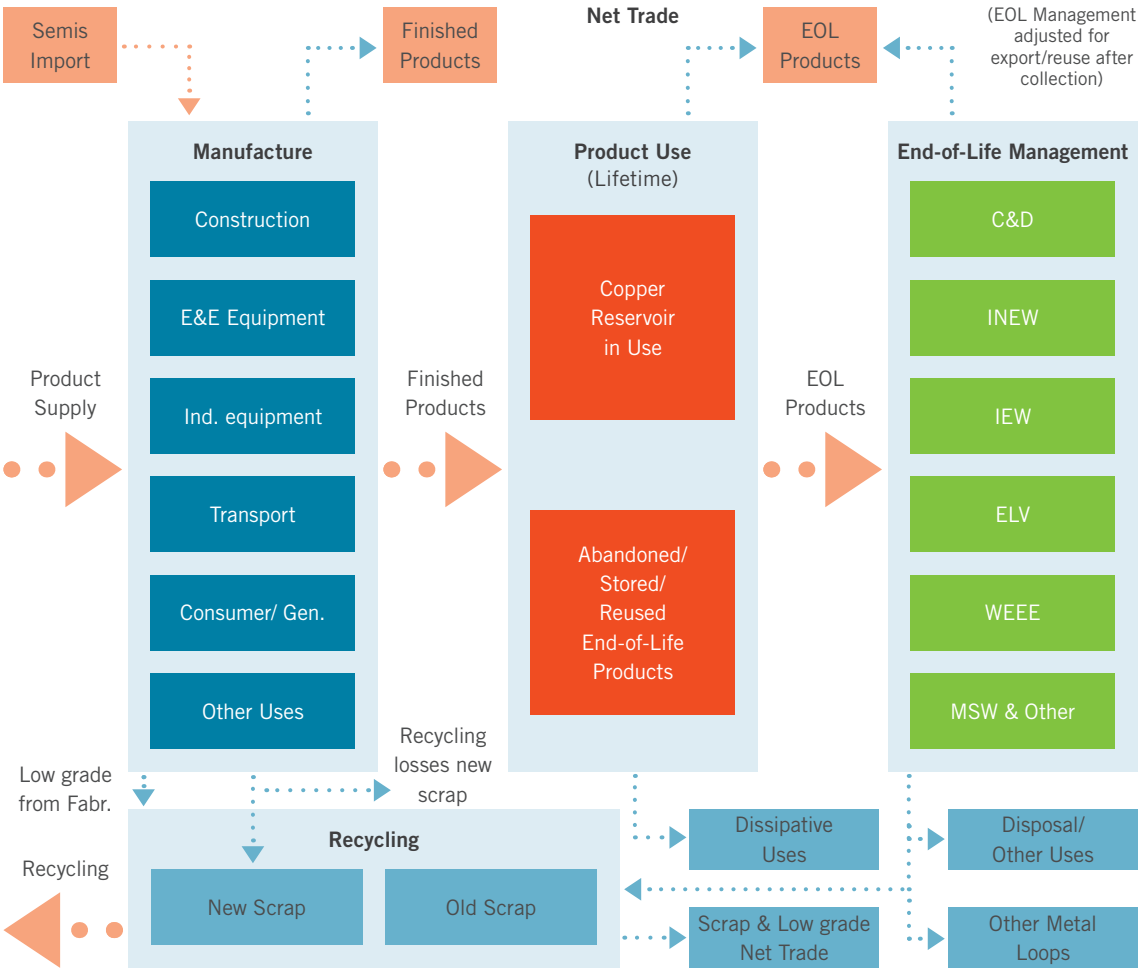
New scrap is usually generated by producers of industrial or consumer goods. It may also arise from a rolling or drawing process. The quality of the metal remains high and the material may be directly used, refined or remelted. Re-use of this material is termed direct use of scrap.

Scrap arises at a manufacturing plant and can simply be collected and put back into the process. This is called **runaround scrap**. Since this is simply an internal transfer, data on this material are rarely available.

Secondary scrap production can be calculated by deducting the copper content of mine production (including solvent extraction/electrowon) from the total amount of refined copper production. This method does not allow for bottlenecks in the system or unreported inventory changes but since there are very few reported data, it is the best methodology available. The table on page 17 shows the available data for the years 2000 to 2015.

FIGURE 2: THE USES AND SCRAP ARISING OF COPPER

The flow of copper (continued...)

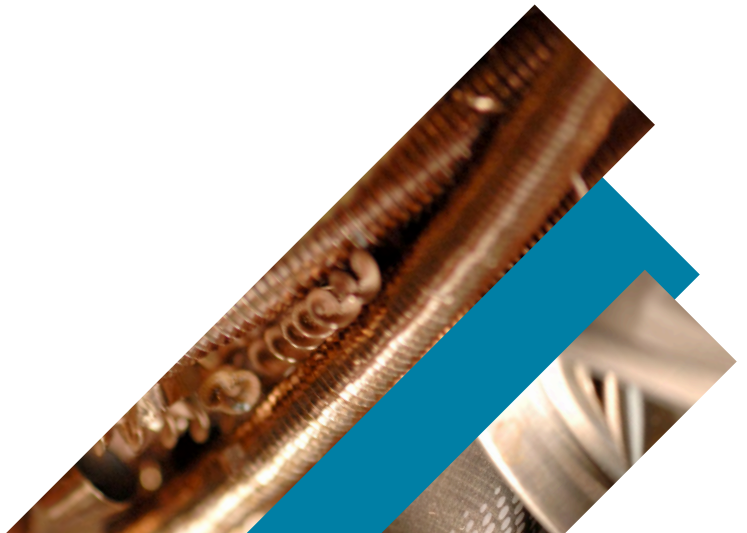


Source: International Copper Study Group

TABLE 3: SECONDARY REFINING OF COPPER 2000 TO 2015 IN THOUSAND TONNES

	Europe	Africa	China	Other Asia	NAFTA	Other America	Oceania	World
2000	1 069	4	348	238	274	70	0	2 003
2001	1 076	4	307	219	216	52	0	1 874
2002	955	4	380	333	95	39	0	1 806
2003	912	4	426	350	115	36	0	1 843
2004	858	4	620	370	116	40	0	2 008
2005	846	4	744	417	113	41	0	2 165
2006	871	4	999	361	115	43	0	2 393
2007	889	4	1 136	507	127	40	0	2 703
2008	927	4	1 080	484	131	38	0	2 664
2009	941	4	1 280	441	111	37	0	2 814
2010	985	4	1 620	483	105	39	0	3 236
2011	1 109	4	1 810	503	98	39	0	3 563
2012	1 051	4	1 880	560	98	41	0	3 634
2013	993	4	2 150	550	111	44	0	3 852
2014	908	4	2 221	540	114	38	0	3 825
2015	967	4	2 200	466	113	38	0	3 788

Source: WBMS



Production of refined copper from scrap almost doubled between 2000 and 2015, which compares with an increase of just over 55% in the output of metal from all sources. Regionally, the trend has been reduced secondary production from the traditional producers in Europe and the Americas and a sevenfold increase in China. Other Asian production of refined copper from scrap doubled over the period from 2000 to 2015.

Usage of direct scrap is calculated as the difference between consumption of refined copper and the copper content of copper products like tubes and wire, which are known as semi-manufactures. In recent years, data on the output of these products have proved much more difficult to obtain owing to company confidentiality. The table below gives estimates of the usage of scrap by copper semi manufacturers for the years between 2000 and 2015.

TABLE 4: DIRECT USE OF COPPER SCRAP 2000 TO 2015 IN THOUSAND TONNES

	Europe	Africa	China	Other Asia	NAFTA	Other America	Oceania	World Total
2000	1 116	33	228	1 307	1 091	132	41	3 948
2001	1 106	33	273	1 238	1 039	135	41	3 865
2002	1 105	33	500	1 310	958	102	47	4 055
2003	1 108	33	500	1 349	898	123	46	4 057
2004	1 165	24	540	1 513	922	135	42	4 341
2005	1 145	24	680	1 542	914	137	39	4 481
2006	1 250	24	680	1 617	932	141	36	4 680
2007	1 200	24	860	1 714	887	136	37	4 858
2008	1 150	24	820	1 680	807	149	38	4 668
2009	900	24	720	1 568	737	130	33	4 112
2010	1 000	24	780	1 710	735	164	35	4 448
2011	1 000	24	790	1 645	741	150	30	4 380
2012	1 108	24	870	1 631	887	156	28	4 704
2013	1 108	24	600	1 627	894	148	21	4 422
2014	1 108	24	740	1 627	908	148	12	4 567
2015	1 107	24	700	1 630	909	148	12	4 530

Source: WBMS

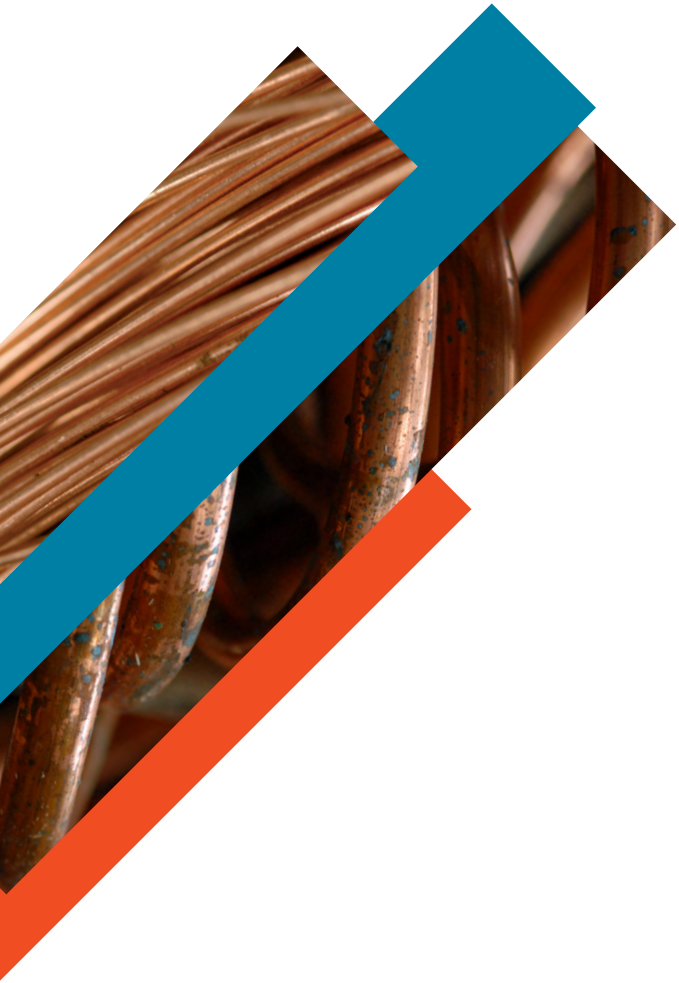
Very few data exist for the most recent years and only two organisations make any real attempt to survey the whole industry: the Copper Development Association (CDA) in the USA and the Japan Mining Association. The direct scrap share of total copper consumption is summarised in the table below.

