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REVIEW OF THE CURRENT MARKET SITUATION AND OUTLOOK

Market situation and outlook for bauxite, alumina and aluminium

Report by the UNCTAD secretariat

CONTENTS

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INTRODUCTION AND SUMMARY

1. This report provides an overview of changes in the bauxite/alumina/aluminium market and industry during the period 1990 to 1992 and some indications concerning the outlook for 1993 to 1994. It should be noted that world production and consumption, unless otherwise stated, refer to the world excluding countries of Eastern Europe and socialist countries of Asia, the reason for this being the difference in availability of data between this group of countries and the rest of the world.

2. The weakness in global economic growth over the past few years has led to low rates of increase in world aluminium consumption (excluding countries of Eastern Europe and socialist countries of Asia). Even so, demand for aluminium has been stronger than that of other metals and minerals. Thus, positive, albeit low, rates of growth in world consumption were recorded for each of the years 1990 to 1992, continuing the trend since 1983. Underlying the relatively flat growth path followed by world consumption are marked differences between the major consuming regions, resulting mainly from differences in overall economic growth rates and composition of aluminium demand. In North America, total aluminium consumption increased, while primary aluminium consumption declined somewhat. In Europe, both primary and total consumption declined slowly over the period, while in Japan, after a continuation in 1990 of the earlier strong growth trend, consumption increased by only a small amount in 1991 and declined in 1992. Outside the major consuming regions, aluminium consumption in Eastern Europe and in the republics of the former USSR declined dramatically as a result of the general fall in income associated with the economic transformation of these countries. This led to a sharp increase in exports from the former USSR Republics, which contributed to the imbalance between global supply and demand. Total world aluminium consumption, including countries of Eastern Europe and socialist countries of Asia, is likely to have decreased in both 1991 and 1992.

3. World production of bauxite (excluding countries of Eastern Europe and socialist countries of Asia) increased strongly in 1990, but declined in both 1991 and 1992. The increase was wholly accounted for by Latin America and the Caribbean. Alumina production increased significantly in both 1990 and 1991 and is estimated to have increased slightly also in 1992. Production of primary aluminium increased slightly less than consumption in 1990. In 1991, however, it grew faster than consumption. Only in 1992 did cutbacks in production become significant enough to result in a small decline. Canada increased its share of production following the commissioning of three new smelters. In Eastern Europe, some refineries and smelters were closed or their operating rates were reduced. The war in former Yugoslavia had serious effects on production in the countries concerned. The variation in production growth rates at the different stages of production are, in all likelihood, the result of changes in trade between countries of Eastern Europe and China with the rest of the world. Net additions to production capacity, in particular at the smelter stage, were larger than the increase in demand, and cutbacks in operating rates were not sufficient to outweigh the increased exports from the former USSR Republics.

4. Additional world demand (excluding countries of Eastern Europe and socialist countries of Asia) in 1991-1992 is estimated at 700,000 tons, while the additional supply was about 2.3 million tons. The difference - 1.6 million tons - has gone to build up stocks, mainly at the London Metal Exchange, but also in the form of producers', consumers' and traders' inventories. In view of the large excess of supply over demand on the international market, it is not surprising that prices fell dramatically over the period, from a high of about US$ 2,100 per ton in September 1990 to lows of below US$ 1,100 per ton in December 1991 and less than US$ 1,200 in November 1992. One of the reasons for the rapid build-up of stocks is that reductions in operating rates were smaller than in previous periods of low prices. Among the possible explanations of this change in industry behaviour is the reduced degree of concentration in the industry and the diminished market power of the major producers, which has made it more difficult to achieve an orderly reduction in operating rates. In addition, the growth in demand decreased less than in previous recessions and consequently many producers may therefore not have been faced with significant reductions in orders from their traditional customers. Furthermore, the present flatter shape of the industry cost curve combined with rapidly changing exchange rates have made the identification of "swing" capacity more difficult. Finally, a number of aluminium smelters have succeeded in insulating themselves from the effects of price falls by linking the price of inputs such as alumina and electric power to the price of aluminium, and this is likely to have made them less prepared to reduce operating rates.

5. The outlook for aluminium demand in 1993 and 1994 depends on whether the indications of an upturn in the business cycle in the United States that were seen at the end of 1992 prove to be correct and whether the recovery spreads to other countries. Historically, the early stages of a cyclical upturn have been associated with increases in aluminium demand of over 5 per cent per year. However, the economic recovery that is expected to take place in 1993 may turn out to be less broad and general than previous upturns, judging from forecasts concerning Germany and Japan. A less widespread recovery would be expected to lead to a possible rate of growth in aluminium consumption of 3 to 4 per cent in 1993 and slightly less in 1994. Since primary aluminium capacity is expected to increase by a corresponding amount in 1993, no significant reductions of inventories or increases in operating rates would be possible this year even in the absence of any continued exports from the former USSR Republics. Given that these exports are expected to continue, although probably at reduced rates, further cutbacks in operating rates and closures of high-cost smelters are likely to be necessary to allow inventory reduction to begin and to avoid a complete collapse in the price. Assuming that substantial cutbacks are implemented in 1993, the price could be expected to increase somewhat, although it is unlikely that it will reach levels that allow existing high-cost smelters to operate profitably until inventory levels have been substantially reduced. This process may not be finished before the end of 1994.

6. As regards alumina, additional capacity corresponding to the expected increase in demand from smelters will come into full production in 1993 and 1994. It should be noted, however, that increased alumina supplies may be needed for the aluminium

industry in the former Republics of the USSR as a result of disruptions in the operation of some alumina refineries in these countries. Aluminium smelters in these countries have been active recently in looking for alumina supplies from sources outside the former USSR, and in the longer term there may be a need for substantial imports of alumina. Consequently, alumina production capacity may become a bottleneck for industry expansion in years to come, and over the next two years, alumina prices would be expected to rise.

7. Known expansion plans for bauxite production appear to be more or less in line with the expected growth in demand. Since there is also considerable flexibility when it comes to adjusting the rate of output, the bauxite market is not expected to show any major changes during the next two years.

