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Santiago, Chile, 26 and 27 October 1989

THE TIN INDUSTRY OF LATIN AMERICA: TECHNOLOGICAL OPTIONS AND OPPORTUNITIES FOR GROWTH **/

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**/ A study by the Secretariats of ECLAC and UNCTAD, prepared for the meeting of "Technological Options and Opportunities for Development: The Aluminium and Tin Industries in Latin America and the Caribbean", as part of work programme RLA/87/019, "Assistance for Commercial Development and Trade Negotiations".

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Introduction

(i) The present study has been prepared jointly by the ECLAC and UNCTAD secretariats using financial assistance by UNDP as part of a general project aimed at strengthening the external sector of Latin American and Caribbean economies (PROJECT RLA/87/019). The objective of the study is to identify options open to the governments and industries of Latin American and Caribbean countries with regard to the use of modern technology to improve the contribution of the tin industry to economic development. A study with the same objective has been prepared for aluminium.

(ii) While the use of modern technology to improve the situation of the tin industry is a matter of priority, it was found during the course of the work that developments in other areas merited attention. Consequently, the scope of the study is broader than implied by its title and recommendations are also made with regard to obstacles to trade, marketing etc.

(iii) The parts of the study dealing with tin concentrates/tin metal production are based on a report by a consultant for ECLAC, Mr. Gilberto Costa Manso of the National Department of Mineral Production in Brasilia. Valuable assistance has also been given by a large number of persons in the Latin American/Caribbean and international tin industry who have provided information and advice.

(iv) The main findings of this study, as well as of the one on aluminium, are summarized in a shorter report comparing the situation of the two industries. All the reports are intended for presentation and discussion, with a view to finalize recommendations, at a meeting of experts at ECLAC headquarters in Santiago in October 1989.

Summary

(v) Chapter I of this study is devoted to a review of supply of and demand for tin in concentrates, tin metal and tinplate since 1978, both at the global level and at the level of the Latin American/Caribbean region.

(vi) The world tin industry has gone through a period of major restructuring during the last decade. The 1985 world tin market collapse had the effect of increasing the pace and scope of the restructuring process. Consumption continued the downward trend started in the 1960's and 1970's. Some of the reasons behind the decline in world tin demand are slower world economic growth, the high price of tin compared to other competing materials and its consequent replacement by aluminium, steel or plastics in a number of uses, and technological advances which have reduced the use of tin per unit of output. In developing countries, however, demand has generally increased.

(vii) The collapse of the international tin market in 1985 led to the closure of a number of the higher cost tin mines around the world and to a consolidation of the world tin industry. These events coincided with the emergence of significant new suppliers to the world tin market, especially Brazil, which had the lowest costs of production in the 1980's, and China. This led to the displacement of Bolivia both as a producer and exporter to the world market and to a reduction in the importance of the traditional South East Asian suppliers such as Malaysia, Indonesia and Thailand.

(viii) While all major metals experienced price falls during most part of the 1980's, the International Tin Council, in an effort to support tin prices, purchased large amounts of tin and this led to the buildup of record high levels of stocks. The price fall in 1985, when the purchases had to cease, was therefore more abrupt and severe than for other metals. However, since then prices have risen in response to increased world demand and reductions in stocks.

(ix) Tin consumption in the Latin American/Caribbean region has been generally increasing. But tinplate consumption has decreased as most countries have had to reduce their imports due to the economic difficulties of the region. Argentina, Chile and Peru were the only countries where tinplate consumption increased. The decline in tinplate consumption has resulted in increased excess capacity in the sector in all countries. Tin concentrate production has increased significantly in Brazil, as a result of the discovery of new deposits, and in Peru, but it has decreased in Argentina and, especially, in Bolivia. Tin metal production has also increased significantly in Brazil. Increases in production in Argentina and Mexico were mostly due to increased imports of concentrates.

(x) Latin American and Caribbean tin concentrate exports to areas outside the region have decreased over the last decade as a result of a drastic decline in production and exports by Bolivia following the 1985 world tin crash. Peru, however, increased its exports, especially to the United States and Western Europe. Total tin metal exports from the region increased since the dramatic decline in exports by Bolivia was compensated by a large increase in exports by Brazil. North America has become the leading trading partner. In Western Europe, imports of Latin American tin concentrates have declined, while imports of tin metal and tinplate from the region have expanded. Finally, exports of semi-manufactured products, especially tinplate, increased markedly mainly as a result of increased exports by Brazil, Venezuela and, to a lesser extent, Mexico. Tinplate exports have been diversified with significant quantities now going to Western Europe, other developing countries and socialist countries.

(xi) Intra-regional trade in tin concentrates and tin metal decreased significantly over the last decade, one reason being, in the case of concentrates, that Brazil, once the largest importer in the region, ceased imports as domestic production expanded. For tinplate, although the share of Latin American exports to the region has declined, actual levels exported increased. However, intra-regional trade in tin in general is still relatively modest. Some of the constraints and difficulties which hamper the development of intra-regional trade are the limited size of domestic markets for

tin, both at the primary stage and for processed products, which do not allow the development of economies of scale in this sector; the lack of transportation, both in terms of inland and shipping routes; foreign exchange restrictions and customs procedures; the relatively high tariffs levied in particular on processed tin products; non-tariff barriers to trade; and finally the impact of a heavy debt burden in the majority of countries in the region which has necessitated reduced levels of imports.