TABLE 5: DIRECT USE OF COPPER SCRAP 2000 TO 2015 (% OF TOTAL COPPER USAGE)

	Japan	USA
2000	38.3	26.7
2001	39.9	27.2
2002	34.3	28.8
2003	34.4	28.2
2004	33.3	27.7
2005	32.9	28.8
2006	32.3	30.8
2007	31.7	29.5
2008	32.4	28.7
2009	32.5	31.0
2010	32.7	29.9
2011	34.3	30.5
2012	33.4	33.5
2013	34.5	32.9
2014	33.7	34.0
2015	34.6	33.6

Sources: CDA and Japan Mining Association

Direct scrap's share of total copper usage in these two countries is around one third. For Europe, the share is believed to be slightly lower at 25% to 30% and for China it is currently only about 10%. Domestic scrap is a scarce resource in China and hence the semi manufacturers tend to use more refined copper than any of the more mature economies.



CHAPTER 3

HISTORICAL GROWTH OF ALUMINIUM PRODUCTION AND CONSUMPTION

3.1 Aluminium demand

Most aluminium scrap is used in secondary aluminium smelting to produce secondary metal. This material is treated at a smelter but requires considerably less energy than new aluminium produced from bauxite. At this smelter stage, a small amount of primary aluminium is added to the mix to improve the quality. The data in the table below relate to metal produced at secondary smelters and are not believed to include any scrap processed at primary plants.

The aluminium industry is relatively new compared with copper and the historical growth rates have been much more dramatic than for copper. In 1970, global demand for aluminium from both primary and secondary sources was 12.7 million tonnes. By 2015, this had grown to about 73 million tonnes. Bauxite, the raw material for aluminium production, is the most common metallic ore found in the earth's crust and the aluminium industry has expanded mine capacity by more than 350% over the last 50 years.

Production of secondary refined metal is under-reported since the available data refer to secondary smelters only. There are no reports on the volume of secondary metal used at primary smelters. The reported data suggest that secondary production at smelters remains at around one fifth of the total output of aluminium and that total output has grown by more than 470% over the last 50 years. Chinese production of primary and secondary aluminium grew from just 200 000 tonnes in 1970 to over 37 million tonnes in 2015. In China, reported secondary output is less than 17% of total output. For the rest of the world, secondary output is around 26% of the total output. Chinese imports of aluminium and alloy scrap were 2.1 million tonnes in 2015, thus limiting their ability to produce secondary aluminium. China's total production is currently just over 50% of the world's output.

TABLE 6: REGIONAL DEMAND FOR ALUMINIUM (% OF TOTAL)

	Europe	Africa	China	Other Asia	USA	Other America	Australasia	Global demand million tonnes
1970	44.969	0.617	1.799	11.978	35.393	3.984	1.260	12.5
1980	43.750	1.005	2.795	15.028	30.553	5.443	1.426	19.7
1990	39.831	1.062	3.373	22.070	26.323	5.303	2.038	25.5
2000	29.401	1.126	11.022	21.158	28.433	7.307	1.553	33.5
2010	22.605	1.454	34.157	20.515	11.965	8.409	0.895	49.9
2014	18.235	1.454	48.739	12.714	11.675	6.425	0.758	59.6

Source: WBMS

The above table refers to demand for unwrought aluminium from primary and secondary aluminium smelters.

Over the last 45 years, Chinese demand for primary aluminium has grown dramatically and now accounts for more than half the world's usage of the metal. Over the same period, European demand has fallen from almost 45% to 15% of the world total and the USA's demand share has dropped from 35% to 9%.

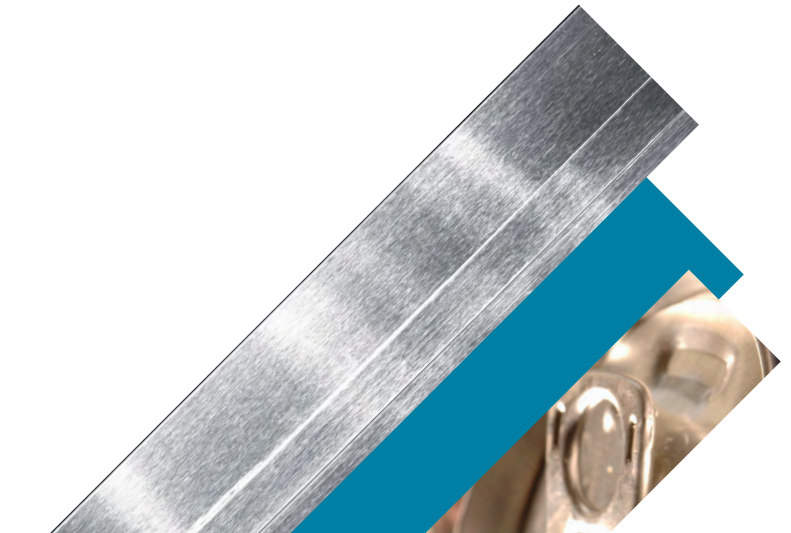


TABLE 7: PRODUCTION OF PRIMARY AND SECONDARY ALUMINIUM IN THOUSAND TONNES

		Europe	Africa	China	Other Asia	USA	Other America	Oceania	World Total	%
1970	Primary	4 081	165	180	933	3 607	1 130	206	10 302	81
	Secondary	828	10	3	375	1 062	81	24	2 383	19
	Total	4 909	175	183	1 308	4 669	1 211	230	12 685	
1980	Primary	6 669	437	358	1 567	4 654	1 891	460	16 036	82
	Secondary	1 281	27	3	744	1 249	147	40	3 491	18
	Total	7 950	464	361	2 311	5 903	2 038	500	19 527	
1990	Primary	7 836	598	854	1 166	4 048	3 353	1 492	19 347	79
	Secondary	1 740	34	7	1 168	1 834	214	38	5 035	21
	Total	9 576	632	861	2 334	5 882	3 567	1 530	24 382	
2000	Primary	7 790	1 176	2 794	2 363	3 668	4 537	2 090	24 418	74
	Secondary	2 627	43	195	1 303	3 450	712	110	8 440	26
	Total	10 417	1 219	2 989	3 666	7 118	5 249	2 200	32 858	
2010	Primary	8 643	1 742	16 244	5 606	1 727	5 270	2 272	41 504	78
	Secondary	2 390	32	4 000	1 789	2 682	965	77	11 935	22
	Total	11 033	1 774	20 244	7 395	4 409	6 235	2 349	53 439	
2015	Primary	7 897	1 687	31 410	8 583	1 587	4 204	1 980	57 348	79
	Secondary	2 906	32	6 200	2 075	3 456	945	0	15 614	21
	Total	10 803	1 719	37 610	10 658	5 043	5 149	1 980	72 962	

Source: WBMS

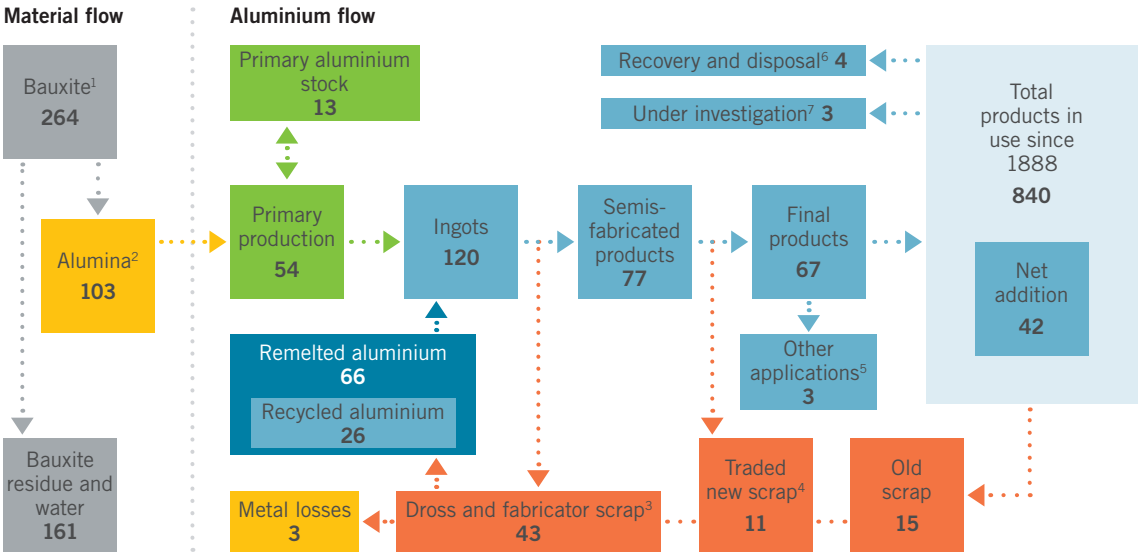
Regionally, Europe produced around 40% of the world's aluminium in 1970 but only 15% by 2015. For the USA, the fall was from 37% in 2000 to 7% in 2015.

Worldwide, secondary aluminium production was around 15.6 million tonnes in 2015 which is about 22% of the total metal produced from bauxite and scrap (see table 7). In China, secondary accounts for 16% of the total metal produced; this proportion is likely to grow as more domestic scrap becomes available to Chinese secondary smelters.

3.2 Flow of aluminium through the value chain

The International Aluminium Institute (IAI) has produced a flow sheet showing where aluminium scrap can be used in the production of aluminium metal and semi manufactures. The processes use either bauxite or scrap as the feed material. The values, shown in Figure 3, all in millions of tonnes, are IAI estimates for 2014. There is no detailed country analysis of the data available and the IAI figure for recycled aluminium is 26 million tonnes. The flow chart remains a valuable tool in explaining the processes involved in the production and use of aluminium metal.

FIGURE 3: GLOBAL ALUMINIUM FLOW 2014 IN MILLION TONNES



Values in millions of metric tonnes. Values might not add up due to rounding. Source: International Aluminium Institute

1 Calculated. Includes depending on the ore between 30% and 50% alumina

2 Calculated. Includes, on a global average, 52% aluminium

3 Scrap generated by foundries, extruders and rolling mills. Most is internal scrap and not taken into account in statistics.

4 Scrap generated during the production of finished products from semis.

5 Such as deoxidation aluminium (metal property is lost)

6 Either incinerated with / without energy recovery, material recovery or disposal

7 Area of current research to identify final aluminium destination (re-use, recycling, recovery or disposal)

Bauxite is processed in a refinery to produce alumina which is an oxide or hydroxide of aluminium. It takes approximately two tonnes of bauxite to make one tonne of alumina. The alumina is further processed in a smelter to produce primary aluminium. It takes two tonnes of alumina to make one tonne of aluminium metal. Aluminium metal is frequently alloyed with other metals like magnesium, and for these products it is possible to use scrap as a feed for the aluminium part of the alloy.