I. DEMAND

A. Demand for aluminium 1990 - 1992[1]

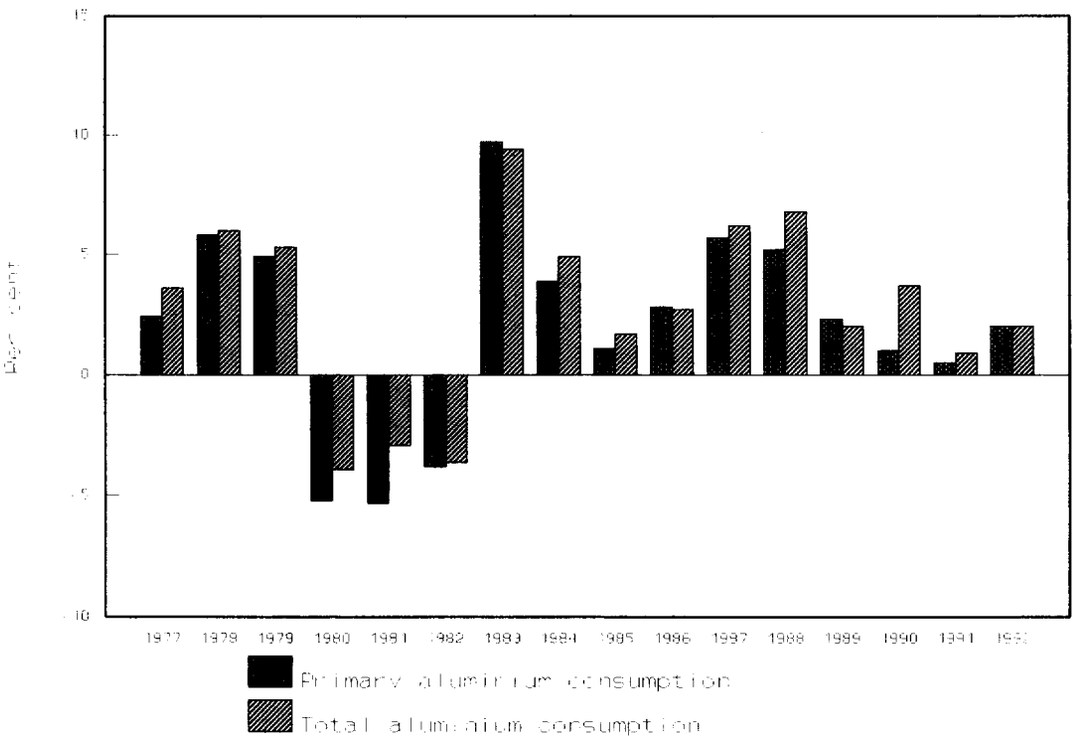
8. The weakness in global economic growth over the past few years has led to low rates of increase in world aluminium consumption (excluding countries of Eastern Europe and socialist countries of Asia). Even so, demand for aluminium has been stronger than that of other metals and minerals[2]. Thus, positive, albeit low, rates of growth in consumption were recorded for each of the years 1990 to 1992, continuing the trend since 1983 (see Figure 1). World consumption of aluminium, including secondary metal, increased by 3.7 per cent in 1990, by about 0.9 per cent in 1991 and by an estimated 2 per cent in 1992. The growth in consumption of primary aluminium was lower than for total consumption in 1990 at 1 per cent, while in 1991 and 1992 it more or less kept pace with total consumption, growing at 0.5 per cent and 2 per cent (estimated) respectively.

9. As is seen from Figure 1, total consumption, including secondary metal, has developed more positively than primary consumption in most of the years since 1977. This reflects the increasing importance of recycling, brought on by changes in both public opinion and in government regulations, and by increasing power costs which have made the use of recycled metal more economical since its production is less energy intensive than that of primary aluminium.

10. Underlying the relatively flat growth path followed by world consumption are marked differences between the major consuming regions, resulting mainly from differences in overall economic growth rates and composition of aluminium demand. In North America, consumption of primary aluminium declined at a rate of 1.5 to 3 per cent in both 1990 and 1991, while total consumption, including secondary metal, increased by almost 4 per cent in 1990 and declined slightly, by 0.4 per cent, in 1991. The stronger growth in total consumption can be attributed to the large relative weight and more positive growth of sectors using large amounts of recycled material, such as packaging and automobile manufacturing. In 1992, consumption strengthened considerably in the

first half of the year, and although it grew less rapidly in the second half it is estimated that positive growth was achieved for the whole year in both primary and total consumption. In Europe, primary consumption decreased slightly in 1990 and 1991, while total consumption decreased in 1990 and increased by a small amount in 1991. In the first six months of 1992, primary consumption decreased by 2.5 per cent compared to the same period in 1991. Primary consumption for the whole year was nevertheless expected to increase by aound 1.3 per cent[3]. Consumption in Japan showed continued strong growth in 1990, but flattened out in 1991, and turned down sharply in the first six months of 1992[4]. Consumption over the whole year is estimated to have fallen by about 2 percent[5].

Figure 1 Annual changes in world aluminium consumption (excluding countries of Eastern Europe and socialist countries of Asia) 1977-1992



Source: UNCTAD Commodity Yearbook, World Bureau of Metal Statisitics and UNCTAD secretariat

11. Outside the major consuming regions, dramatic changes in aluminium consumption have taken place, which have contributed to the imbalance in the global market. Aluminium consumption in Eastern Europe and in the Republics of the former USSR has declined dramatically as a result of the general fall in income associated with the economic transformation of these countries. A sharp fall in consumption by the military

and aviation sectors was also of importance in the former USSR Republics, where these sectors absorbed a large portion of production previously. Consequently, exports of aluminium from the former USSR have increased by between 600,000 and 800,000 tons from their previous level, corresponding to about a quarter of previously estimated consumption in the former USSR. In China, on the other hand, consumption and imports of aluminium have increased in tandem with the rapidly growing industrial production. Judging from what is known about Chinese aluminium imports, the increase in 1992 from earlier levels may have been as much as 150,000 tons, which however still falls far short of offsetting the effect of the increased exports from the former USSR Republics. As a result, total world aluminium consumption including countries of Eastern Europe and socialist countries of Asia is likely to have decreased in both 1991 and 1992.

B. Trends in composition of demand[6]

12. In the generally weak market situation over the past few years some sectors have shown a more dynamic development of demand than others. This is the case for packaging, where aluminium use in beverage cans and in other packaging has expanded rapidly over the past several years, partly for reasons of consumer convenience, and partly because of the introduction of mandatory recycling schemes in many developed countries. Such schemes provide aluminium cans with a strong advantage compared to their main competitors.

13. Aluminium use in transportation is also expanding, as automobile manufacturers attempt to reduce petrol consumption by weight savings, in particular to be able to comply with more stringent petrol consumption standards in the important United States market. Most major automobile manufacturers have advanced models in production which use very large quantities of aluminum both in the engine and in the car body. While this extensive use of aluminium is at the moment confined to the luxury segment of the market, significant increases in the use of aluminium have taken place also in medium and small size vehicles. The average aluminium content of North American passenger cars produced in 1991 was 87 kilograms, or 47 per cent more than in 1981[7]. The corresponding figure for Europe is 55 kilograms[8]. It should be noted that, according to Alcoa, about 60 per cent of the aluminium used in the automobile industry is secondary metal[9]. Thus, the growing use of aluminium in car manufacturing contributes strongly to the increase in recycling.

14. The prolonged recession in developed countries and high interest rates have led to very modest activity in the construction sector in most countries with consequent effects on aluminium demand in this sector. Low rates of investment in general have also set limits to the development of demand for aluminium for use in electrical and other machinery.

II. SUPPLY

A. Production of bauxite, alumina and aluminium 1990 - 1992[10]

15. World production of bauxite (excluding countries of Eastern Europe and socialist countries of Asia) increased in 1990 by 7.3 per cent, but declined in both 1991 and 1992. Alumina production increased in both 1990 and 1991, by 4 and 1.7 per cent respectively, and is estimated to have increased slightly also in 1992. Production of primary aluminium increased by 0.7 per cent, or slightly less than consumption in 1990. In 1991, however, it grew faster than consumption, at a rate of 3.6 per cent. Only in 1992 did cutbacks in production become significant enough to result in a negative growth rate of 0.1 per cent (based on International Primary Aluminium Institute figures). While production of bauxite and alumina appear not to have mirrored the development of primary aluminium production exactly, the differences are not believed to reflect any changes in the production of bauxite and alumina for non-metallurgical uses, which is relatively insignificant compared to total production. Instead, they are likely to result from variations in trade between countries of Eastern Europe and China with the rest of the world.