(xii) Chapter II deals with technology and costs of production in the tin industry. The cost of mining accounts for the major share of the total costs of tin production. Brazil has the lowest costs of production in the world as most of its deposits are alluvial. The only country with costs comparable to Brazil is Indonesia. However, the major share of this country's production is split between high cost gravel pump operations and relatively low cost off-shore dredging. Malaysia and Thailand have the highest costs in gravel pump operations because of the high degree of exhaustion of their resources, while Brazil, with higher grade deposits, has the lowest cost. Bolvia, whose tin deposits are virtually all underground, had among the highest costs in the world. This was one of the reasons why it was so severely affected by the 1985 tin market crisis as it had to reduce its production drastically. Recent Bolivian costs are difficult to estimate since the effects of the restructuring are not yet fully absorbed, but Bolivian industry officials argue that what is left of Bolivian output can be considered as marginallly profitable. Peru is relatively cost competitive while Argentina's costs of production are higher. Costs of smelting and refinning in Brazil are twice as high as in Thailand and Malysia, mainly because of the long distance between mining and smelting facilities. Bolivia has among the highest smelting and refinning costs due to the complexity of its ore. However, rationalization measures being currently introduced are expected to lower overall costs. As regards tinplate, Latin American producers in general appear to have significantly higher costs than producers in the industrial world. Brazil, which has a more balanced industry, is an exception.

(xiii) In Chapter III, the expected development of demand and supply to the mid 1990's is discussed. World tin supply and demand are expected to remain in equilibrium. The trends already observed during the 1970's and 1980's, that is, the downward trend in world tin demand and the decline in world production, are expected to continue into the 1990's. The consolidation of the world tin industry following the 1985 tin crash, which resulted in important changes in the pattern of supply and trade for both tin concentrates and tin metal, will continue to exert a significant impact on the world tin industry. All tin producing countries are expected to decrease their output with the exception of Brazil whose production will continue to expand substantially. The geoghraphical shift in tin smelting is likely to be enhanced in the future in favour of developing countries. Tin metal production is expected to decrease in the industrialized countries. Smelting is a very competitive industry and only highly cost effective smelters will be able to survive in the long-run. The South-East Asian countries, especially Malaysia, are expected to continue to dominate world tin smelting, at least in the short-run, and that region is expected to continue to provide the largest share of both tin concentrates and tin metal to the world market.

(xiv) The Latin American and Caribbean region is expected to enhance its position as a major supplier to the world tin market while demand for tin in the region will remain relatively modest compared to capacity. The region will continue to be export oriented and rely on outside markets for its continued survival and harmonious development. The exportable surplus of tin metal is expected to be on the order of 44, 000 tons per year in the mid 1990's or 63 per cent of expected production capacity. Therefore, the industry will have to remain internationally competitive and be attentive to developments in the world market.

(xv) Chapter IV deals with the opportunities for and constraints on increased Latin American and Caribbean production. The greatest opportunity for exports will still exist in the industrial countries, the largest consuming markets for primary tin metal, especially North America, the EEC and Japan. Opportunities also exist in developing countries, especially in Asia. In the socialist countries of Eastern Europe, the level of tin metal imports is expected to decrease slightly. However, these countries should remain net importers. Barriers to trade in tin in terms of tariffs are negligible as most industrialized countries accord duty free treatment on tin ore and concentrates from developing countries. However, the tariff protection increases with the degree of processing. There are also a number of non-tariff barriers which restrict imports. Tariffs are generally higher in developing countries and nominal rates of duty on tin increase with a higher degree of processing.

(xvi) Tin exporters in Latin America will also have to consider their future marketing strategy in order to be able to penetrate markets in the region itself and elsewhere, especially in developing countries where the highest rate of consumption is expected. As regards opportunities for intra-regional trade of tin, a potential for growth in consumption exists in particular at the semi-manufacturing and manufacturing stages. However, considering the prevailing financial difficulties of most countries in the region it is difficult to see how consumption could be developed, at least in the short run.

(xvii) Chapter V sets out conclusions and recommendations. Against the background of expected negative growth in world tin consumption and the existing over capacity in smelting and tin semimanufacturing industries, the characteristics of the tin industry are delineated in order to assess the possibilities for any new investments in the region. The processing of tin further downstream requires complementary metals and unless these metals are available on economic terms, the establishment of processing facilities beyond the stage of smelting would face difficult problems. The processing of downstream products on the basis of imported materials

tends to raise production costs rendering the operation uncompetitive. However, the availability of complementary metals from domestic sources, for example lead in Bolivia and Brazil and silver in Bolivia, Peru and Mexico would permit the expansion of solder alloy industries in those countries. The availability of technology, especially in Brazil and Mexico, which are adequately equipped to undertake processing of tin end use products is likely to facilitate the establishment of further processing. Competitive production costs, especially in Brazil, favour the expansion and further development of the tinplate industry.

(xviii) The following recommendations are made:

- Transportation facilities in the region need to be improved to facilitate trade.

- The incidence of tariff and non-tariff barriers on tin and tin products needs to be reduced and customs duties rationalized.