3.3 Aluminium scrap usage at smelters

The following table shows the production of secondary aluminium for the years 2000 to 2015. Regular reports are received from Japan, the USA and some European countries. Other countries' figures are estimated on the basis of national production and trade in scrap.

TABLE 8: SECONDARY ALUMINIUM PRODUCTION 2000 TO 2015 IN THOUSAND TONNES

	Europe	Africa	China	Other Asia	USA	Other America	Oceania	World Total
2000	2 588	43	145	999	3 413	748	110	8 046
2001	2 575	32	287	1 238	2 965	697	127	7 921
2002	2 590	32	1 300	1 329	2 958	689	127	9 025
2003	2 532	32	1 450	1 316	3 210	737	76	9 353
2004	2 669	32	1 660	1 100	3 329	719	88	9 597
2005	2 775	32	1 940	1 128	3 334	763	73	10 045
2006	2 863	32	2 350	1 129	3 368	835	78	10 655
2007	2 933	32	2 750	1 194	3 888	813	102	11 712
2008	2 650	32	2 600	1 162	3 264	885	115	10 708
2009	2 063	32	3 100	738	3 090	870	84	9 977
2010	2 390	32	4 000	915	2 682	965	77	11 061
2011	2 837	32	4 400	827	3 044	966	80	12 186
2012	2 772	32	4 800	2 010	3 431	951	79	14 075
2013	2 783	32	5 200	2 089	3 482	945	127	14 658
2014	2 873	32	5 650	2 141	3 637	975	20	15 328
2015	2 906	32	6 200	2 075	3 456	945	0	15 614

Source: WBMS

Secondary aluminium production increased from 8 million tonnes in 2000 to 15.6 million in 2015. Europe and the USA showed little change. China's total increased by 6 million tonnes and the rest of Asia by 1.1 million tonnes.

Both the US Aluminum Association and the Japan Aluminium Alloy Refiners Association publish data on the output of secondary aluminium. The table below shows Japanese production of secondary aluminium by type of scrap.

TABLE 9: JAPANESE SECONDARY ALUMINIUM PRODUCTION IN THOUSAND TONNES

	2000	2005	2010	2015
Production of primary	7	0	0	0
Production of secondary	910	1 039	817	773
Total	**917**	**1 039**	**817**	**773**
Of which from:				
Aluminium scrap	91	86	85	76
Alloy scrap	621	731	548	575
Remelt	153	207	190	149
Aluminium dross	80	81	63	64
Other/alloying metal	69	80	61	75
Total	**1 014**	**1 185**	**947**	**939**

Source: Japan Aluminium Alloy Refiners Association

There is currently no primary aluminium production in Japan and output is exclusively from scrap. The majority of the scrap used is alloyed material and recovery rates are around 85% to 90%. In recent years, secondary aluminium production in Japan has accounted for about one quarter of the country's demand for aluminium metal.

Data published by the US Aluminum Association show the consumption of scrap and the metal recovered from it. Metal recovery rates from scrap are around 80% to 85% and secondary metal accounts for between 35% and 40% of the national demand for aluminium metal.

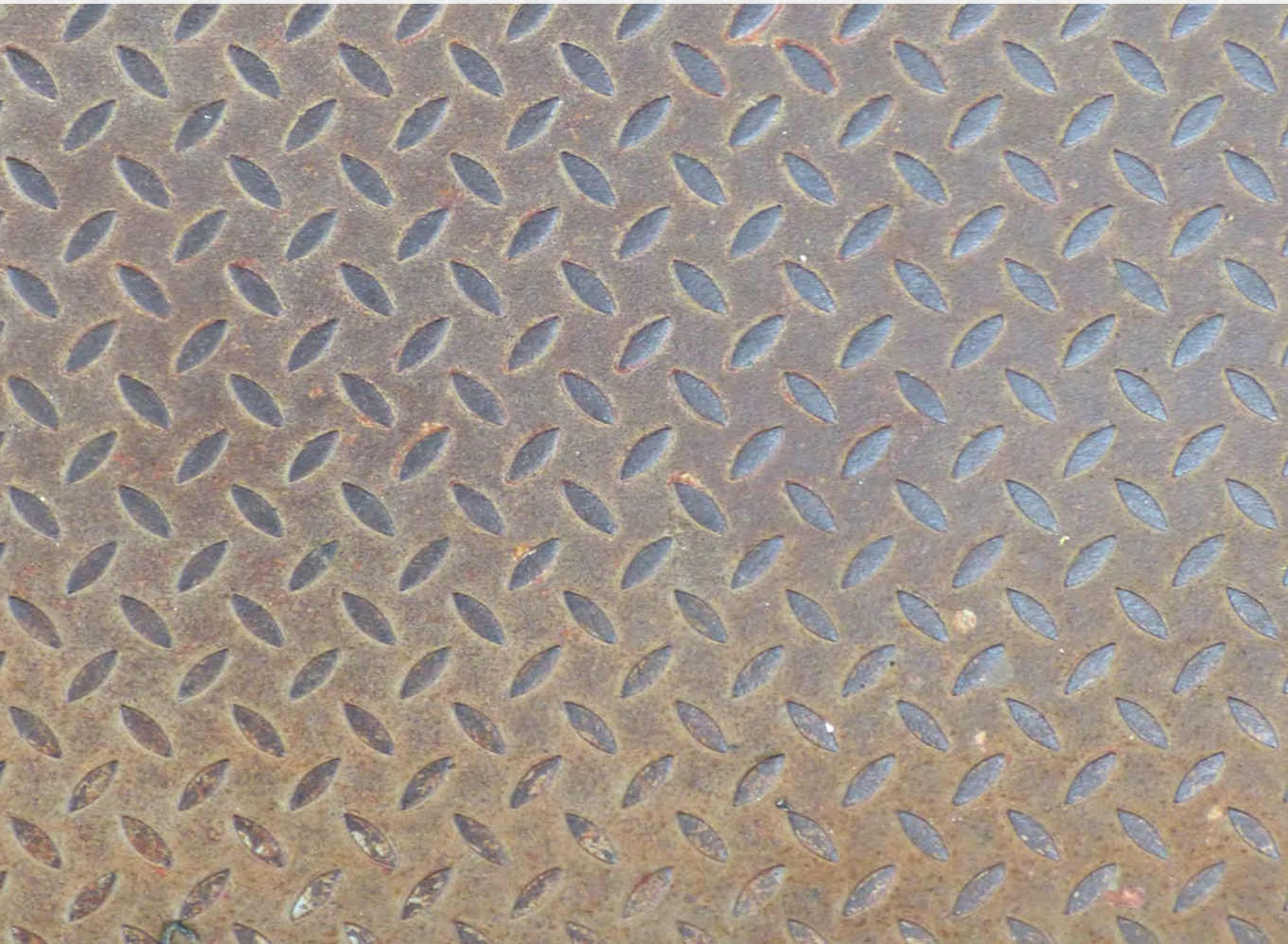
TABLE 10: USAGE OF ALUMINIUM SCRAP IN THE USA IN THOUSAND TONNES

	Scrap Consumption	Metallic Recovery	New	Old
2002	3 620	2 920	1 750	1 170
2003	3 519	2 851	1 720	1 131
2004	3 656	3 030	1 830	1 200
2005	3 544	2 990	1 926	1 064
2006	4 322	3 536	2 284	1 252
2007	4 580	3 747	2 219	1 528
2008	4 144	3 319	1 975	1 344
2009	3 721	3 100	1 849	1 251
2010	3 374	2 804	1 553	1 251
2011	3 736	3 029	1 631	1 398
2012	4 076	3 430	1 810	1 620
2013	4 114	3 482	1 850	1 633
2014	4 400	3 637	1 932	1 705
2015	4 520	3 456	1 870	1 586

Source: US Aluminium Association

CHAPTER 4

INTERNATIONAL TRADE



4.1 Trade definitions

Sections 5 and 6 examine global copper scrap and aluminium scrap flows as measured by individual national customs authorities. The analysis concentrates largely on extra-regional flows of scrap which excludes any exports shipped within the same continent or economic bloc.

For the purposes of this report, trade recorded under the tariff headings 740400 (copper and alloy scrap) and 760200 (aluminium and alloy scrap) have been used. These categories include scrap shipped in gross weight terms. This means that alloying metals and coatings will be included in the total weight of material shipped. On average, the material shipped under these codes will contain roughly 60% copper and 70% aluminium. Other tariff headings covering mixed scrap have been excluded from the analyses as there is no way of evaluating how much copper may be included under these headings.

It is important to understand the way the data are collected and the significance of national differences in the definition of trade and the products they cover.

All countries need to measure the imports and exports of goods and services in order to calculate the balance of payments data. In 1988, a worldwide coding system known as the Harmonised System was introduced and has now been adopted in virtually all countries. The first six digits of the code are common to all countries but additional digits may be used by individual countries to further sub-divide the products.

There are key differences in the definitions used by countries that affect the way the data are collected. In some cases, a shipment may be delivered to a country for onward transportation to another state. In this case, the final receiving country can either register the trade by the country of origin or the country of consignment. As a result of this, the same cargo of scrap metal can be recorded more than once along its journey. Another issue is the treatment of shipments directly into a bonded warehouse. Some countries record these trades as an import as soon as the product crosses the border and others at the point where the material is delivered to the end user. Finally, there are leads and lags between the timing of export shipment and the point at which it is registered as an import. For these reasons, it is rare that the export data from one shipping country will exactly match the corresponding import statistics for the receiving country.

In this report, both import and export data will be reviewed. Scrap trade is only one part of the flow of secondary material since it excludes domestic scrap arisings that are used within the country of collection. However, it does provide an insight into how the external scrap market works.

CHAPTER 5

TRADE IN COPPER AND ALLOY SCRAP

5.1 Regional copper and alloy scrap trade flows

Copper and alloy scrap is traded internationally by many countries. For the purpose of this study, we have included data for trade statistics from 176 countries.

Regional flows of copper and alloy scrap as reported by the import and export statistics are measured in gross weight terms, which means that the total weight exported includes other metals as part of an alloy. It is difficult to assess what percentage of copper is contained in these exports but it is generally assumed that copper scrap is 100% copper and alloy scrap is around 65% copper. On average, it is assumed that the mixed copper and alloy scrap contains around 80% copper.