16. As regards the geographical distribution of production, the major changes in bauxite production during the period 1990-1992 included significant growth in Latin America and the Caribbean, in particular in Brazil, Guyana, Jamaica and Venezuela, declines in France and the United States as mines were closed, and minor declines elsewhere as mines adjusted to the fall in demand. The geographical distribution of alumina production did not change significantly, except for a small decline in the share of the United States, balanced by a corresponding increase in the share of Australia. In primary aluminium, Canada increased its share due to the opening of one new smelter in 1991 and two smelters in late 1992, while the share of European production declined as a result mainly of closures of smelters in Austria, France, Italy and Switzerland (see section B.1 of this chapter). Production cutbacks were introduced during 1991 and 1992 in several countries, particularly in the United States and Western Europe (see section B.2). Smelters in Eastern Europe were also closed during this period, although production in the republics of the former USSR continued at rates similar to earlier periods until mid-1992. The war in former Yugoslavia had serious effects on production in some of the countries concerned, notably Croatia, where production at the Šibenik smelter was suspended after the smelter was damaged by artillery fire[11], and Bosnia and Herzegovina, where exports from the refinery/smelter complex at Mostar were cut off. The complex is reported not to have been seriously damaged, but it is not considered likely that it will be restarted until the conflict has been resolved[12].

B. Specific factors affecting supply

1. Changes in production capacity

17. World bauxite production capacity (excluding countries in Eastern Europe and socialist countries of Asia) increased by almost 6 million tons during the period 1990-1992, with most of the increase - i.e. about 5 million tons - occurring in 1991 (see table A.1 in the annex for details). Capacity in Latin America and the Caribbean increased by over 7 million tons, as a result of expansions in Venezuela, Brazil (where two new mines were opened), Guyana (one new mine), Suriname (two new mines opened, of which one replaced a mine which closed during the period) and Jamaica, while it decreased in all other regions. In Europe, the closure of two mines in France was to some extent balanced by the opening of a new mine in Italy. One mine each was closed in India and the United States. It should be noted that capacity figures for bauxite mines have to be interpreted with caution, since in many cases, given the nature of most bauxite deposits, capacity changes can be implemented relatively easily. It is therefore difficult to distinguish between temporary changes in operating rates and more permanent changes in capacity. Furthermore, capacity is often expanded in small increments which are usually not reported in trade journals.

18. Alumina production capacity increased by more than 3 million tons over the period, with again most of the increase taking place in 1991 (see table A.2 in the annex). No new alumina refineries were opened, although the St. Croix refinery in the U.S. Virgin Islands, which had been closed since May 1985, was reopened in early 1990. Australia accounted for nearly half of the total increase in capacity, with expansions taking place at four refineries. Capacity was also expanded significantly in Venezuela, the United States, Brazil and Jamaica.

19. Primary aluminium production capacity increased by 1.3 million tons, or almost 10 per cent, over the period, with most of the expansion taking place in 1991 and 1992 (see Table A.3 in the Annex). The net increase was composed of additions to capacity corresponding to almost 1.7 million tons per year, of which 859,000 tons at new smelters, and partial or complete shutdowns corresponding to about 375,000 tons per year. Canada accounted for more than half of the new capacity, with three new smelters entering production. The only other new smelter to come on stream during the period was the Dunkerque smelter in France. Existing smelters were expanded in Brazil, Canada, India, Islamic Republic of Iran, Norway, the United Arab Emirates, the United States and Venezuela. Primary aluminium smelters were closed down in Austria, France, Germany[13], India, Italy and Switzerland.

20. Changes in production capacity in the countries of Eastern Europe, including the former German Democratic Republic, and in socialist countries of Asia are not included in the above figures. The economic transformation of the former group of countries has had a severe impact on the mining and metallurgical industry, with several operations being closed down due to their lack of competitiveness and because they do not conform with new environmental regulations. The Lauta refinery/smelter complex in the former

German Democratic Republic was closed down in 1991 because of environmental problems. In the Slovak Republic, the Žiar nad Hronom smelter/refinery complex is undergoing extensive reconstruction. In Hungary, three of the four smelters were closed down at the end of 1992, and alumina output has also been reduced as a consequence. At the large Slatina smelter in Romania, half of the capacity was closed down in 1992 and exports were cancelled because of lack of international competitiveness. In the former USSR Republics, few closures have so far taken place. The only known case of complete closure is the Sumgait smelter in Azerbaijan which was reported to have closed down in the second quarter of 1992 owing to transportation difficulties. It may, however, be reopened later. Alumina refineries in the former USSR republics have also had problems maintaining production at previous levels. Finally, a number of operations in the former USSR Republics are undergoing modernization in order to reduce production costs and negative effects on the environment.

2. Changes in operating rates

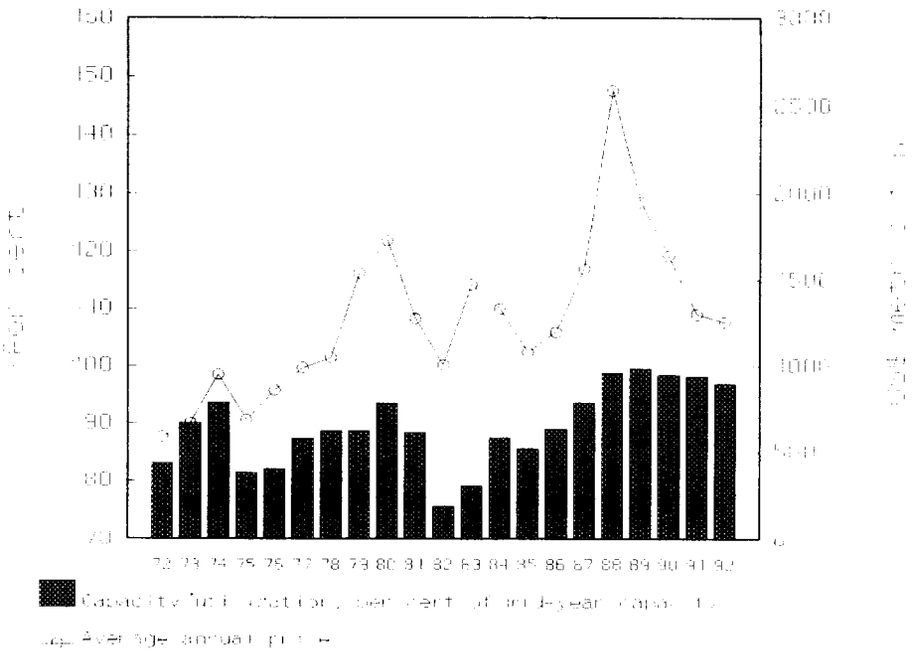
21. Operating rates have remained high in the present recession despite very low prices. Figure 2 shows aluminium prices and capacity utilization in aluminium smelters during the period 1972 to 1992[14]. It can be observed that capacity utilization during the period of depressed prices in 1991 and 1992 has remained very high. This phenomenon should of course be seen against the background of the massive closures of smelter capacity that took place in 1985/86 and resulted in the present "leaner" industry structure. Some cutbacks in output have taken place during the current recession, but in the unanimous opinion of industry observers they are not sufficient to reestablish balance between supply and demand. Table 2 shows cutbacks in the operating rates of existing aluminium smelters during 1991 and 1992.

22. The total amount of the cutbacks which were in force at the end of 1992 corresponded to almost 500,000 tons per year. The temporary cutbacks in Canada, New Zealand and Spain can be estimated to have reduced supply by 11,000 tons in 1991 and 136,000 tons in 1992. Actual cutbacks are probably larger, since there is no certainty that all cutbacks are reported. Nevertheless, even with the inclusion of the additional cutbacks in France and the Netherlands, corresponding to 79,000 tons per year which were announced at the end of 1992 by Pechiney[15], and the cutback of 73,000 tons per year that was the subject of negotiations between the Spanish producer Inespal and trade unions at the beginning of 1993[16], the total amount of the cutbacks corresponds to less than 5 per cent of production capacity. Recent cutbacks in the production rate of nine smelters in the northwestern part of the United States resulting from a power shortage correspond to 345,000 tons per year[17], but the smelters may reenter production in spring.