- Promotion and marketing facilities should be upgraded so as to make possible the penetration of other markets, both within the region and elsewhere, and to maintain the attractiveness of tinplate as a packaging material.

- Smelting capacities in the region need to be streamlined and rationalized and co-operation in tin smelting should be further developed. Tinplate capacities in the region need also to be rationalized in order to improve efficiency and reduce production costs. Opportunities exist to set up processing plants in the area of tin chemicals, especially in Brazil and Mexico. This could be done through joint ventures.

- There is a need to formulate adequate foreign exchange policies to encourage exports of tin and tin products from the region as well as appropriate fiscal policies providing incentives for exports.

- Export credits and adequate systems of payments for the promotion of intra-regional trade need to be developed.

- There is a need to develop co-operation between tin producing countries in the region as regards research and development in metallurgical processes to reduce production costs and develop new uses of tin in order to slow down the replacement of tin by other materials. This could be done through financial support to the I.T.R.I.

- Compilation and collection of comprehensive statistics, especially on consumption, with a view to improve market transparency in the domestic markets, would be helpful in determining the level of demand for tin in the region. The signature or ratification of the Terms of Reference of the International Tin Study Group would assist in this regard.

- The establishment of environmental protection policies to be adopted by the large companies operating in the tin mining industry would help promoting Latin American tin products.

I. Development of tin supply and demand - 1978-1987

A. Global tin supply and structural changes

1. Tin was one of the first metals to be used by man because it was relatively easy to work. Tin consumption acquired the characteristics of a mature industry relatively early. In fact, the consumption and production of tin have been relatively stable since the first decades of the century. By 1940, world production was already well above two hundred thousand tons, similar to what it would be in the late 1970s and well above the output recorded in the mid-1980s (see table 1). The main concentrate producing countries were already those which ranked until recently as the most important producers, namely Malaysia, Thailand, Indonesia, Bolivia, China and, to a lesser extent, Australia and Nigeria.

2. The tin industry, has been characterized by boosts of demand and production, but it has been the only mineral commodity subject to market agreements, first among producers during the 1930s, and then among producers and consumers after 1956 when the first International Tin Agreement was signed and the International Tin Council (ITC) was established.

3. Another characteristic of this mature industry compared to other metal industries is the degree of substitution it has had to reckon with for a long time. This stimulated the producing countries to establish the International Tin Research Institute (ITRI) in 1932, with the specific aim of undertaking research to develop new markets or maintain traditional ones.

4. Although the forces behind the need for the restructuring of the world tin industry were at work since the 1970s, it was only in recent years that restructuring became imperative, when it was triggered by the collapse of the International Tin Agreement and the suspension of tin trading on the London Metal Exchange. These events coincided with the emergence of Brazil as the world's leading producing country and to a lesser extent, China.

5. While all major metals experienced price falls during most part of the 1980s, the ITC had administered tin prices in a counter-cyclical way leading to the build-up of record high levels of stocks. The abrupt price fall in 1985 was more severe than expected, with prices decreasing from around US$ 12,000 during the first half of the year to US$ 5,000 by the year end.

TABLE 1

World tin-in-concentrates production, 1978 to 1987
(000 metric tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Europe	3.9	3.1	4.0	4.8	5.1	4.9	5.7	6.0	4.8	4.2
Asia	128.9	135.9	136.2	134.7	124.4	106.7	100.0	88.6	74.8	72.7
Indonesia	27.4	29.4	32.5	35.3	33.8	26.6	23.2	21.8	24.6	26.2
Malaysia	62.7	63.0	61.4	59.9	52.3	41.4	41.3	36.9	29.1	30.4
Thailand	30.2	34.0	33.7	31.5	26.2	19.9	21.6	16.6	16.8	14.8
Other	8.4	9.5	8.6	8.0	12.1	18.8	13.9	13.3	4.3	1.3
Africa	10.1	9.8	9.7	8.5	7.4	6.9	8.0	6.2	3.9	4.5
Latin America	38.5	36.2	36.6	40.4	37.2	42.2	43.5	48.0	41.6	42.5
Argentina	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.5	0.3	0.2
Bolivia	30.9	27.8	27.3	29.8	26.8	25.3	19.9	16.1	10.5	8.1
Brazil	6.3	6.6	6.9	8.3	8.2	13.3	20.0	26.5	25.4	28.5
Mexico	0.1	0.0	0.1	0.0	0.0	0.1	0.4	0.4	0.6	0.4
Peru	0.7	0.9	1.1	1.5	1.7	2.4	2.2	3.8	4.8	5.3
Developing C	177.3	181.8	182.1	183.6	169.1	155.6	151.5	142.8	120.3	119.7
North America	0.5	0.4	0.3	0.3	0.2	0.2	0.3	0.3	2.5	3.5
Australia	11.9	12.6	11.6	12.3	12.1	9.7	7.9	6.9	8.7	7.7
Western C	19.8	19.5	19.3	21.0	20.9	18.1	16.7	15.9	18.7	16.9
Eastern C	19.8	19.8	18.0	17.9	18.0	19.2	19.7	19.0	19.0	18.5
USSR	18.0	18.0	16.0	16.0	16.0	17.0	17.0	16.0	16.0	15.0
China	18.0	17.0	16.0	16.0	17.0	17.5	20.0	25.0	28.0	
Total	235.4	238.3	235.8	238.9	224.5	211.4	206.9	199.2	184.5	184.9

Source: UNCTAD secretariat.