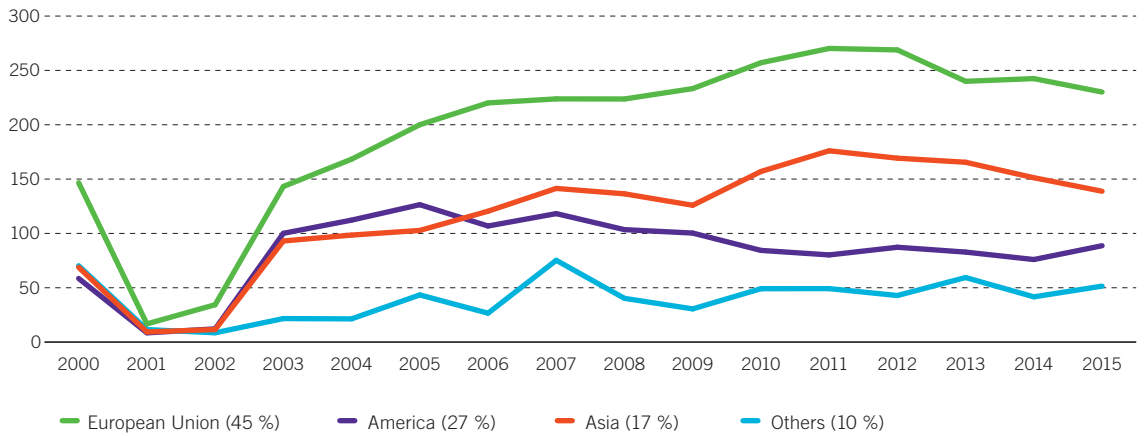
For each of the last 15 years, the USA has been the single largest exporter of copper and alloy scrap, accounting for between 14% and 22% of global exports. The next six largest exporters, all mature economies, regularly contributed a further 30% to 36% of global exports. The top seven (the USA, Germany, Japan, France, the Netherlands, the UK and Italy) jointly accounted for more than half of the world's exports of copper scrap. Exports of scrap from Asian countries including South Korea, Thailand and Saudi Arabia have increased by 54% since 2000 but are still small compared with the top seven countries.

5.2 Copper and alloy scrap exports

Total exports grew at an annual rate of 4% over the 15 years under review. Overall, the 28 countries of the European Union have consistently exported the most copper and alloy scrap, although the bulk of this material is shipped to other EU member states. America continues to be a strong exporter, accounting for between 20% and 36% of global trade. Asian countries, outside China and the Middle East, had started to become a major force in the export of scrap up to 2006 but have become less significant in the last few years as the domestic market became stronger.

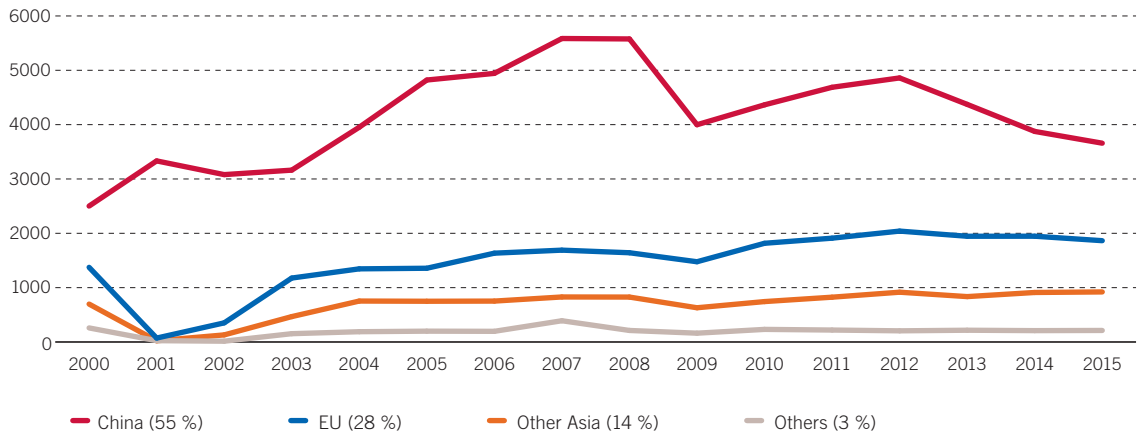
Global shipments fell by 14% in 2015 from the high of 5.8 million tonnes in 2011. In absolute terms, the greatest falls were recorded in the European Union and Asian countries outside China and the Middle East.

FIGURE 4: REGIONAL EXPORTS OF COPPER AND ALLOY SCRAP 2000 TO 2015 IN THOUSAND TONNES



Figures in brackets are regional percentages for 2015. Source: National Customs Statistics via Global Trade Tracker

FIGURE 5: REGIONAL IMPORTS OF COPPER AND ALLOY SCRAP 2000 TO 2015 IN THOUSAND TONNES



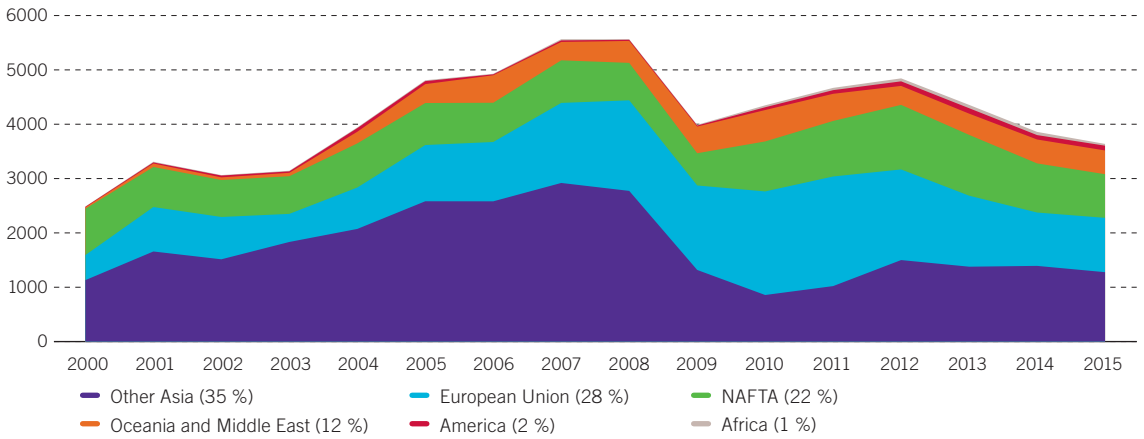
Figures in brackets are regional percentages for 2015. Source: National Customs Statistics via Global Trade Tracker

5.3 Copper and alloy scrap imports

Global imports of copper scrap have been consistently higher than recorded exports for all of the period under review. The differences are considerable, with total imports exceeding exports by more than half in the early years and by about one third in the last five years. The main reason for the discrepancy is that Chinese reported imports appear to be substantially overstated. Deliveries from other countries to China are significantly lower than in the official Chinese data. It is possible that there may be some misclassified material included in the Chinese import data. Consequently, it is believed that the global export data are more accurate than the corresponding import statistics.

China is the main importer of copper and alloy scrap and for many years has driven the trade in this material. The following chart shows Chinese imports in 2015 by region of origin. Over the period, the proportion of scrap imported from other Asian countries has declined and the European Union share has increased. In absolute terms, the volume of imports of copper scrap into China peaked in 2008 when total imports were approaching 5.6 million tonnes but this total had declined to 3.6 million tonnes in 2015.

FIGURE 6: CHINESE COPPER SCRAP IMPORTS 2000 TO 2015 BY REGION OF ORIGIN IN THOUSAND TONNES



Figures in brackets are regional percentages for 2015. Source: National Customs Statistics via Global Trade Tracker

5.4 Extra-regional trade in copper and alloy scrap

Intra-regional trade is defined as exports of a product by one member of a regional group to another member of the same group (eg European Union or NAFTA). Exports to countries outside the group are called extra-regional trade and this section looks at this part of the exports only.

The table below shows extra-regional exports only for the years 2000, 2005, 2010 and 2015. The second section is a summary of these exports analysed by trading partner (ie the importer).

TABLE 11: SUMMARY OF COPPER IMPORTS AND EXPORTS BY REGION IN MILLION TONNES

	2000	2005	2010	2015
Exports				
NAFTA	0.4	0.8	1.2	1.1
Other America	0.1	0.1	0.2	0.0
Other Asia	0.3	0.8	0.6	1.2
European Union	0.5	0.9	1.2	1.0
Other Europe	0.1	0.1	0.2	0.1
Others	0.3	0.4	0.4	0.5
Total	**1.7**	**3.1**	**3.8**	**3.9**
Delivered to:				
China	0.9	2.2	2.8	2.4
Other Asia	0.4	0.6	0.6	0.5
European Union	0.2	0.2	0.3	0.5
Others	0.2	0.1	0.1	0.5
Total	**1.7**	**3.1**	**3.8**	**3.9**

Source: National Customs Statistics via Global Trade Tracker

Between one third and a half of all reported scrap exports are to nearby countries within that region. In 2015, for example, 2.1 million tonnes were traded between the groups and regions out of total reported exports of 6 million tonnes (see table 15). Exports recorded by NAFTA are currently the most significant, accounting for about one third of the total. The EU has been equally as important as NAFTA for the early years but has declined in 2015 (see table 11). Exports by countries in Africa and Oceania contribute only small quantities of exports and are shown on the table as others. China has been the dominant recipient of exported scrap taking 53% of the material in 2000 and rising to 62% in 2015. Deliveries to other Asian countries and to the EU have remained flat throughout the period.

The following four tables show the global exports by region of destination. All of the data are taken from national reported export data and the intra-regional trade has been highlighted in blue.