23. The small amount of cutbacks in operating rates during the present recession is in contrast with the experience during previous periods of low prices. There are probably several explanations of this change in industry behaviour. An important one is the reduced degree of concentration in the industry and the diminished market power of the

major producers, which has made it more difficult to achieve an orderly reduction in operating rates. Another reason is that demand growth has fallen less sharply than in most previous recessions, and many producers may therefore not have been faced with significant reductions in orders from their traditional customers. A large portion of exports from the former USSR republics is used in production that does not require high purity, and consequently the number of consumers is limited. Furthermore, the present flatter shape of the industry cost curve combined with rapidly changing exchange rates have made the identification of "swing" capacity more difficult. Finally, a number of aluminium smelters have succeeded in insulating themselves from the effects of price falls through various means, and this is likely to have made them less prepared to reduce operating rates (see section 3 below).

Figure 2: Capacity utilization in aluminium smelters 1972-1992 (world excluding countries of Eastern Europe and socialist countries in Asia)



Sources: International Primary Aluminium Institute (capacity and production); UNCTAD Commodity Price Bulletin (prices)

Table 2: Cutbacks in operating rates of primary aluminium smelters in 1991-1992 (1 000 metric tons per year)

Country	Company	Quantity	Effective from-to
Argentina	Aluar	15	October 1991-
Brazil	Alcan	27	December 1992-
Canada	Alcan	68	November 1991-October 1992
Germany	Vereinigte Aluminiumwerke (VAW)	32 105	October 1991-October 1992 October 1992-
Mexico	Grupo Carso (ex-Alcoa)	66	Autumn 1991-
Netherlands	Pechiney	22	October 1991-
New Zealand	Comalco	86	June-July 1992 (power shortage)
Norway	Hydro	45	November 1991-
Spain	Inespal	145	March-September 1992
Sweden	Gränges	20	December 1991-
United Kingdom	Alcan	10 76	July-November 1991 November 1991-
United States	Reynolds	71 118	August-December 1991 December 1991-

Source: UNCTAD secretariat based on trade journals.

3. Developments in costs of production

24. Following the increase in average operating costs of aluminium smelters and the flattening out of the industry cost curve that took place in the second half of the 1980s with the closure of many high-cost smelters, operating costs decreased from 1990 to 1992, mainly as a result of lower alumina prices. Average operating costs are now estimated to be 54 US cents per pound (US$ 1190 per ton), while the operating cost of smelters making up the "swing" capacity is at a level of 75-76 US cents per pound (US$ 1650-1675)[18]. At the prices prevailing in late 1992 more than half of the smelters in operation were not covering operating costs[19]. Operating costs are high in particular in Europe. One reason for this is that many European smelters have relatively unfavourable power

contracts with high fixed rates based on expensive coal generated power. Another reason is the depreciation of the US dollar against most European currencies until the autumn of 1992 which had the effect of raising the operating costs of these smelters measured in US dollars, the relevance of measuring the costs in dollars being of course that aluminium prices are quoted in dollars. The spate of exchange rate depreciations since then has improved the situation for some European smelters, although not for those operating in Germany or in countries with undepreciated currencies tied to the Deutschmark.

25. As already mentioned, a growing number of smelters have succeeded in protecting themselves from the effects of price falls through the use of power contracts with variable tariffs linked to the aluminium price and by tying the price of another major cost element, alumina, to the price of aluminium. Operating costs for these smelters thus become partially a function of the price and the smelters can to some extent insulate themselves from price movements. It has been estimated that each 1 cent per pound reduction in the aluminium price leads to a reduction of 0.2 cents in average industry operating costs[20]. These practices are likely to have contributed to the slowness with which the industry has reacted to the fall in prices. It should be noted, however, that most power contracts with variable rates make use of a floor rate which usually corresponds to a price well above that prevailing in 1991/92. The smelters buying power on these terms are therefore not fully protected against price falls, although the price they pay for their power can be assumed to be lower than those paid by most smelters operating under fixed price power contracts. Only in the province of Quebec in Canada are flexible power contracts without any floor rate in use. Another factor that may have reduced the speed with which the industry has adapted to lower prices is the increased importance of tolling contracts with long time spans, which insulate the smelters concerned from demand fluctuations. These smelters generally have high operating costs and would, under other circumstances, probably be considered as part of the "swing" capacity.

26. Production costs for alumina and bauxite have been more stable than for primary aluminium, although operating costs in many alumina refineries have been reduced significantly over the past several years as a result of continuous rationalization. High real rates of interest have, however, raised the cost of investment in new capacity and are deterring producers from undertaking greenfield projects. No new alumina refineries have been opened since 1983. On the other hand, exchange rate depreciations in many bauxite and alumina producing countries have lowered the local cost component of investment[21].

27. Environment control costs have become a significant component of both investment and operating costs at all stages of production in recent years. For instance, in Canada, at Alcan's Laterrière smelter, which was completed in February 1991, 20 per cent of the total investment cost of 800 million Canadian dollars was reportedly due to environment control costs[22]. At the French Dunkerque smelter, which reached full capacity in May 1992, pollution control equipment absorbed 10 to 15 per cent of capital costs, and the operation of this equipment will account for 5 to 10 per cent of operating

costs[23]. For alumina refineries, more stringent requirements as regards the handling of waste products ("red mud") have not only raised investment and operating costs but appear to have reinforced the trend towards locating refining capacity close to bauxite mines[24]. In bauxite mining, the main environment control costs are associated with the need to restore mine sites after mining. Provided that the future rehabilitation of the site is taken into account at the outset of the project, the costs are however relatively low[25]. By way of a general observation, it can be noted that investment in equipment intended to reduce pollution often leads to improved operating efficiency and savings which diminish the impact of higher capital and operating costs[26].

III. TRADE

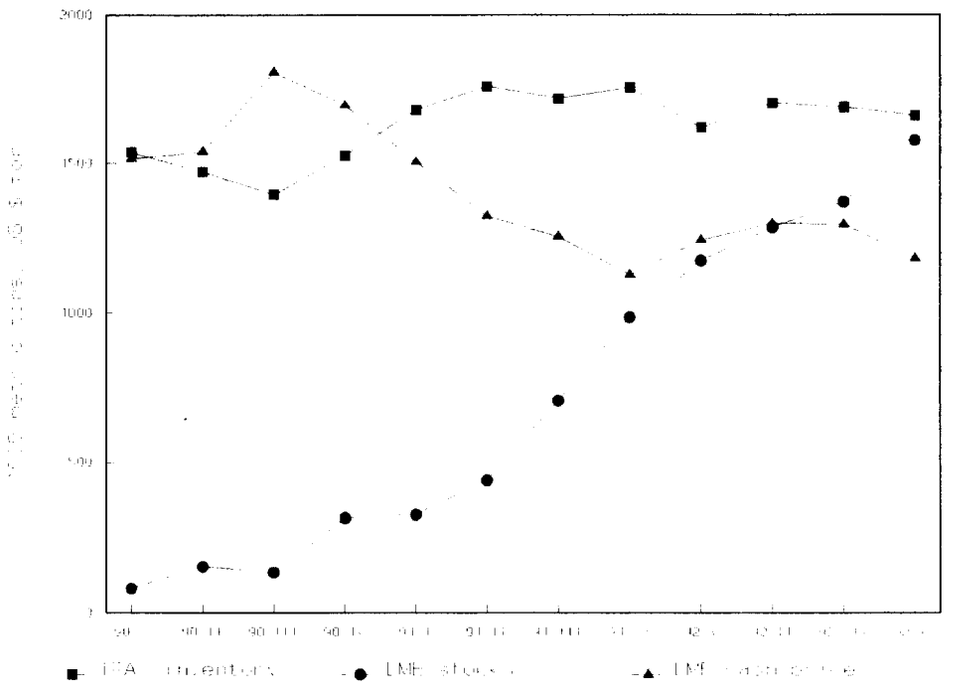
28. The most important development in international trade in aluminium in the past two years has been the massive increase in exports from the former Republics of the USSR, in particular the Russian Federation, to the international market. In 1991, these exports are reported to have been 935,000 tons, of which 700,000 tons from the Russian Federation[27]. Exports from the former USSR in preceding years were between 200,000 and 300,000 tons. Figures for 1992 were not available at the time of writing, although judging from the various estimates presented it appears that Russian exports are likely to have been about the same as in 1991, whereas exports from other ex-USSR Republics may have declined[28]. Chinese imports are estimated to have increased from a level of about 50,000 tons per year earlier to about 200,000 tons in 1992[29]. Other notable developments include an increase in aluminium exports from Brazil, and increases in exports of bauxite and alumina from Caribbean countries, particularly Guyana, Jamaica and Suriname.