6 The maintenance of relatively high prices during the early 1980s did not stimulate the tin producers to reduce their costs of production, as did other metal producers (see chapter II, section C). The consequence of the market collapse was that most traditional producers started to operate at a loss. In fact, production had already been cut between 1981 and 1985, especially by the South-East Asian producers. As tables 1 and 2 indicate, this region reduced its mine and smelter output by over 30 per cent in this period.

7. In Latin America this was also the situation of Bolivia. For many years the world's second largest tin concentrate producer, Bolivia's concentrate production declined dramatically after 1981 owing to a mixture of technical and other factors, which will be discussed below.

8. In contrast, Brazilian production, stimulated by favourable world tin prices and the discovery of the Pitinga deposit, increased significantly, thus more than compensating for the reduction of the Bolivian output. Since Brazil was not a member of the International Tin Agreement, it was under no obligation to curtail production. Consequently, the Latin American share in world output of tin in concentrate increased.

9. Paradoxically, after the tin price collapse in 1985, a significant number of producers increased their output. In part, this action was an attempt to compensate for the drastic reduction in profit margins via reduction in unit costs through the larger output. This seems to have been the case of Australia1/ and Indonesia (see table 1). Other companies, both state owned and private, benefitted from government incentives and subsidies. This was the case of Australia, Malaysia, the United Kingdom and Thailand.2/

10. Another common reaction to the depressed prices (and one which is common to almost all metal industries) was the adoption of selective mining, a practice which, by concentrating extraction on the higher grade zones of the deposit enables a reduction in costs.3/ The selective mining may be justified since its adoption may be the condition for the survival of the firm involved, but a consequence of this practice is that it shortens the mine's life.

Table 2
World primary tin metal production
(000 tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Developing Countries	159.8	170.1	172.8	172.5	156.0	135.2	134.7	132.6	127.0	124.6
Africa	4.5	4.3	4.1	4.2	4.2	3.8	3.7	3.2	1.2	1.6
Asia	128.7	138.6	140.9	139.6	122.6	102.9	94.5	90.0	88.4	87.8
Indonesia	25.8	27.8	30.5	32.5	29.8	28.4	22.5	20.4	22.1	24.2
Malaysia	71.9	73.1	71.3	70.3	62.8	53.3	46.9	45.5	43.8	44.4
Thailand	29.0	33.2	34.7	32.6	25.5	18.5	19.7	18.0	19.7	15.4
Latin America	26.6	27.2	27.8	28.7	29.2	28.5	36.5	39.4	37.4	35.2
Argentina	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Bolivia	16.2	15.7	17.5	19.9	18.9	14.1	15.8	12.9	7.7	2.7
Brazil	9.3	10.1	8.8	7.8	9.3	13.0	18.9	24.7	27.5	29.1
Mexico	1.0	1.3	1.4	0.9	0.9	1.2	1.6	1.6	2.0	3.2
Developed Market economy Countries	34.4	31.9	25.7	24.8	25.3	25.4	27.7	26.8	24.9	25.4
North America										
United States	5.9	4.6	3.0	2.1	3.5	2.5	4.0	3.0	3.2	3.9
Europe	20.8	19.0	14.4	14.3	13.9	15.6	17.2	17.3	16.3	
17.6United Kingdom	7.7	8.0	5.9	6.8	8.2	6.4	7.2	7.5	9.2	12.2
Australia	5.1	5.4	4.8	4.2	3.1	2.9	2.9	2.7	1.4	0.6
Socialist Countries	19.5	19.7	19.0	18.3	19.5	21.4E	21.9E	22.3E	21.5E	20.6
USSR	18.0	18.0	17.0	16.0	17.0	18.5E	18.5E	18.5E	18.0E	17.0
China	18.0	17.0	15.0	16.5	16.5	16.5	17.0	19.0	20.0	25.0
World	231.7	238.7	232.5	232.1	217.8	199.0	201.8	201.2	193.9	196.1

E = Estimates.
Sources: UNCTAD secretariat; Metallgesellschaft and national statistics for Argentina.

Table 3
Production of secondary tin metal
(000 tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Europe	6.4	7.2	8.8	9.2	7.8	8.3	8.9	9.3	7.1	6.0
F.R.Germany	1.5	1.6	1.6	1.2	0.6	0.4	0.4	1.0	0.4	0.2
United Kingdom	2.7	3.4	5.5	6.1	5.4	6.9	6.7	7.3	5.7	4.8
United States	1.6	1.8	1.7	1.6	1.1	1.2	1.1	1.3	1.1	1.5
Canada	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Australia	0.3	0.4	0.5	0.4	0.5	0.4	0.5	0.4	0.3	0.3
Argentina	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Brazil	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Others	0.3	0.3	0.3	0.5	0.5	0.2	0.8	0.4	0.3	0.3
World	9.1	10.2	11.8	12.2	10.4	11.0	11.8	12.3	9.4	8.8

Source: UNCTAD secretariat.