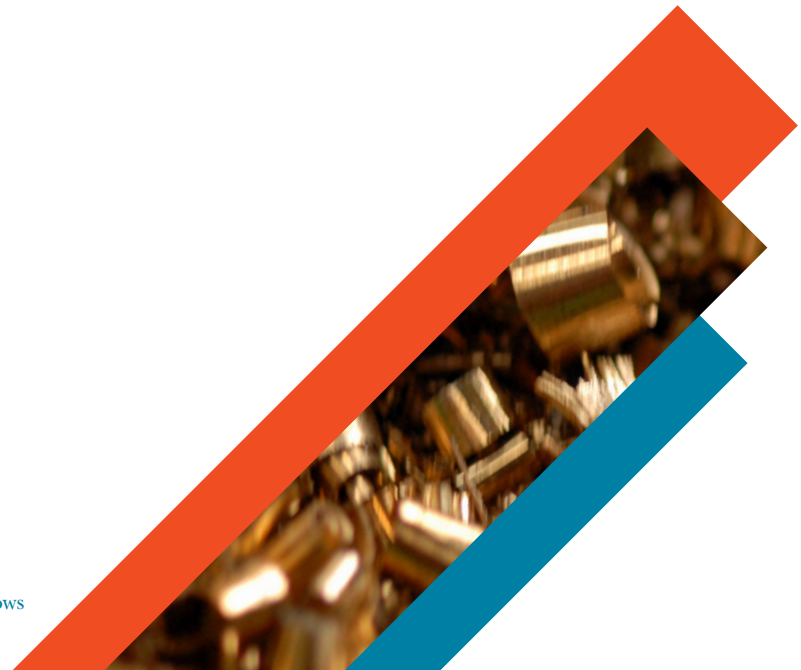


TABLE 12: EXPORTS OF COPPER AND ALLOY SCRAP 2000 IN THOUSAND TONNES

Exporting Region	Africa	NAFTA	Other America	China	Middle East	Other Asia	EU	CIS	Other Europe	Oceania	World Total	Of which Intra	Of which Extra
Importing Region													
Africa	9.1	0.2	0.0	0.0	0.0	0.1	0.9	0.1	0.0	0.0	10.4	9.1	1.3
NAFTA	1.6	220.5	11.6	0.0	0.3	2.7	14.4	0.3	0.4	0.1	251.9	220.5	31.3
Other America	0.1	3.3	2.5	3.4	0.0	0.0	1.8	0.1	0.0	0.0	11.2	2.5	8.8
China	20.4	231.2	21.4	0.0	1.9	277.2	270.5	67.6	9.0	15.6	914.8	0.0	914.9
Middle East	1.9	0.4	0.0	0.0	2.8	0.2	2.3	7.4	0.0	0.0	15.0	2.8	12.2
Other Asia	30.8	161.7	9.4	6.7	29.3	227.9	157.9	15.7	5.3	17.3	662.0	227.9	434.2
EU	44.0	20.0	9.2	0.0	3.8	4.3	994.0	82.9	69.7	0.4	1228.3	994.0	234.3
CIS	0.0	0.1	0.0	0.0	0.0	0.0	0.0	10.4	0.0	0.0	10.5	10.4	0.1
Other Europe	2.4	1.3	0.5	0.0	0.9	0.2	23.0	1.2	0.1	0.0	29.6	0.1	29.5
Oceania	0.1	0.2	0.0	0.0	0.0	0.4	1.2	0.0	0.2	3.1	5.2	3.1	2.0
Unspecified	2.1	0.2	4.1	0.0	23.0	1.9	0.1	0.3	0.1	0.0	31.8		
Intra region	9.1	220.5	2.5	0.0	2.8	227.9	994.0	10.4	0.1	3.1	1470.4		
Extra region	103.4	418.6	56.2	10.1	59.2	287.0	472.1	175.6	84.7	33.4	1700.3		
Total exports to:	**112.5**	**639.1**	**58.7**	**10.1**	**62.0**	**514.8**	**1466.1**	**186.0**	**84.8**	**36.5**	**3170.7**		

Source: National Customs Statistics via Global Trade Tracker

TABLE 13: EXPORTS OF COPPER AND ALLOY SCRAP 2005 IN THOUSAND TONNES

Exporting Region	Africa	NAFTA	Other America	China	Middle East	Other Asia	EU	CIS	Other Europe	Oceania	World Total	Of which Intra	Of which Extra
Importing Region													
Africa	2.7	0.0	0.0	0.0	0.3	0.0	0.6	0.0	0.0	0.0	3.6	2.7	0.9
NAFTA	0.8	158.9	14.2	0.0	0.1	0.7	7.4	0.0	0.1	0.0	182.2	158.9	23.3
Other America	0.1	0.4	2.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	2.7	2.0	0.7
China	23.3	584.4	51.7	0.0	36.0	768.0	641.1	7.2	22.4	80.4	2214.5	0.0	2214.5
Middle East	2.1	0.2	0.0	0.0	5.3	1.6	1.9	2.7	0.0	0.0	13.8	5.3	8.5
Other Asia	39.1	151.7	12.1	6.3	142.6	473.7	226.3	4.0	4.5	12.3	1072.6	473.7	598.9
EU	39.2	47.9	3.5	0.1	7.3	3.4	1071.7	5.4	85.1	1.5	1265.1	1071.7	193.4
CIS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	1.4	1.4	0.0
Other Europe	0.8	0.3	0.0	0.0	0.0	0.1	49.8	0.0	1.2	0.1	52.3	1.2	51.1
Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	1.0	1.9	1.0	0.9
Unspecified	9.4	0.0	22.7	0.0	3.8	6.2	0.3	0.1	0.2	0.0	42.7		
Intra region	2.7	158.9	2.0	0.0	5.3	473.7	1071.7	1.4	1.2	1.0	1717.9		
Extra region	114.8	784.9	104.2	6.4	190.1	780.0	928.5	19.4	112.3	94.3	3134.9		
Total exports to:	**117.5**	**943.8**	**106.2**	**6.4**	**195.4**	**1253.7**	**2000.2**	**20.8**	**113.5**	**95.3**	**4852.7**		

Source: National Customs Statistics via Global Trade Tracker

TABLE 14: EXPORTS OF COPPER AND ALLOY SCRAP 2010 IN THOUSAND TONNES

Exporting Region	Africa	NAFTA	Other America	China	Middle East	Other Asia	EU	CIS	Other Europe	Oceania	World Total	Of which Intra	Of which Extra
Importing Region													
Africa	2.7	0.4	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	3.4	2.7	0.7
NAFTA	0.1	142.3	40.0	0.0	0.1	1.5	20.2	1.0	0.0	0.0	205.2	142.3	62.9
Other America	2.1	1.6	2.8	0.0	0.7	0.3	0.5	0.4	0.0	0.0	8.4	2.8	5.6
China	39.7	955.6	143.7	0.0	54.4	538.4	968.3	3.7	11.4	68.3	2783.5	0.0	2783.5
Middle East	4.0	0.1	0.0	0.0	13.8	2.9	1.2	4.5	0.1	0.0	26.6	13.8	12.8
Other Asia	48.2	163.8	22.4	1.8	148.2	271.9	199.4	3.4	6.5	16.5	882.1	271.9	610.2
EU	22.1	84.2	23.2	0.4	15.7	19.5	1350.4	10.6	142.3	2.1	1670.5	1350.4	320.1
CIS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.8	0.0	0.0	12.8	12.8	0.0
Other Europe	0.6	0.8	0.0	0.0	13.3	0.0	14.2	1.1	0.6	0.0	30.6	0.6	30.0
Oceania	0.3	0.1	0.0	0.0	0.2	0.0	0.6	0.0	0.0	0.6	1.8	0.6	1.2
Unspecified	0.5	0.0	6.7	0.0	2.8	0.0	3.1	0.7	0.0	0.0	13.8		
Intra region	2.7	142.3	2.8	0.0	13.8	271.9	1350.4	12.8	0.6	0.6	1797.9		
Extra region	117.6	1206.6	236.0	2.2	235.4	562.6	1207.7	25.4	160.3	87.0	3840.8		
Total exports to:	**120.3**	**1348.9**	**238.8**	**2.2**	**249.2**	**834.5**	**2558.1**	**38.2**	**160.9**	**87.6**	**5638.7**		

Source: National Customs Statistics via Global Trade Tracker

TABLE 15: EXPORTS OF COPPER AND ALLOY SCRAP 2015 IN THOUSAND TONNES

Exporting Region	Africa	NAFTA	Other America	China	Middle East	Other Asia	EU	CIS	Other Europe	Oceania	World Total	Of which Intra	Of which Extra
Importing Region													
Africa	3.4	0.2	0.0	0.0	0.7	0.0	0.6	0.0	0.0	0.0	4.9	3.4	1.5
NAFTA	0.0	173.5	8.6	0.0	0.3	0.1	14.0	0.3	0.1	0.2	197.1	173.5	23.6
Other America	0.1	3.3	4.1	0.0	0.1	0.1	2.0	1.9	0.0	0.0	11.6	4.1	7.5
China	18.4	807.0	90.5	0.0	12.1	591.3	784.3	3.4	13.1	64.8	2384.9	0.0	2384.9
Middle East	4.5	2.3	0.6	0.0	21.6	1.0	1.4	0.1	0.4	0.0	31.9	21.6	10.3
Other Asia	23.3	127.3	28.4	0.1	98.9	606.7	188.2	0.6	4.6	26.5	1104.6	606.7	497.9
EU	17.6	123.9	17.7	0.0	15.2	639.3	1286.2	4.8	145.2	2.0	2251.9	1286.2	965.7
CIS	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.3	0.0	0.0	2.4	1.3	1.1
Other Europe	0.0	0.7	0.0	0.0	0.0	0.0	22.6	24.2	1.8	0.0	49.3	1.8	47.5
Oceania	0.7	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	1.6	2.5	1.6	0.9
Unspecified	0.6	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.9		
Intra region	3.4	173.5	4.1	0.0	21.6	606.7	1286.2	1.3	1.8	1.6	2100.5		
Extra region	65.2	1064.7	145.8	0.1	127.4	1231.8	1014.6	35.3	163.4	93.5	3941.8		
Total exports to:	**68.6**	**1238.2**	**149.9**	**0.1**	**149.0**	**1838.5**	**2300.8**	**36.6**	**165.2**	**95.1**	**6042.0**		

Source: National Customs Statistics via Global Trade Tracker

CHAPTER 6

GLOBAL ALUMINIUM TRADE FLOWS

6.1 Regional aluminium and alloy scrap trade flows

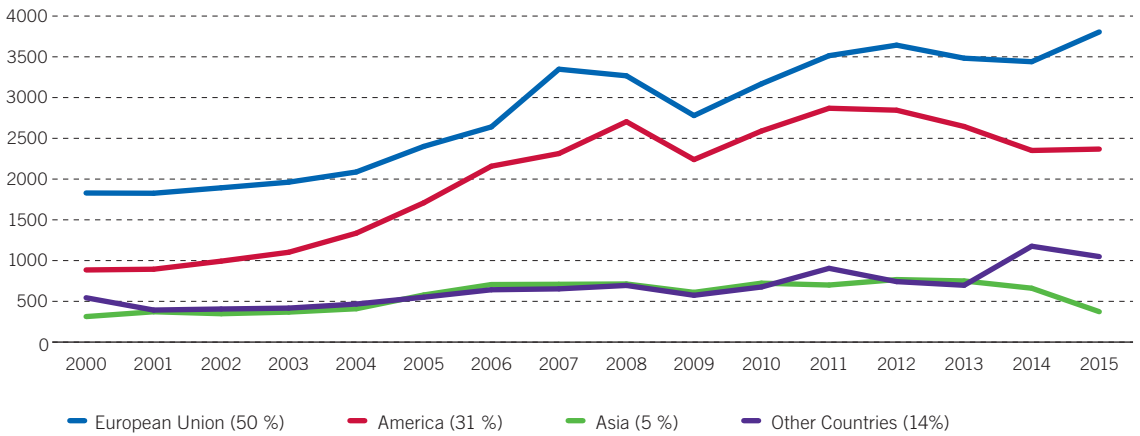
There are very few countries in the world which do not trade in aluminium scrap. For the purposes of this study, we have obtained reports on imports and exports from around 115 countries.

Regional flows of aluminium and alloy scrap as reported by the import and export statistics are measured in gross weight terms, which means that the total weight exported includes other metals as part of an alloy. It is difficult to assess what percentage of aluminium is contained in these exports but aluminium products contain a low proportion of alloying metals. On average, it is assumed that the mixed aluminium and alloy scrap contains around 90% aluminium.

6.2 Aluminium and alloy scrap exports

Over the period 2000 to 2015, total exports of aluminium scrap grew at a compound rate of 6% per annum. In 2000, total exports were 3.6 million tonnes and by 2015 this had grown to 7.6 million tonnes. Throughout the period, the top six exporters (the USA, Germany, Canada, France, the UK and the Netherlands) consistently accounted for more than half of the global total (see tables 17 to 20).