29. As regards conditions for international trade, the conclusion of the Uruguay Round of trade negotiations is expected to result in some reduction of tariffs on unwrought aluminium and semi-fabricated products. Tariffs on bauxite and alumina have already been eliminated in the major importing countries. The establishment of a large number of London Metal Exchange (LME) warehouses in new locations over the past few years has had some effects on the way trade is carried out, in particular by making it easier for producers and consumers in North America and Asia to use the LME as a market and supplier of last resort. Finally, the introduction of a contract for secondary aluminium alloys on the LME in October 1992, following several years of discussion in the industry, has brought another segment of the industry into the area of exchange based pricing. This development would be expected to lead to modifications in pricing behaviour in the secondary aluminium industry.

IV. SUPPLY/DEMAND BALANCE AND PRICES

30. The review of demand and supply in chapters I and II has shown that, while demand for aluminium grew slowly in 1991 and 1992, supply to the international market increased as a result of capacity expansions and increased exports from the Republics of the former USSR to the rest of the world. Since late 1990, assuming that supply and demand for primary aluminium were then roughly in balance, which would appear reasonable in the light of reported stock movements, the additional demand in 1991-1992 can be estimated to have amounted to a total of 700,000 tons, while the additional supply has been about 2.3 million tons (composed of 1 million tons in additional production and 1.3 million tons in additional net imports from countries of Eastern Europe and socialist countries of Asia). The difference - 1.6 million tons - has gone to build up stocks, mainly at the LME (a five-fold increase of 1.3 million tons to almost 1.6 million tons), but also in the form of inventories held by producers (an increase of about 100,000 tons according to the International Primary Aluminium Institute) and inventories held by consumers and traders (presumably the remaining 200,000 tons)[30]. Figure 3 shows the development of inventories and the aluminium price during the period 1990 to 1992.

Figure 3 End of quarter aluminium inventories and quarterly price, 1990-1992



Sources: International Primary Aluminium Institute; UNCTAD secretariat.

31. It deserves to be noted that world production and consumption rates, excluding the ex-USSR Republics, in the second half of 1992 appear to have been roughly equal,

and that in the absence of exports from the former USSR Republics, production cutbacks, whether in the form of reduction in output rates or closedowns, would in theory have been sufficient to balance supply and demand. It is not certain, however, that the same cutbacks would have taken place if there had been no exports from the former USSR Republics.

32. It is not surprising, in view of the large excess of supply over demand on the international market, that prices have fallen dramatically over the period, from a high of about US$ 2,100 per ton in September 1990 to lows of below US$ 1,100 per ton in December 1991 and less than US$ 1,200 in November 1992. The price fell continuously from the third quarter of 1990 to the end of 1991, owing mainly to the pressure of exports from the USSR. Permanent closures and cutbacks that were announced at the end of 1991 gave the market some renewed confidence, and prices turned up in 1992. A contributing factor was the belief that exports from the former USSR Republics could not in the long run remain at the high level reached in 1991, in view of the rapid deterioration of the transportation and trading network in the countries concerned and also because it was thought that some of these exports consisted of stocked material. Delays in shipments from the Russian Federation at the beginning of 1992 reinforced these beliefs. As it happened, however, exports continued at more or less the same level in 1992 as in 1991.

33. Since prices of alumina in many contracts are linked to the aluminium price, alumina prices in these contracts have also been affected by the unbalanced supply/demand situation for primary aluminium, despite the fact that output and consumption of alumina has been more closely matched during the period so that prices, taking only supply and demand fundamentals into account, would have been expected to be higher. Capacity extensions in many alumina refineries contributed, however, to uncertainty about future market developments and led to a fall in spot market prices for alumina from the very high levels reached in 1988-1990. Spot prices in the first quarter of 1992 were reported to be around US$ 130 per ton. Later, prices improved to between US$ 165 and 170 per ton due to continued strong demand from smelters in the absence of substantial cutbacks[31]. This price level is, however, insufficient to justify investment in new alumina refineries. At present, supply and demand of alumina seem to be in balance.

34. Bauxite prices, which are usually determined by formulas contained in long-term contracts, appear to have been relatively little affected by the downturn in aluminium prices, although there is a growing tendency to link prices of bauxite to the aluminium price, which may influence the price obtained by some producers. Furthermore, governments in some bauxite producing developing countries have in recent years had to accept reductions in the share of income from bauxite sales that accrue to them through profit sharing agreements, taxation or export levies, thus effectively reducing the price paid by the buyer. Keeping in mind the already mentioned difficulties of estimating bauxite mining capacity, it appears nevertheless that capacity utilization in bauxite mines at present is higher than it has usually been in the past.

V. OUTLOOK FOR 1993 - 1994

35. The development of aluminium demand in 1993 and 1994 depends on whether the indications of an upturn in the business cycle in the United States that were seen at the end of 1992 prove to be correct and whether the recovery spreads to other countries. Historically, the early stages of a cyclical upturn have been associated with increases in aluminium demand of over 5 per cent per year (see Figure 1 in Chapter I). Several forecasts for aluminium demand in 1993 that were presented at the end of 1992 were based on this historical experience[32]. However, the economic recovery that is expected to take place in 1993 may turn out to be less broad and general than previous upturns, judging from forecasts concerning Germany and Japan. A less widespread recovery would be expected to lead to a lower rate of growth in aluminium consumption, possibly 3 to 4 per cent in 1993 and slightly less in 1994, corresponding to an increase in demand of 450,000 to 600,000 tons in 1993 and about 500,000 tons in 1994. Primary aluminium capacity is expected to increase by about 570,000 tons in 1993 and by a further 20,000 tons in 1994 (see table A.6 in the annex for details). The additions to capacity in 1993 would be too large to allow any significant reductions of inventories or increases in operating rates this year even in the absence of any continued exports from the former USSR Republics. Since these exports are expected to continue, although probably at reduced rates (see below), further cutbacks in operating rates and closures of high-cost smelters are likely to be necessary to allow the process of inventory reduction to begin and to avoid a complete collapse in the price. Assuming that further substantial cutbacks are implemented in 1993, the price could be expected to increase somewhat, although it is unlikely that it will reach levels that would allow existing high-cost smelters to operate profitably until inventory levels have been substantially reduced. This process may not be finished before the end of 1994.