B. Global tin demand:

1. Macro-economic developments and their influence on tin demand

11. World demand for tin has been declining for several years, mostly as a result of decreasing consumption in developed market economy countries (D.M.E.C.S), the major consumers. Since 1978, tin consumption has experienced a sharp decline particularly in the United States and the EEC, and to some extent in Japan. This situation is due to a number of factors, such as the slowdown in world economic growth, the high price of tin compared to other competing materials and its consequent replacement by, for example, aluminium, steel or plastics in a number of uses; and technological advances which have reduced the use of tin per unit of output especially in the production of tinplate, one of its major end-uses.

12. World consumption of primary tin metal had a negative average growth rate of 0.1 per cent from 1978 to 1987. In 1988, consumption is estimated to have increased by 5 to 6 per cent, not taking into account the centrally planned economies of Eastern Europe. Total tin consumption, including secondary tin metal, also decreased by an annual average of 0.1 per cent from 1978 to 1987 as world secondary tin metal consumption was more or less maintained at a little over 7,000 tons. Total tin consumption declined from 229,600 tons in 1978 to 227,300 tons in 1987 (see table 4).

Table 4

Consumption of primary and secondary tin metal

(000 of metric tons)

	1978		1987	
	Primary	Secondary	Primary	Secondary
World	222.2	7.4	220.1	7.2E
Developed market economy countries				
of which	146.7	7.0	126.2	6.9E
America	53.7	2.4	39.6	1.3E
EEC	55.4	4.1	47.0	5.2
Japan	29.6	-	32.6	-
Developing countries				
of which	24.8	0.4	37.4	0.3
Africa	2.1	-	1.6	-
America	9.7	0.2	15.4	0.2
Asia	11.2	0.2	18.9	0.1
Socialist countries of Eastern Europe	40.7	-	43.0	-
Socialist countries of Asia	10.0	-	13.5	-

E = Estimate

Source: UNCTAD secretariat.

14. Between 1975 and 1980, world tin consumption increased at the modest rate of 0,4 per cent per year (see table 5). With the onset of the world economic recession in 1980, world tin metal consumption for the year fell to around 212,000 tons. The combined effect of the prolongation of the recession and the continuing technological changes in the consuming industries resulted in further declines in demand for tin metal to around 195,000 tons in 1982, a drop of 12.5 per cent compared to 1978. In 1983, despite the start of economic recovery in the industrialized countries of the West, tin metal consumption stagnated. In 1986 and 1987, world economic growth intensified to an estimated average of 3.0 per cent and world tin metal consumption also increased at an average of 2.2 per cent per year during this period. However, the increase of world tin demand was partly due to the sharp drop in tin prices which occurred at the end of 1985. Tin demand continued to increase in 1988 and early 1989. The growth of world tin demand in these two years is mainly due to the remarkable increase in tin consumption in developing countries, especially in Latin America, South East Asia and China. Developed market economy countries' tin consumption in 1985 and 1986 actually decreased and it was only in 1987 that it recovered to 126,200 tons, a level 14 per cent lower than that of 1978, notwithstanding the resumed growth in their economies.

15. In developing countries, although their economies grew at an annual average of 5.0 per cent between 1975 and 1980, tin metal consumption increased at an annual average of only 1.8 per cent. Between 1980 and 1985, despite decelerating GDP growth, tin metal consumption continued to grow at a sustained rate of 3.4 per cent (5.7 per cent in Asia, 1.6 per cent in Latin America and -1.3 per cent in Africa).

16. The period 1985 to 1987 saw a remarkable increase of developing countries' tin metal consumption as overall economic growth was resumed. This was especially true for the countries of South and South East Asia (Hong Kong, India, Malaysia, Pakistan, Philippines, Republic of Korea, Thailand and Taiwan); and Latin America (Argentina, Brazil, Chile and Mexico).

2. The development of demand in different end-use sectors and substitution effects

17. The replacement of tin by other competing materials has been one of the major factors behind the decrease in world tin consumption. Table 6 shows tin consumption by end use in 1978 and 1986 in a selected number of industrialized countries representing more than 83 per cent of developed market economy countries' tin consumption in 1987. This group of countries might not be

13. The world economy grew at a much lower pace between 1978 and 1986 than in the 1960s and early 1970s. The overall low growth of the world economy between 1978 and 1987 had a depressing effect on demand for tin during this period, especially in developed market economy countries. However, in developing countries, in spite of the slow growth of their economies during this period, total demand for tin increased at an annual average growth rate of 4.4 per cent between 1978 and 1986 and 4.5 per cent in Latin America.

Table 5
Average growth rates in GDP and primary tin metal consumption in selected years

	GDP				Tin consumption			
	1978 I986	1975 I980	1980 I985	1986 I987E	1978 I986	1975 I980	1980 I985	1986 I987
World	2.7	3.7	2.6	3.0	-0.4	0.4	0.4	2.2
Developed market economy countries	2.4	3.3	2.5	3.3	-2.4	-0.2	-2.2	-4.7
Developing countries of which	2.6	5.1	1.6	3.0	4.4	1.8	3.4	6.5
Latin America	2.2	4.9	4.8	2.6	4.5	3.0	1.6	11.6
Socialist countries of Eastern Europe	3.3	4.1	3.4	2.6	1.8	1.1	1.9	-8.1
Socialist countries of Asia	8.7	5.5	9.7	8.9	3.3	2.1	3.7	3.8

Source: UNCTAD Handbook of International Trade and Development Statistics, 1988.

representative of other countries' pattern of tin consumption, especially developing countries and centrally planned economies, but it accounts for a large proportion of world tin consumption It appears, that tin consumption has decreased in almost all end use sectors with the exception of solder and other uses.