FIGURE 7: REGIONAL EXPORTS OF ALUMINIUM AND ALLOY SCRAP 2000 TO 2015 IN THOUSAND TONNES



Figures in brackets are regional percentages for 2015. Source: National Customs Statistics via Global Trade Tracker

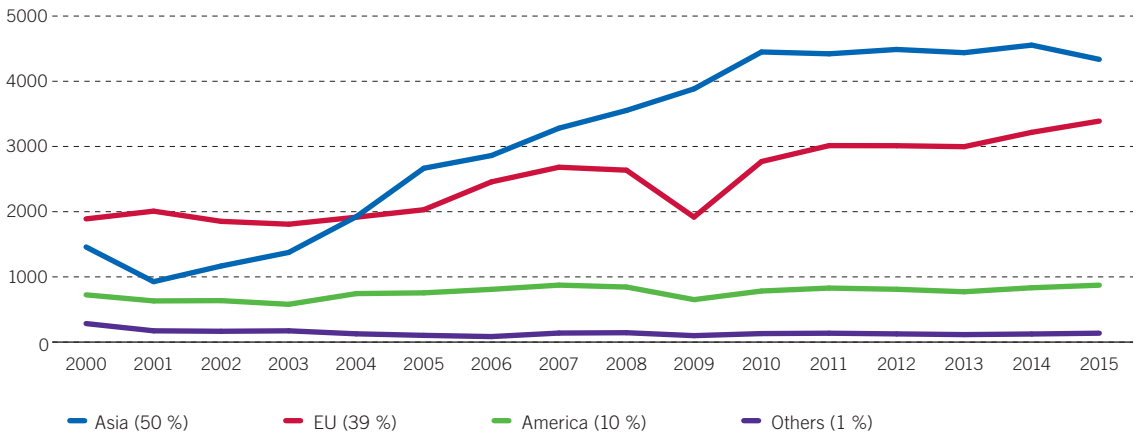
6.3 Aluminium and alloy scrap imports

Global reported imports of scrap have been, on average, around 5% higher than reported exports. This is because the same shipment can be counted twice as it is trans-shipped between countries. However, the growth trend is very similar, with an annual growth rate of 5.1% recorded over the period. China is the single most significant importer of aluminium scrap in each of the years from 2000 to 2015. Chinese imports grew at an annual rate of 9.1% from just over 800,000 tonnes in 2000 to more than 2.5 million tonnes in 2013. In 2014 and 2015, China's total imports declined to 2.3 million tonnes and 2.1 million tonnes, respectively.

Meanwhile, Indian imports increased from less than 60,000 tonnes in 2000 to 883,000 tonnes in 2015.

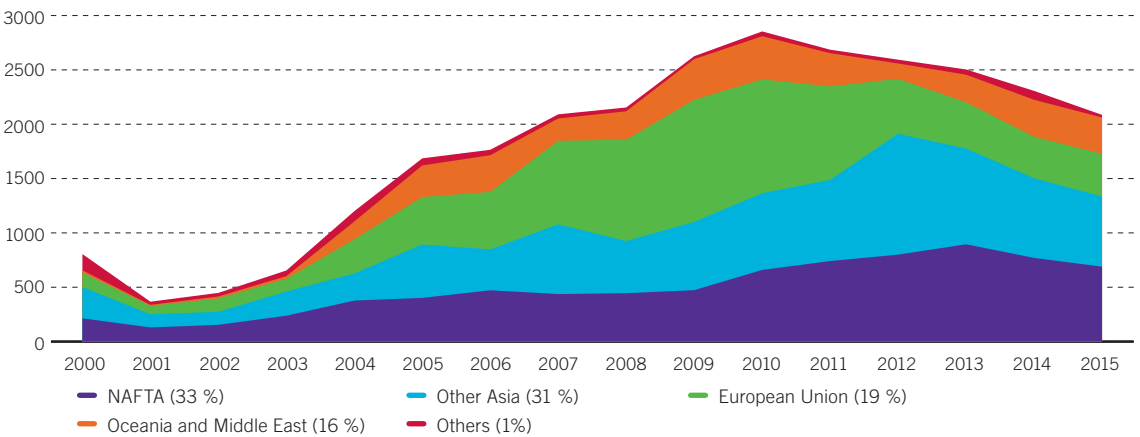
The six most significant importers in 2000 were China, the USA, Germany, Italy, South Korea and Belgium. Together they accounted for 57% of global trade. In 2014, India replaced Belgium in the top six. Intra-regional trade is defined as exports of a product by one member of a regional group to another member of the same group (e.g. the European Union or NAFTA).

FIGURE 8: REGIONAL IMPORTS OF ALUMINIUM AND ALLOY SCRAP 2000 TO 2015 IN THOUSAND TONNES



Figures in brackets are regional percentages for 2015. Source: National Customs Statistics via Global Trade Tracker

FIGURE 9: CHINESE ALUMINIUM SCRAP IMPORTS 2000 TO 2015 BY REGION OF ORIGIN IN THOUSAND TONNES



Figures in brackets are regional percentages for 2015. Source: National Customs Statistics via Global Trade Tracker

Chinese imports remain the main driver of international trade in aluminium scrap. The graph on the previous page shows the imports of aluminium and alloy scrap into China by region for the years 2000 to 2015.

Chinese imports of aluminium and alloy scrap peaked in 2010 at 20.9 million tonnes but the total has declined steadily since then. At the peak, the European Union supplied much of the scrap required by Chinese secondary smelters but, in recent years, the three NAFTA countries have been increasing their exports to China. Shipments from other Asian countries peaked in 2012 at 1.1 million tonnes but fell back in more recent years.

6.4 Extra-regional trade in aluminium and alloy scrap

The table on the following page shows extra-regional exports for the years 2000, 2005, 2010 and 2015. The second section is a summary of the extra-regional exports analysed by trading partner (i.e. the importer).

NAFTA is the largest regional exporter, accounting for 1.5 million tonnes in 2015, followed by the EU with 0.9 million tonnes. China is the largest importing region with 1.5 million tonnes in 2015 followed by the rest of Asia with 1.4 million tonnes.

TABLE 16: SUMMARY OF ALUMINIUM IMPORTS AND EXPORTS BY REGION IN MILLION TONNES

	2000	2005	2010	2015
Exports				
NAFTA	0.3	1.0	1.8	1.5
Middle East	0.1	0.3	0.4	0.2
Other Asia	0.1	0.2	0.3	0.0
European Union	0.4	0.7	0.9	0.9
Former CIS	0.2	0.0	0.0	0.0
Other Europe	0.2	0.2	0.2	0.4
Others	0.2	0.3	0.4	0.6
Total	**1.5**	**2.7**	**4.0**	**3.6**
Delivered to:				
China	0.5	1.3	2.1	1.5
Other Asia	0.5	1.0	1.4	1.4
European Union	0.0	0.4	0.3	0.4
Others	0.5	0.0	0.2	0.3
Total	**1.5**	**2.7**	**4.0**	**3.6**

Source: National Customs Statistics via Global Trade Tracker

The following four tables show the global exports by region of destination. All of the data are taken from national reported export data and the intra-regional trade has been highlighted in blue.

TABLE 17: EXPORTS OF ALUMINIUM AND ALLOY SCRAP 2000 IN THOUSAND TONNES

Exporting Region	Africa	NAFTA	Other America	China	Middle East	Other Asia	EU	CIS	Other Europe	Oceania	World Total	Of which Intra	Of which Extra
Importing Region													
Africa	3.0	0.1	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	4.4	3.0	1.4
NAFTA	0.6	523.8	1.8	1.6	9.0	7.5	36.1	1.3	0.4	0.4	582.5	523.8	58.7
Other America	0.0	46.5	5.2	0.0	0.0	0.0	0.3	1.1	0.0	0.1	53.2	5.2	48.0
China	1.0	148.8	7.0	0.0	1.2	112.0	121.6	100.9	3.4	47.9	543.8	0.0	543.8
Middle East	0.2	1.9	0.0	0.0	15.9	1.2	1.5	23.1	0.0	0.0	43.8	15.9	27.9
Other Asia	18.6	123.6	6.6	5.9	85.4	118.1	204.3	32.0	4.6	28.9	628.0	118.1	509.9
EU	19.1	7.1	1.1	0.0	11.8	8.1	1384.9	49.7	154.7	2.4	1638.9	1384.9	254.0
CIS	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.4	0.0	0.0	1.6	1.4	0.2
Other Europe	0.4	1.1	0.0	0.0	2.4	0.1	77.4	0.9	2.4	0.0	84.7	2.4	82.3
Oceania	0.3	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	4.7	5.4	4.7	0.7
Unspecified	0.5	0.8	1.8	0.0	0.7	0.4	5.1	0.0	0.0	0.0	9.3		
Intra region	3.0	523.8	5.2	0.0	15.9	118.1	1384.9	1.4	2.4	4.7	2059.5		
Extra region	40.7	329.9	18.3	7.5	111.8	129.5	446.7	209.0	163.1	79.7	1536.2		
Total exports to:	**43.7**	**853.7**	**23.5**	**7.5**	**127.7**	**247.6**	**1831.6**	**210.4**	**165.5**	**84.4**	**3595.6**		

Source: National Customs Statistics via Global Trade Tracker

TABLE 18: EXPORTS OF ALUMINIUM AND ALLOY SCRAP 2005 IN THOUSAND TONNES

Exporting Region	Africa	NAFTA	Other America	China	Middle East	Other Asia	EU	CIS	Other Europe	Oceania	World Total	Of which Intra	Of which Extra
Importing Region													
Africa	1.5	0.9	0.0	0.0	1.8	0.0	1.5	0.0	0.1	0.0	5.8	1.5	4.3
NAFTA	0.0	607.8	31.4	0.0	5.9	0.5	5.9	0.0	0.0	0.5	652.0	607.8	44.2
Other America	0.1	5.0	17.9	0.0	4.9	1.6	2.2	0.0	0.6	0.6	32.9	17.9	15.0
China	8.3	648.0	20.4	0.0	8.0	185.7	370.0	6.0	8.6	88.4	1343.4	0.0	1343.4
Middle East	3.0	0.7	0.0	0.0	18.4	2.0	1.5	5.5	0.0	0.0	31.1	18.4	12.7
Other Asia	48.8	294.3	34.9	1.0	211.5	164.9	311.2	9.2	4.2	91.4	1171.4	164.9	1006.5
EU	13.5	3.7	5.0	0.0	27.3	12.2	1674.3	0.9	166.0	10.8	1913.7	1674.3	239.4
CIS	1.4	0.0	0.0	0.0	0.0	0.0	0.4	1.0	0.0	0.0	2.8	1.0	1.8
Other Europe	0.0	11.2	0.1	0.0	0.0	0.0	40.1	0.0	2.0	0.1	53.5	2.0	51.5
Oceania	0.4	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	4.4	5.1	4.4	0.7
Unspecified	0.1	1.5	0.0	0.0	3.7	1.5	0.2	0.0	0.0	0.0	7.0		
Intra region	1.5	607.8	17.9	0.0	18.4	164.9	1674.3	1.0	2.0	4.4	2492.2		
Extra region	75.6	965.3	91.8	1.0	263.1	203.5	733.3	21.6	179.5	191.8	2726.5		
Total exports to:	**77.1**	**1573.1**	**109.7**	**1.0**	**281.5**	**368.4**	**2407.6**	**22.6**	**181.5**	**196.2**	**5218.7**		