36. Smelter operating costs are likely to increase over the next several years since the limits of what can be achieved through rationalization have been reached in many cases, and since alumina prices are likely to rise in order to permit investment in new refining capacity. It is also uncertain whether power suppliers in the future will be willing to enter into the kind of variable price-linked power rate contracts that have been concluded over the past several years, given their recent experience of low prices and consequent loss of potential revenue.

37. About 1 million tons per year of additional alumina capacity in Australia, Brazil and Jamaica are expected to come into production in each of the years 1993 and 1994. While this would seem to be more than sufficient to meet the requirements of new smelters and the expected increase in demand, it should be noted that increased alumina supplies may be needed for the aluminium industry in the Republics of the former USSR as a result of transportation problems which have left some alumina refineries in these countries without raw materials and without the possibility to ship their production. Aluminium smelters in these countries have been active recently in looking for alumina supplies from sources outside the former USSR, and in the longer term there may be a need for substantial imports of alumina. Consequently, alumina production capacity may

become a bottleneck for industry expansion in years to come, and over the next two years alumina prices would be expected to rise.

38. Known expansion plans for bauxite production appear to be more or less in line with the expected growth in demand. The entire expansion in 1993 and 1994 is expected to take place in Latin America and the Caribbean. Since there is also considerable flexibility when it comes to adjusting the rate of output, the bauxite market is not expected to show any major changes during the next two years.

39. Since developments in the Republics of the former USSR will be of critical importance to the outlook for the international bauxite/alumina/aluminium industry over the next few years, it might be useful to briefly review the main factors that are likely to determine the performance of the industry in these countries. Tables A.7 and A.8 in the annex give an overview of the present situation as regards production capacity for alumina and primary aluminium. It should be noted that the data in these tables are often based on estimates and they can not be considered as reliable as the corresponding data concerning the rest of the world. Information on the production capacity of mines in the former USSR is not available.

40. The bauxite/alumina/aluminium industry in the former USSR Republics is expected to pass through a restructuring process in the next few years. This process is likely to have a significant impact on the industry's production and its export capabilities in 1993 and 1994. Although there is considerable potential for increased domestic consumption in hitherto undeveloped consumer goods sectors, and plans are being made to increase production capacity for semifabricates and finished goods, personal incomes and private consumption are expected to grow only slowly over the next few years. Accordingly, domestic demand for aluminium in the countries concerned is likely to remain very low in the short to medium term, and the bulk of production will be intended for exports as is the case at present.

41. Available information indicates that production costs in aluminium smelters in the former USSR Republics are very low, with the main cost components being alumina and labour. Power tariffs are extremely low in most cases and capital costs are not relevant[33] Most of the smelters are, however, relatively old and not very efficient in their use of power and raw materials. Furthermore, many of them are significant sources of pollution. It is considered unlikely that the extent of pollution originating from the smelters will be tolerated by public opinion in the future. As the transformation of these economies to a higher degree of reliance on market mechanisms achieves momentum, higher prices will have to be paid for electric power and for other inputs, as well as for transportation. This will inevitably raise production costs and reduce the relative cost advantage enjoyed by the smelters at present. Furthermore, as of 1 January 1993, international prices are used in trade between the Russian Federation and the other Republics. This will raise prices of raw material for some of the smelters considerably. A process of transformation intended to increase operating efficiency and reduce pollution has been initiated at several smelters, but it is likely that some of them will have to close.

42. The situation with regard to the alumina refineries is similar to that of the smelters. Many of the refineries are also old and constitute a considerable burden on the environment. Furthermore, some of them rely on non-bauxite mines for feed. It is unlikely that these mines will be competitive in the future. Accordingly, bauxite would have to be imported in order to continue refining operations, and this would automatically place the refineries at a disadvantage because of the higher transport costs. It has been suggested that these alumina refineries, with a combined capacity of about 1.6 million tons per year, would therefore have to close down[34]. This would further exacerbate the difficulties of the smelters, which would then have to rely on supplies of imported alumina to a greater extent than before. This would be more expensive because of the added transport costs.

43. The Russian Federation has large deposits of adequate quality bauxite, particularly in the Ural mountains, where production could possibly be expanded to replace the exploitation of non-bauxite and low-grade bauxite deposits[35]. Many of these deposits, however, can be exploited only through high-cost underground mining methods.

44. Primary aluminium production in the former USSR Republics is expected to fall from 3.5 million tons in 1992 to about 2.5 million tons in 1993, mainly as a result of transportation difficulties[36], which as mentioned above have already led to the closure of a smelter in Azerbaijan. It can not be automatically assumed, however, that exports will decline by the same amount, since large amounts of material may still be awaiting transportation and since domestic demand may decline further. It is likely that exports from the former USSR Republics will remain in excess of 500,000 tons in both 1993 and 1994.

Notes

1. Unless otherwise indicated, data on consumption are from the World Bureau of Metal Statistics (primary aluminium consumption) and from the UNCTAD secretariat (total consumption). See also UNCTAD: Bauxite, alumina and aluminium statistics 1982-1991. Report by the UNCTAD secretariat (TD/B/CN.1/RM/BAUXITE/3).

2. Except for copper, for which reliable estimates of 1992 consumption are not yet available, figures on consumption of all other non-ferrous metals show increases below those of aluminium consumption over the period 1990 to 1992. Lead and nickel consumption are estimated to have declined over the three years concerned.

3. Metal Bulletin, London, 21 September 1992

4. Japan Metal Bulletin, Tokyo, 1 August 1992.

5. Japan Metal Bulletin, Tokyo, 4 January 1993.

6. See UNCTAD: Recent market and industry developments (TD/B/C.1/RM/BAUXITE/2), 8 February 1991, for a more detailed description of the development of aluminium demand in different end use sectors in recent years and future prospects.

7. Aluminum Association, quoted in Metals Week, New York, 2 November 1992.

8. Organization of European Smelters, quoted in Mining Journal, London, 9 October 1992.

9. Mining Journal, London, 9 October 1992.

10. Unless otherwise indicated, data on production are from the World Bureau of Metal Statistics and from the UNCTAD secretariat. See also UNCTAD: Bauxite, alumina and aluminium statistics 1982-1991(TD/B/CN.1/RM/BAUXITE/3).

11. Metal Bulletin, London, 4 June 1992.

12. Metal Bulletin, London, 21 December 1992.

13. The German smelter (Alusuisse's Rheinfelden smelter) continues, however, to produce secondary aluminium.

14. The figures for production and capacity are from the International Primary Aluminium Institute (IPAI). It is known that these figures, which are based on reports directly from the companies, often understate actual capacity and that therefore "real" capacity utilization may in fact be somewhat lower than is implied. Nevertheless, the IPAI data have been used here since they constitute the only consistent time series for capacity.

15. American Metal Market, New York, 1 December 1992.

16. Mining Journal, London, 22 January 1993.

17. American Metal Market, New York, 14 January 1993, Metal Bulletin, London, 18 January 1993, Mining Journal, London, 22 January 1993.

18. Aluminium industry analyst Anthony Bird, quoted in Mining Journal, London, 30 October 1992, and in Metal Bulletin, London, 27 July 1992.

19. Anthony Bird, quoted in Mining Journal, London, 11 December 1992. Results for the third quarter of 1992 for four major North American aluminium companies illustrate this point: **Alcoa** had earnings of US$ 62.2 million as compared to US$ 75.9 million in 1991; **Reynolds Metals** earned US$ 20.8 million, compared to US$ 41.5 million in 1991; **Alcan** lost C$ 10 million in the third quarter of 1992 and had a net income of C$ 6 million in the same period in 1991; and **Amax** had a loss of US$ 23.8 million in 1992 and earnings of US$ 3.2 million in 1991. (Metal Bulletin, London, and Metals Week, New York, 19 October 1992).