18. Consumption of tin for tinplate, traditionally the largest end use of tin, decreased by an annual average rate of -5.1 per cent in this period and in 1986 represented only 28.1 per cent of total tin consumption. This was partly due to replacement of tin by steel, aluminium, and other materials, in the packaging sector, particularly and in beverage cans. Solder has become the largest end user of tin; its share in total tin consumption for this group of countries increased from 24 per cent in 1978 to 30.1 per cent in 1986. Actual volumes of tin consumed in solder increased modestly from 30,000 tonnes in 1978 to 31,600 tonnes in 1986, an average annual growth of 0.7 per cent. The expansion of the electronics industry, especially in Japan and the United States, environmental pressures against the use of lead in canned foods 4/ and plumbings explain the rise in the use ofsolder. Stricter national and international standards with regard to lead levels in canned foods apparently brought some can makers to use pure tin solder as a lead free alternative to the conventional lead containing product.6. Other uses of tin also increased during the period, especially in the chemical sector for the production of PVC stabilizers.

Table 6

Consumption of tin by end use for selected countries a/

	Tonnes 1978	Tonnes 1986	Average annual change, per cent
Tinplate b/	47,300	29,400	-5.8
%	37.7	28.1	
Tinning	5,200	4,700	-1.3
%	4.2	4.5	
Solder	30,000	31,600	0.7
%	23.9	30.1	
White metal, babbit & anti-friction metal	10,100	6,600	-5.2
%	8.1	6.3	
Bronze and brass	9,700	7,000	-4.0
%	7.7	6.7	
Other	23,100	25,500	1.2
%	18.4	24.3	
Total c/	125,400	104,800	-2.2
%	100	100	

a/ Include United States, Japan, France, Federal Republic of Germany, Italy and the United Kingdom. All figures rounded to nearest 100 tonnes.

b/ Figures may include some tin used in tinplate.

c/ Mainly primary, includes recycled tin metal for the United States (tinplate only), Italy and the United Kingdom (all uses).

Source: ITC tin statistics 1976-1986.

Table 7
Tin - Prices, a/1978-87 (actual) and 1988-2000 (projected)

	(c/Kg) Current$			(c/kg) 1985 Constant $			
				MUV a/		US GNP b/	
	LME Cash c/	Export Value d/	Kuala Lumpur e/	LME Cash c/	Kuala Lumpur e/	LME cash c/	Kuala Lumpure/
Actual							
1978	1,291	1,165	1,252	1,537	1,490	2,000	1,939
1979	1,546	1,380	1,482	1,626	1,558	2,201	2,110
1980	1,678	1,620	1,644	1,609	1,576	2,190	2,145
1981	1,416	1,270	1,406	1,350	1,341	1,685	1,673
1982	1,283	1,190	1,295	1,241	1,252	1,435	1,448
1983	1,299	1,230	1,303	1,290	1,294	1,399	1,403
1984	1,227	1,240	1,246	1,240	1,259	1,272	1,292
1985	1,195	1,200	1,154	1,154	1,195	1,195	1,154
1986	NA	606	616	NA	521	NA	604
1987	NA	660	669	NA	515	NA	637
Projected							
1988			690		490		632
1989			800		535		701
1990			925		610		771
1995			1,200		663		770
2000			1,700		750		870

NA Not available.
a/ Deflated by Manufacturing Unit Value (MUV) Index.
b/ Deflated by US GNP Deflator.
c/ LME Settlement Price, standard grade.
d/ Developing country export unit value.
e/ Settlement price.

Primary aluminum prices, 1978-87 (actual) and 1988-2000 (projected)

	($/Ton) Current $		($/Ton) 1985 Constant $			
			MUV a		US GNP b/	
	transactions Price c/	LME Cash d/	Transactions Price c/	LME Cash d/	Transactions Price /	LME Cash d/
Actual						
1978	1,045		1,244		1,619	
1979	1,520	1,602	1,598	1,685	2,164	2,281
1980	1,730	1,780	1,659	1,706	2,258	2,323
1981	1,338	1,262	1,276	1,203	1,593	1,502
1982	1,061	991	1,026	958	1,187	1,108
1983	1,495	1,440	1,484	1,430	1,610	1,551
1984	1,371	1,251	1,385	1,264	1,421	1,297
1985	1,110	1,041	1,110	1,041	1,110	1,041
1986	1,261	1,150	1,066	972	1,236	1,128
1987	1,608	1,565	1,237	1,204	1,531	1,491
Projected						
1988	2,400		1,706		2,199	
1989	2,100		1,404		1,840	
1990	1,800		1,186		1,501	
1995	2,350		1,299		1,508	
2000	2,900		1,280		1,485	

a/ Deflated by Manufacturing Unit Value (MUV) Index.
b/ Deflated by US GNP Deflator.
c/ Certain other transaction, US shipments to Europe, Min 99.5%, c.i.f. Europe (Source: Metal Bulletin).
This quotation was published beginning December 20, 1957.
d/ Average bid/asked (Source: Metals Week).
Sources: Price Prospects for major Primary Commodities Report No: 814/88, World Bank

19. The price of tin has been one of the key factors which has brought the tin consuming industries to search for cheaper alternative materials. This is illustrated in table 7 which shows that, relative to aluminium, tin prices were high up to 1985. This has had a negative effect on consumption. Tin, therefore, has been gradually replaced in a number of uses by aluminium, steel, plastics and other materials. After 1985, the price of tin decreased in 1986, but has since risen.