Source: National Customs Statistics via Global Trade Tracker

TABLE 19: EXPORTS OF ALUMINIUM AND ALLOY SCRAP 2010 IN THOUSAND TONNES

Exporting Region	Africa	NAFTA	Other America	China	Middle East	Other Asia	EU	CIS	Other Europe	Oceania	World Total	Of which Intra	Of which Extra
Importing Region													
Africa	7.2	0.4	0.0	0.0	0.7	0.9	1.5	0.0	0.0	0.0	10.7	7.2	3.5
NAFTA	0.2	650.6	31.2	0.0	0.7	0.7	7.4	0.3	0.0	0.0	691.1	650.6	40.5
Other America	1.1	6.6	31.6	0.0	9.1	0.2	6.9	0.1	1.1	0.0	56.7	31.6	25.1
China	4.2	1335.7	24.3	0.0	10.7	205.8	369.3	2.0	13.4	94.3	2059.7	0.0	2059.7
Middle East	7.9	0.3	0.1	0.0	14.7	2.9	6.2	6.2	0.0	1.5	39.8	14.7	25.1
Other Asia	58.0	449.3	34.2	1.1	325.5	204.4	428.2	8.7	10.0	134.2	1653.6	204.4	1449.2
EU	11.0	8.5	2.9	0.0	18.5	62.4	2290.8	2.4	184.2	4.6	2585.3	2290.8	294.5
CIS	3.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	3.1	0.0	3.1
Other Europe	0.0	0.7	0.0	0.0	15.9	0.0	72.5	0.0	5.0	0.0	94.1	5.0	89.1
Oceania	0.2	0.2	0.0	0.0	0.0	0.8	3.7	0.0	0.0	5.3	10.2	5.3	4.9
Unspecified	1.7	0.0	0.0	0.0	22.6	0.8	0.0	0.0	0.0	0.1	25.1		
Intra region	7.2	650.6	31.6	0.0	14.7	204.4	2290.8	0.0	5.0	5.3	3209.5		
Extra region	87.3	1801.7	92.7	1.1	403.7	274.5	895.8	19.7	208.7	234.7	4019.9		
Total exports to:	**94.5**	**2452.3**	**124.3**	**1.1**	**418.4**	**478.9**	**3186.6**	**19.7**	**213.7**	**240.0**	**7229.5**		

Source: National Customs Statistics via Global Trade Tracker

TABLE 20: EXPORTS OF ALUMINIUM AND ALLOY SCRAP 2015 IN THOUSAND TONNES

Exporting Region	Africa	NAFTA	Other America	China	Middle East	Other Asia	EU	CIS	Other Europe	Oceania	World Total	Of which Intra	Of which Extra
Importing Region													
Africa	3.3	0.1	0.0	0.0	1.5	0.1	0.5	0.0	0.0	0.1	5.6	3.3	2.3
NAFTA	0.2	702.8	49.7	0.0	2.2	2.8	10.2	0.0	1.6	0.1	769.6	702.8	66.8
Other America	3.8	29.8	52.1	0.0	3.0	0.0	1.2	0.1	0.9	0.1	91.0	52.1	38.9
China	7.4	975.6	24.7	0.0	1.2	63.8	330.7	0.2	17.9	95.5	1517.0	0.0	1517.0
Middle East	4.5	1.8	0.6	0.0	34.9	2.0	2.4	0.3	0.2	4.5	51.2	34.9	16.3
Other Asia	69.5	429.4	76.5	1.0	165.5	298.2	450.7	6.4	25.0	178.1	1700.3	298.2	1402.1
EU	20.6	14.8	7.7	0.0	10.6	5.3	2906.7	3.2	357.4	12.6	3338.9	2906.7	432.2
CIS	0.1	0.3	0.0	0.0	0.0	0.6	1.4	0.9	0.0	0.0	3.3	0.9	2.4
Other Europe	0.0	2.4	0.0	0.0	0.0	0.0	93.4	0.4	5.0	0.0	101.2	5.0	96.2
Oceania	2.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	5.0	7.2	5.0	2.2
Unspecified	0.5	0.0	0.0	0.0	0.2	0.0	8.6	0.0	2.6	0.0	11.9		
Intra region	3.3	702.8	52.1	0.0	34.9	298.2	2906.7	0.9	5.0	5.0	4009.0		
Extra region	108.7	1454.2	159.2	1.0	184.2	74.6	899.2	10.6	405.6	291.0	3588.3		
Total exports to:	**112.0**	**2157.0**	**211.3**	**1.0**	**219.1**	**372.8**	**3805.9**	**11.5**	**410.6**	**296.0**	**7597.2**		

Source: National Customs Statistics via Global Trade Tracker

CHAPTER 7

MAPS

The maps on the following pages show the geographical shipments of copper and alloy scrap in 2015, followed by aluminium and alloy scrap in the same year.