20. Anthony Bird, quoted in Metal Bulletin, London, 24 September 1992.

21. For instance, the share of local costs for the expansion of the Alpart alumina refinery in Jamaica was estimated to have been reduced from 30 to 15 per cent as a result of the devaluation of the Jamaican dollar (Metal Bulletin, London, 30 July 1992).

22. Metal Bulletin Monthly, London, November 1990.

23. Metal Bulletin Monthly, London, September 1992.

24. D. Morrison: Bauxite Supply in a Changing Market. Paper presented at Metal Bulletin's 7th International Aluminium Conference, Oslo, 20-23 September 1992.

25. According to industry sources, the costs of rehabilitation of bauxite minesites in Western Australia, where the legislation requires a complete rehabilitation, is on the order of 2 per cent of operating costs.

26. For instance, Alcoa's annual investment in environmental equipment is between US$ 65 and 80 million per year, and approximately the same amount is spent on operating costs for this equipment. Between $40 and 50 million per year are recovered in raw materials and products, which thus offset over 50 per cent of the operating costs (information from Alcoa).

27. Metal Bulletin, London, 9 July 1972. It should be noted that the export figures quoted in UNCTAD: Bauxite, alumina and aluminium statistics 1982-1991 (TD/B/CN.1/RM/BAUXITE/3) do not reflect this sudden increase in exports. These figures are based on trade data from importing countries. It has not been possible to identify an explanation that accounts for the whole amount of the discrepancy. Furthermore, since the export figures shown in the above-mentioned report include exports to other countries of Eastern Europe and socialist countries in Asia, they are higher for years prior to 1991 than the figures quoted in the text of the present report which refer only to exports to developed market-economy countries and developing countries.

28. Estimates of changes in Russian exports in 1992 have tended to increase over time, from a decline of 135 000 tons (Metal Bulletin, London, 10 August 1992) to a 100 000 ton increase (Metal Bulletin, London, 21 September 1992) to an increase of between 50 000 and 250 000 tons (Mining Journal, London, 4 December 1992).

29. Metal Bulletin, London, 13 August and 21 September 1992.

30. It should be noted that while inventories of unwrought aluminium held by producers as reported by the International Primary Aluminium Institute (IPAI) increased by almost 100,000 tons over the period, some of these inventories are likely to be included in the figure for LME stocks, since such stocks are included in IPAI's reports if the title to them is held by an IPAI member(International Primary Aluminium Institute: A guide to the IPAI Statistical System, London, 1988). Consequently, the residual increase in inventories held by consumers and traders may be understated.

31. Metal Bulletin, London, 23 July 1992.

32. See, for instance, Metals and Minerals Research Services: Metals Analysis and Outlook, Fourth Quarter 1992 (demand increase in 1993 forecast at 4-5 per cent); and Anthony Bird, quoted in Mining Journal, London, 30 October 1992 (demand forecast to increase by 4 per cent in 1993).

33. Based on information from industry.

34. D. Morrison, ibid. According to this source, the combined capacity of the refineries concerned is 1.4 million tons per year.

35. Engineering and Mining Journal, Chicago, July 1992.

36. Metal Bulletin, London, 30 November 1992.

ANNEX

Table A.1 Changes to bauxite mine production capacity 1990-1992

Country/operation	Owner	Change 1000 metric tons from end 1989	Effective date	Comment
Brazil		**+2 800**		
Cataguazes	CBA	+500	Late 1990	New mine
Poços de Caldas	CBA	+200	1991	Expansion
Trombetas	Mineraçao Rio do Norte Aluvale Alcan Alcoa Billiton CBA Hydro Reynolds	+2 000	1991	Expansion
Paragominas	Companhia Brasileira de Bauxita	+100	1990	New mine, refractory grade bauxite
France		**-450**		
La Braque	Pechiney	-300	1990	Shutdown
Les Canonettes	Pechiney	-150	1991	Shutdown
Guyana Orami	Government of Guyana Reynolds	**+1 500**	1991	New mine
India Madhya Pradesh	Bharat Aluminium Co.	**-500**	1991	Shutdown
Italy Oloved, Sardinia	Sardabauxiti	**+450**	June 1991	New mine
Jamaica		**+900**		
Woodside	Government of Jamaica Alcoa	+200	1991	Expansion
Alpart, Nain	Kaiser Hydro	+700	1990	Expansion
Suriname		**+1 000**		
Moengo	Alcoa	-2 000	End 1992	Shutdown due to exhaustion of reserves
Coirmotito	Alcoa	+2 000	1991	New mine
Accaribo	Billiton Alcoa	+1 000	1992	New mine
United States Bauxite, Arkansas	Alcoa	**-800**	May 1990	Shutdown
Venezuela Los Pijiguaos	Government of Venezuela	**+1 000**	1990-1992	Continuous expansion
Total		**+5 900**		

Source: UNCTAD secretariat, based on trade journals and information from industry

Table A.2 Changes to alumina refinery capacity 1990-1992

Country/operation	Owner	Change 1000 metric tons from end 1989	Effective date	Comment
Australia		**+1 400**		
Gove	Alusuisse Gove Alumina	+150	Early 1992	Expansion
Kwinana	Alcoa of Australia	+350	1991	Expansion
Gladstone	Queensland Alumina Comalco Kaiser Alcan Pechiney	+500	1991	Expansion
Worsley	Worsley Alumina Reynolds Billiton Kobe Alumina Ass.	+400	1991	Expansion
Brazil		**+290**		
Sao Paulo	CBA	+90	1991	Expansion
Alumar	Aluminio do Maranhao Alcoa Camargo Correa	+200	1992	Expansion
India Renukoot, Uttar Pradesh	Hindalco	**+20**	1991	Expansion
Ireland Aughinish	Alcan Billiton	**+100**	1991	Expansion
Italy Porto Vesme, Sardinia	Alumix Comalco Clarendon	**+100**	1991	Expansion
Jamaica Alpart	Kaiser Hydro	**+250**	1990	Expansion
United States		**+500**		
Bauxite, Arkansas	Alcoa	-300	1990	Shutdown
Sherwin, Texas	Reynolds	+200	1991	Expansion
St. Croix, Virgin Islands	Clarendon Ormet Ravenswood	+600	Early 1990	Reopening
Venezuela Interalumina	Government of Venezuela	**+700**	1992	Expansion
Total		**+3 360**		

Source: UNCTAD secretariat, based on trade journals and information from industry

Table A.3 Changes to aluminium smelter capacity 1990-1992

Country/operation	Owner	Change 1000 metric tons from end 1989	Effective date	Comment
Austria				
Ranshofen	Austria Metall	**-80**	End 1992	Shutdown
Brazil		**+291**		
Ouro Preto	Alcan	-9	October 1991	Partial shutdown
Sao Paulo	CBA	+35	1991	Expansion
Alumar	Aluminio do Maranhao Alcoa Camargo Correa	+85	1990	Expansion
Albras	CVRD Nippon Amazon Aluminium	+180	1991	Expansion
Canada		**+825**		
Arvida	Alcan	-59	1990	Partial shutdown
Baie Comeau	Reynolds	+120	1991	Expansion
Bécancour	Pechiney Reynolds Alumax Government of Québec	+120	April 1991	Expansion
Laterrière	Alcan	+214	February 1991	New smelter
Alouette	Austria Metall Hoogovens Government of Québec VAW Kobe Steel Marubeni Corp.	+215	December 1992	New smelter
Deschambault	Alumax	+215	September 1992	New smelter
France		**+126**		
Dunkerque	Pechiney Electricité de France Banque Nationale de Paris General Electric Norwich Union Suez Legal & General	+215	May 1992	New smelter
Noguères	Pechiney	-75	October 1991	Shutdown