20. Another factor contributing to the downward trend in world tin demand were technological advances in electrolytic processes which have reduced the use of tin per square metre of tinplate (see table 8).

21. The share of secondary tin metal, in total tin demand is quite small (3.2 per cent in 1987) compared to other materials like aluminium . Recycling of tin is undertaken mostly in developed countries, especially in the United States and the EEC.

Table 8

Tin used (Kilogrammes per ton of tinplate produced)

	1977	1982	1983	1984	1985	1986	1987
United States	4.4	4.0	3.6	3.5	4.2 c/	4.1 c/	4.0 c/
EEC a/	5.7	4.8	4.6	4.8	4.3	4.4	4.4
Japan	7.0	6.4	6.3	6.2	6.0	5.8	5.7
Three regions	5.4	4.7	4.6	4.7	4.6	4.6	4.6
Rest of World b/	5.9	5.5	5.6	5.5	5.4	5.4	5.2
World	5.5	4.9	4.9	4.9	4.8	4.9	4.8

a/ Including Portugal and Spain.
b/ Excluding Bulgaria, The People's Republic of China, The German Democratic Republic, The People's Republic of Korea and the USSR.
c/ Figures under investigation.

Source: International Tin Council, June 1988.

3. World trade in tin at different stages of processing

22. In 1987, exports of tin-in-concentrates represented about 23.4 per cent of world tin in concentrates production and exports of primary tin metal about 31 per cent of world primary tin metal production. The largest share of world trade in tin is in the form of primary tin metal. Between 1978 and 1987, world trade in tin continued the downward trend already begun in the 1970s. After a slight recovery in 1981, it decreased dramatically in 1982 and 1983, recovered in the following two years, to fall again in 1986. In 1987 the total volume of world tin exports improved somewhat to a little over 200,000 tons, a level much lower than that of 1978 (see tables A8 and A10).

23. The structural changes already under way in the 1970s continued throughout the 1980s, resulting in important changes in the pattern of trade for both tin-in-concentrates and primary tin metal. These changes were exacerbated by the 1985 tin crash which led to closures of a number of the higher-cost tin mines around the world.

24. The remarkable increase in smelting capacity in the developing producing countries, which was undertaken in the 1960s and 1970s in order to achieve greater vertical integration, initially led to an increase in their exports of primary tin metal and a contraction in their exports of tin in concentrates.

25. The emergence of significant new suppliers to the world tin market, especially Brazil and China, which had the lowest costs of production in the 1980s, led to the displacement of Bolivia both as a major producer and an exporter to the world market, and to a reduction in the importance of the traditional South East Asian suppliers such as Malaysia, Indonesia and Thailand. The dramatic fall in prices in 1985 contributed to these changes.

26. From 1978 to 1982, world exports of tin in concentrates dropped from 41,000 tons to 25,000 tons. However, after 1983, exports increased continuously to regain the level of 1978, or a little over 42,000 tons. The decline in tin-in concentrates exports was the result of a number of factors such as the severe recession of 1981-1983,the reduction in tin production by small producers such as Argentina, Rwanda, Tanzania and Burma, and the trend towards forward integration into primary tin metal by the majority of producers. The only exception was Peru, where both production and exports increased throughout the period.

27. Since 1983, the renewed growth in tin-in-concentrates exports up to 1987 was due mainly to the increase in exports by Bolivia, where tin smelting activities were drastically reduced 7/. In addition, China also became a significant exporter of tin-in-concentrates, an estimated 5,600 tons in 1987. Table A8 shows that, while developing countries accounted for 69 per cent of world exports of tin in concentrates in 1978, their share went down to around 57 per cent in 1987. Argentina and Rwanda ceased exports completely and Bolivia's exports decreased from 13,800tons in 1978 to an estimated 8,300 tons in 1987. at present, most tin in concentrate exported by developing countries comes from small producers such as Peru, Namibia and Burma, which have no smelting facilities. Since 1978, re-exports from Singapore have fluctuated and stood at 7,300 tons in 1987.

28. Developed market economy countries maintained their share in world exports of tin-in-concentrates at approximately 30 per cent throughout the decade, with the exception of 1985, when their share declined to 25 per cent. Although exports by the United Kingdom decreased significantly between 1980 and 1985, they recovered in 1986, to decrease again slightly in 1987 to a level of 2,700 tons. Australia's tin concentrates exports increased in 1980 and 1981, declined in 1983 and recovered in 1986 and 1987 to around 6,000 tons. South Africa's exports of tin concentrates decreased by more than half between 1978 and 1987, when they stood at an estimated 1,000 tons.