FIGURE 10: EXPORTS OF **COPPER AND ALLOY SCRAP** 2015: EUROPE AND AFRICA

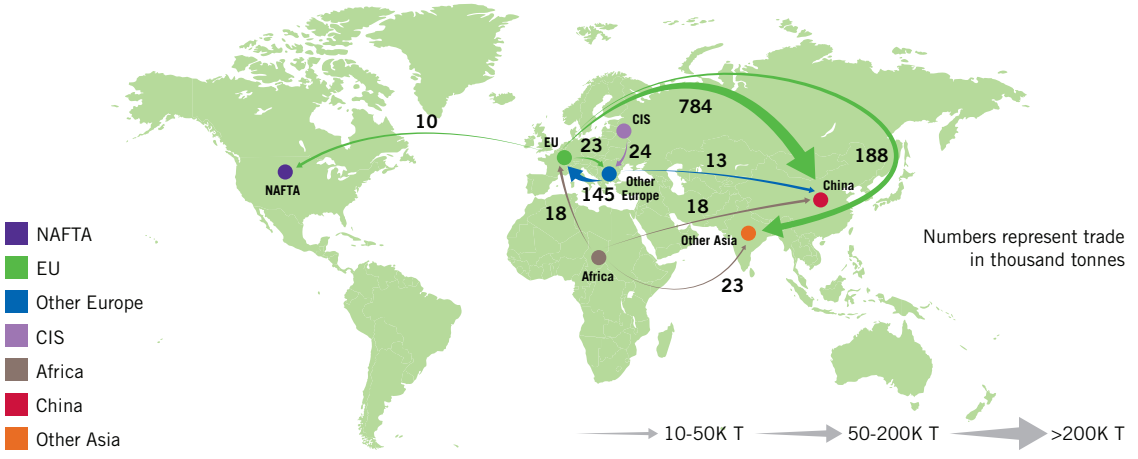


FIGURE 11: EXPORTS OF **COPPER AND ALLOY SCRAP** 2015: ASIA & OCEANIA

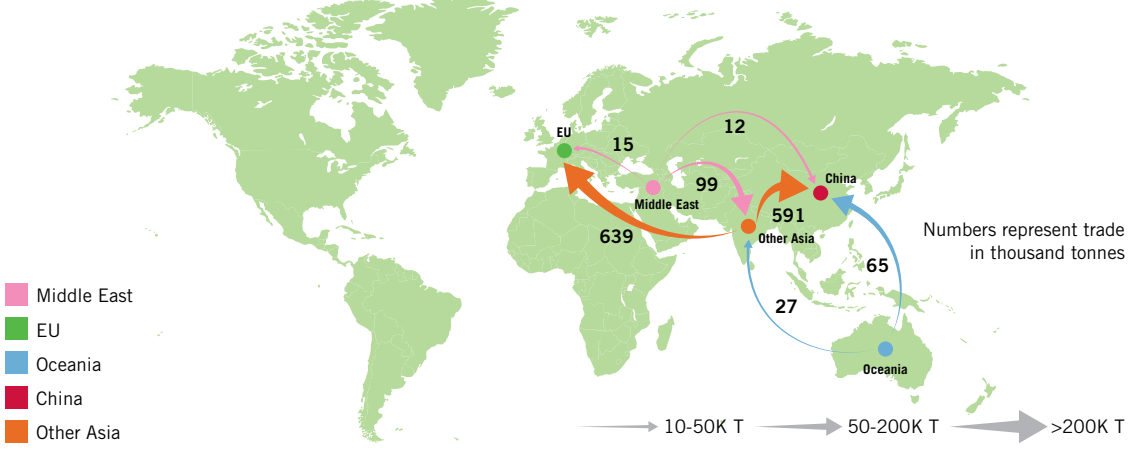


FIGURE 12: EXPORTS OF **COPPER AND ALLOY SCRAP** 2015: NAFTA & OTHER AMERICA

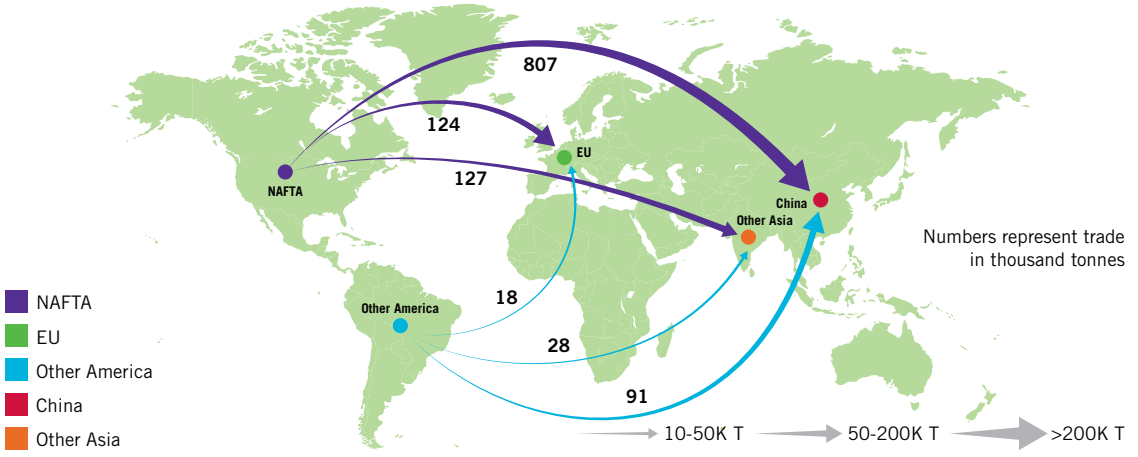


FIGURE 13: EXPORTS OF **ALUMINIUM AND ALLOY SCRAP** 2015: EUROPE & AFRICA

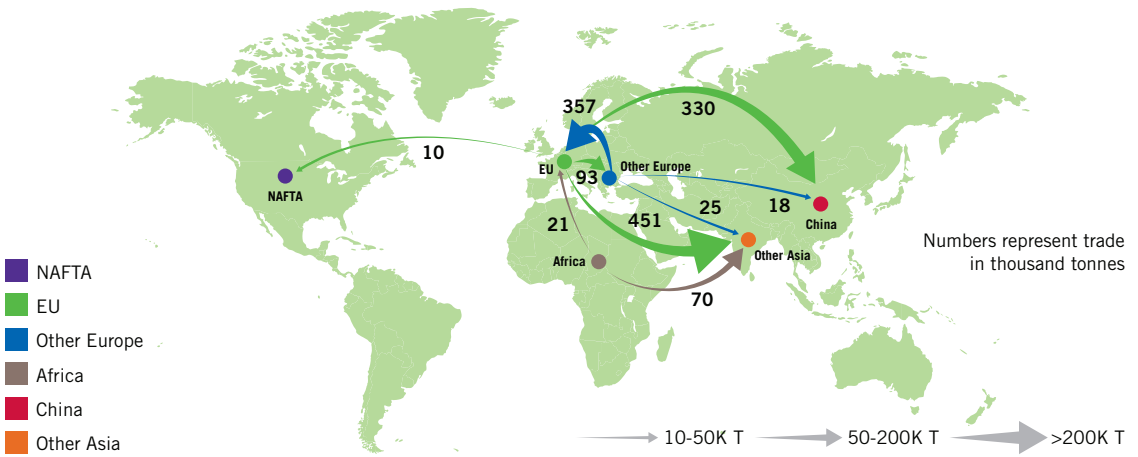


FIGURE 14: EXPORTS OF **ALUMINIUM AND ALLOY SCRAP** 2015: ASIA & OCEANIA

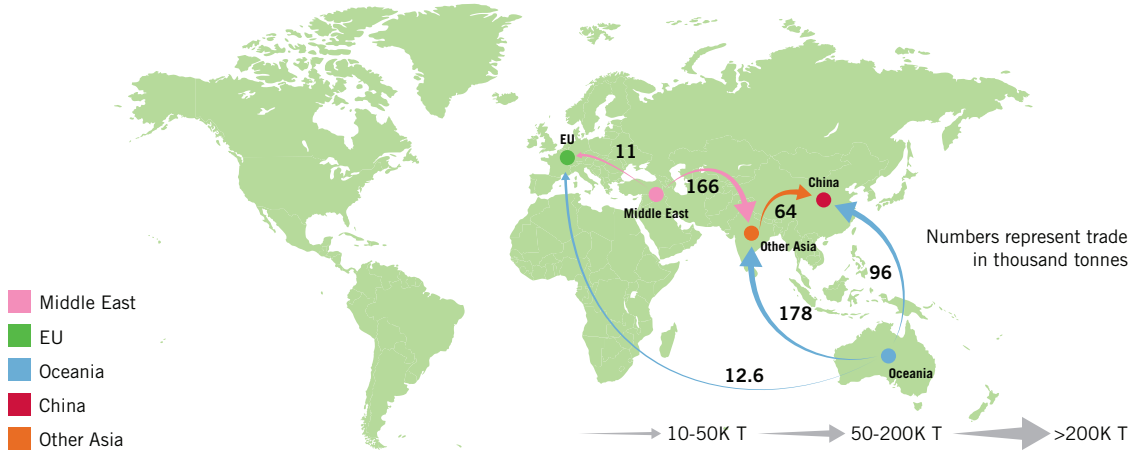
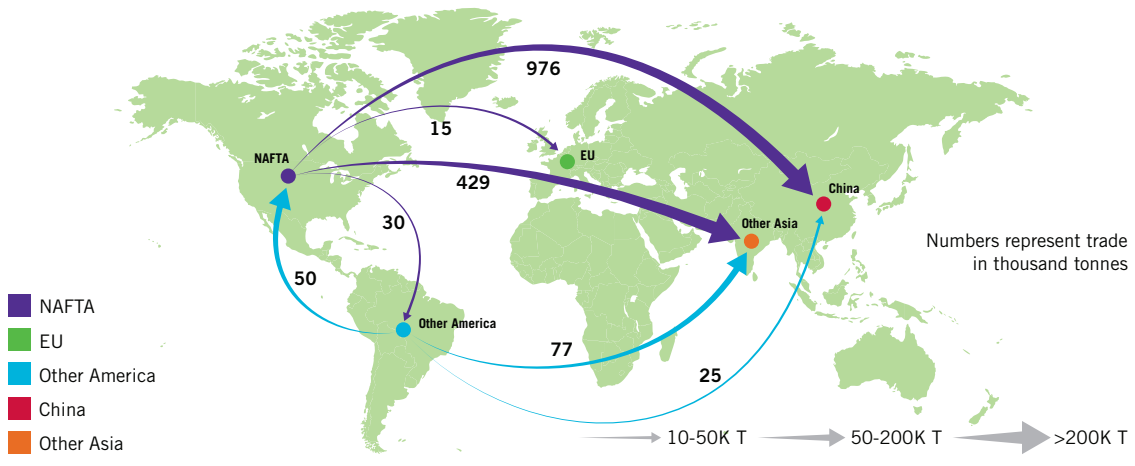
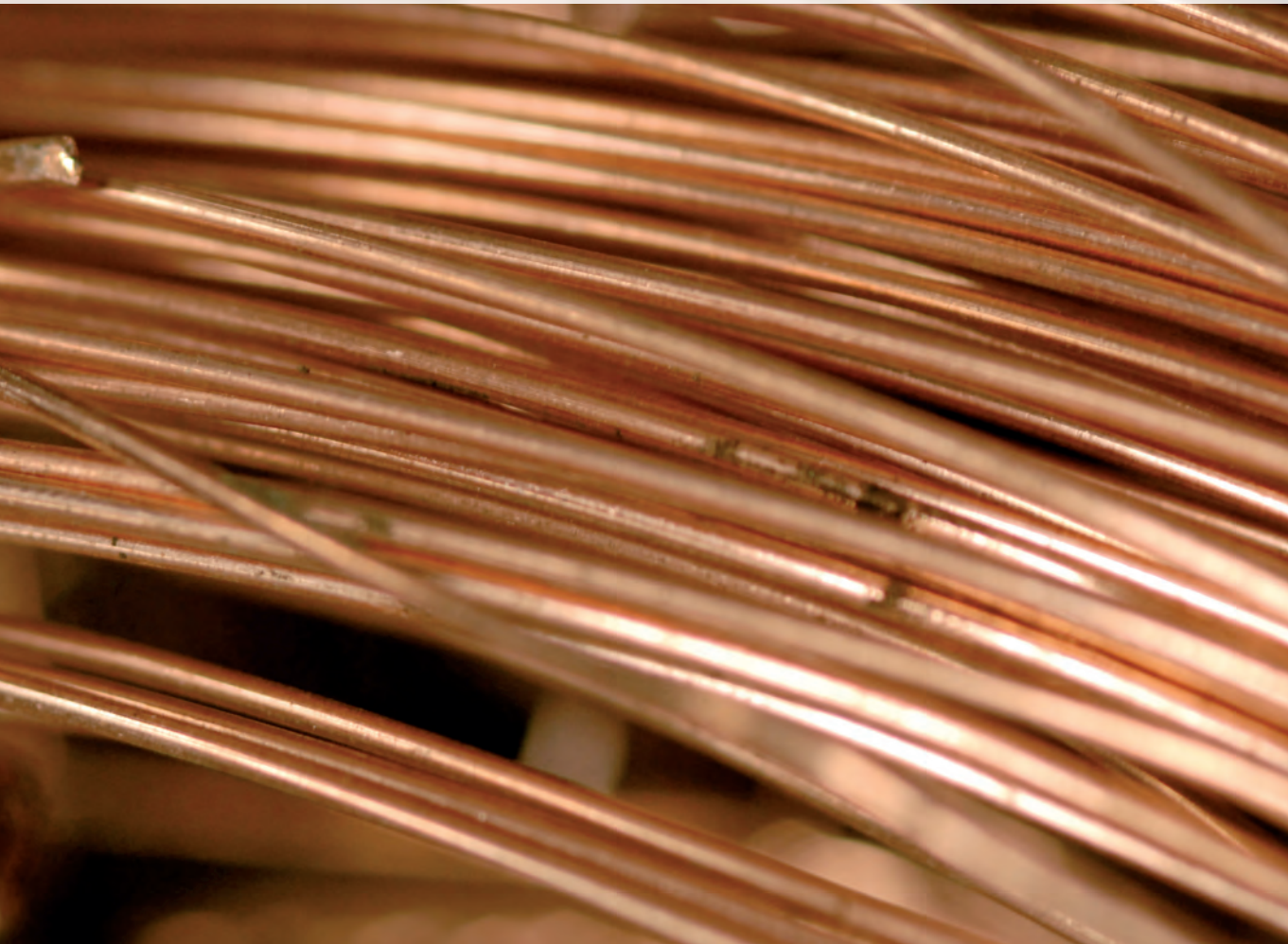


FIGURE 15: EXPORTS OF **ALUMINIUM AN ALLOY SCRAP** 2015: NAFTA & OTHER AMERICA



CHAPTER 8

CONCLUSION



Recycling is here to stay and will continue to grow and be a significant element of world trade. It is a valuable part of the non-ferrous industry and the cost advantages in recycling old metal over new materials will always make scrap the preferred option where quality permits.

The following table shows the value of scrap replacing new metal in the years 2000, 2005, 2010 and 2015. There is considerable room for expansion in the sector, particularly as the Chinese industry matures and can derive more scrap from domestic sources.

TABLE 21: TOTAL USE OF SCRAP

		2000	2005	2010	2015
Copper					
Secondary production	Thousand tonnes	2 003	2 166	3 235	3 788
Direct use of scrap	Thousand tonnes	3 948	4 481	4 448	4 530
Total Copper	Thousand tonnes	5 951	6 647	7 683	8 318
LME Price	$US per tonne	1 814	3 684	7 535	5 502
Estimated Value	**Billion $US**	**11**	**24**	**58**	**50**

		2000	2005	2010	2015
Aluminium					
Secondary production	Thousand tonnes	8 046	8 585	9 343	11 417
LME Price	$US per tonne	1 595	1 897	2 173	1 663
Estimated Value	**Billion $US**	**13**	**16**	**20**	**19**

Source: WBMS and LME

The estimated value of the recycling of copper has increased fourfold since the turn of the century, aided by substantial price increases over the period. The value of the secondary aluminium industry has doubled over the same period whilst prices stayed relatively similar.

Design by karakas

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International Recycling
Non-Ferrous Metals Division

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