Riouperoux	Pechiney	-14	October 1991	Shutdown
Germany		**-40**		
Rheinfelden	Alusuisse	-20	Late 1991	Shutdown of primary aluminium capacity, smelter produces secondary aluminium
Essen	Alusuisse	-20	Beginning 1992	Partial shutdown
India		**+25**		
Mettur, Tamil Nadu	Madras Alumina	-25	1991	Shutdown
Renukoot, Uttar Pradesh	Hindalco	+50	1992	Expansion
Iran, Islamic Rep. Arak	Government of Iran	**+30**	1990	Expansion
Italy		**-62**		
Porto Marghera	Alumix	-30	July 1991	Shutdown
Fusina	Alumix	-32	May 1992	Shutdown
Norway Mosjøen	Alcoa Elkem	**+25**	1991	Expansion
Switzerland Chippis	Alusuisse	**-12**	October 1991	Shutdown
United Arab Emirates Dubai	Government	**+75**	1991	Expansion
United States Ferndale, Washington	Alumax	**+10**	1991	Expansion
Venezuela Alcasa	Government of Venezuela Reynolds	**+85**	1990	Expansion
Total		**+1 298**		

Source: UNCTAD secretariat, based on trade journals and information from industry

Table A.4 Expected changes to bauxite mine production capacity 1993-1994

Country/operation	Owner	Change 1 000 metric tons from end 1992	Effective date	Comment
Brazil				
Trombetas	Mineraçao Rio do Norte Aluvale Alcan Alcoa Billiton CBA Hydro Reynolds	**+1 500**	1993	Expansion
Jamaica		**+800**		
Alpart, Nain	Kaiser Hydro	+500	1993	Expansion
Woodside	Government of Jamaica Alcoa	+300	1993	Expansion
Venezuela				
Los Pijiguaos	Government of Venezuela	**+4 000**	1993	Expansion
Total		**+6 300**		

Source: UNCTAD secretariat, based on trade journals and information from industry

Table A.5 Expected changes in alumina refinery capacity 1993-1994

Country/operation	Owner	Change 1 000 metric tons from end 1992	Effective date	Comment
Australia				
Wagerup	Alcoa of Australia	**+630**	Early 1993	Expansion, further increase by 250 000 tons possible in 1994
Brazil				
Alumar	Aluminio do Maranhao Alcoa Camargo Correa	**+1 000**	1994	Expansion
Jamaica		**+450**		
Alpart	Kaiser Hydro	+250	Mid-1993	Expansion
Clarendon	Government of Jamaica Alcoa	+200	1993	Expansion
Total		**+2 080**		

Source: UNCTAD secretariat, based on trade journals and information from industry

Table A.6 Expected changes in aluminium smelter capacity 1993-1994

Country/operation	Owner	Change 1 000 metric tons from end 1992	Effective date	Comment
Australia				
Tomago	Gove Aluminium Pechiney Australian Mutual VAW Hunter Douglas	**+140**	Early 1993	Expansion
Bahrain				
Alba	Government of Bahrein Saudi Public Investment Fund Breton Investments	**+235**	Mid-1993	Expansion
Brazil		**+74**		
Sao Paulo	CBA	+65	1993	Expansion
Valesul	Aluvale Billiton Cataguazes	+9	1993	Expansion
France				
Venthon	Pechiney	**-31**	Early 1993	Shutdown
Norway				
Husnes	Hydro Alusuisse	**+32**	1994	Expansion
Qatar				
Umm Said	Doha Aluminium	**+150**	1993	New smelter
South Africa				
Richards Bay	Alusaf	**+40**	1994	Expansion
Switzerland				
Steg	Alusuisse	**-50**	Autumn 1994	Shutdown
Total		**+590**		

Source: UNCTAD secretariat, based on trade journals and information from industry

Table A.7 Alumina refineries in the republics of the former USSR

Operation/location	Capacity 1 000 metric tons per year	Comments
Azerbaijan Sumgait	**500**	Opened 1965, uses alunite, output goes to Sumgait smelter
Kazakhstan	**1 400**	
Achinsk	400	Opened 1970, uses nepheline syenite
Pavlodar	1 000	Opened 1975, uses low-grade high-silica bauxite from local mines
Russian Federation	**1 900**	
Bogoslovsk, Ekaterinburg region	400	Opened 1945, modernized 1980, uses low-silica bauxite from the Urals, output to Bogoslovsk smelter
Kamensk, Ekaterinburg region	200	Opened 1939, uses low-silica bauxite from the Urals, output to Kamensk smelter
Kandalaksha, Kola peninsula	70	Opened 1970, uses nepheline syenite from local mines, output to Kandalaksha smelter
Novokuznetsk, western Siberia	250	Opened 1943, uses low-grade high-silica bauxite from Siberia, output to Novokuznetsk smelter
Pikalevo, St. Petersburg region	500	Opened 1959, uses nepheline syenite from Kola peninsula
Tikhvin, St. Petersburg region	350	Opened 1938, uses local and imported low-silica bauxite
Volkhov, St. Petersburg region	130	Opened 1932, uses nepheline syenite, output to Volkhov smelter
Ukraine	**1 300**	
Nikolaev	1 000	Opened 1982, uses bauxite from Guinea, output to Regar and Volgograd smelters
Zaporoshye	300	Opened 1934, uses imported bauxite from Hungary, Guinea, Jamaica, output to Zaporoshye smelter
Total	**5 100**	

source: UNCTAD secretariat, based on trade journals and information from industry

Table A.8 Aluminum smelters in the republics of the former USSR

Operation/location	Capacity 1 000 metric tons per year	Comments
Azerbaijan Sumgait	**60**	Opened 1954, uses alumina from Sumgait refinery, conversion planned, closed down in 1992 due to transportation difficulties
Russian Federation	**3 300**	
Bogoslovsk, Ekaterinburg region	150	Opened 1945, uses alumina from Bogoslovsk refinery, retrofit planned
Bratsk, Siberia	1 000	Opened 1966, uses alumina from Kazakhstan refineries and imports from elsewhere
Irkutsk, Siberia	275	Opened 1962, uses alumina from Kazakhstan refineries, modernization programme under-way
Kamensk, Ekaterinburg region	100	Opened 1939, uses alumina from Kamensk refinery
Kandalaksha, Kola peninsula	30	Opened 1970, uses alumina from Kandalaksha refinery, conversion and possibly expansion under-way
Krasnoyarsk, Siberia	800	Opened 1964, uses alumina from Achinsk refinery and imports from elsewhere, modernization programme under-way
Nadvoitsky, Karelia	70	Opened 1954, uses alumina from Kandalaksha refinery, modernization planned
Novokuznetsk, western Siberia	200	Opened 1943, uses alumina from Novokuznetsk refinery, retrofit planned
Sayanagorsk, Krasnoyarsk region, Siberia	520	Opened 1985, expanded gradually
Volgograd (Tsaritsyn)	135	Opened 1958, uses alumina from Hungary and Nikolaev refinery, retrofit planned
Volkhov, St. Petersburg region	20	Opened 1932, rebuilt after World War II, uses alumina from Volkhov refinery
Tajikistan Regar	**520**	Opened 1975, uses alumina from Nikolaev, operated at reduced capacity end 1992
Ukraine Zaporoshye	**120**	Opened 1934, rebuilt 1949, uses alumina from Zaporoshye refinery and from Hungary, retrofit and expansion planned
Total	**4 000**	

Source: UNCTAD secretariat, based on trade journals and information from industry