29. In 1978, the United States and the EEC were the largest importers of tin concentrates, sharing between them 57 per cent of world imports (see table 9). However, the low demand for tin and the shortage of tin concentrates led to the closure or reduced operation of many smelters in these countries. By 1987, the share of the United States and the EEC in total imports had consequently fallen to 32 per cent.

30. In contrast to the situation in developed countries, total tin-in-concentrates imports by developing countries increased steadily between 1978 and 1987, doubling over the period to reach 32,600 tons in 1987, or 65.3 per cent of world tin concentrates imports. The bulk of developing countries' imports is accounted for by Malaysia, which is by far the largest tin concentrates importer in the world. The substantial increase in imports into Malaysia in recent years is largely due to imports of concentrates which are smelted on a toll basis. In 1987, such imports accounted for some 90 per cent of total concentrates imports into this country. Mexico increased its imports throughout the period. The Republic of Korea also increased its imports in 1987. Singapore is a significant importer of tin concentrates for re-export.

31. Imports into the USSR remained stable from 1978 to 1985, decreased slightly in 1986, and recovered in 1987 to an estimated 2.6 per cent of world tin concentrates imports.

Table 9

Tin-in-concentrates a/: Exports by destination, 1978
(000 tons)

Origin \ Destination	World	Developed Market Economy countries				Developing countries				Socialist countries of Europe	Socialist countries of Asia	Countries not elsewhere specified
		Total	United States	EEC (12)	Other	Total	Latin American	Asia	Africa			
World	41.1	25.4	4.1	19.7	1.6	13.9	3.6	10.3	–	1.7	–	0.1
DME countries	12.6	5.1	0.3	4.8	–	7.4	0.5	6.9	–	–	–	0.1
United States	–	–	–	–	–	–	–	–	–	–	–	–
EEC (12)	2.5	2.5	–	2.5	–	–	–	–	–	–	–	–
Others	10.1	2.6	0.3	2.3	–	7.4	0.5	6.9	–	–	–	0.1
Developing countries	28.5	20.3	3.8	14.9	1.6	6.5	3.1	3.4	–	1.7	–	–
Latin America	15.3	13.7	3.8	9.3	0.	1.6	1.6	–	–	–	–	–
Asia	8.0	2.4	–	2.4	–	3.9	1.5	2.4	–	1.7	–	–
Africa	5.2	4.2	–	3.2	1.0	1.0	–	1.0	–	–	–	–
Socialist countries of Europe	–	–	–	–	–	–	–	–	–	–	–	–
Socialist countries of Asia	–	–	–	–	–	–	–	–	–	–	–	–

a/ Exports of tin-in-concentrates as defined in the SITC item 287.6.

Source: Quarterly Statistical Bulletin, International Tin Council; National trade Statistics.

Table 10

Tin-in-concentrates a/: Exports by destination, 1987
(000 tons)

Origin \ Destination	World	Developed market economy countries				Developing countries				Socialist countries of Europe	Socialist countries of Asia	Countries not elsewhere specified
		Total	United States	EEC (12)	Other	Total	Latin American	Asia	Africa			
World	42.3	19.9	6.5	12.8	0.6	21.0	0.7	20.3	–	1.2	–	0.2
DME countries	12.7	6.3	0.1	6.2	–	6.2	0.2	6.0	–	–	–	0.2
United States	–	–	–	–	–	–	–	–	–	–	–	–
EEC (12)	2.7	2.7	–	2.7	–	–	–	–	–	–	–	–
Others	10.0	3.6	0.1	3.5	–	6.2	0.2	6.0	–	–	–	0.2
Developing countries	24.0	13.6	6.4	6.6	0.6	9.2	0.5	8.7	–	1.2	–	–
Latin America	12.7	12.2	6.2	5.5	0.5	0.5	0.5	–	–	–	–	–
Asia	9.3	0.3	0.1	0.2	–	7.8	–	7.8	–	1.2	–	–
Africa	2.0	1.1	0.1	0.9	0.1	0.9	–	0.9	–	–	–	–
Socialist countries of Europe	–	–	–	–	–	–	–	–	–	–	–	–
Socialist countries of Asia	5.6	–	–	–	–	5.6	–	5.6	–	–	–	–

a/ SITC item 287.6.

Source: See table 9.

Table 11

Tin metal a/: Exports by destination, 1978
(000 tons)

Origin	World	Developed market economy countries				Developing countries				Socialist countries of Europe	Socialist countries of Asia	Countries not elsewhere specified
		Total b/	United States	EEC (12)	Other	Total b/	Latin American	Asia	Africa			
World	172.1	136.3	38.6	66.4	31.3	21.5	2.4	16.7	0.5	13.1	-	1.2
DME countries	21.3	14.9	0.3	12.8	1.8	1.4	0.6	0.5	0.3	4.9	-	0.1
United States	0.5	0.1	-	-	0.1	0.3	0.3	-	-	0.1	-	-
EEC (12)	12.4	12.5	0.3	10.8	1.4	1.0	0.3	0.4	0.3	4.8	-	0.1
Others	2.4	2.3	-	2.0	0.3	0.1	-	0.1	-	-	-	-
Developing countries	145.4	118.1	36.7	52.1	29.3	18.3	1.8	16.3	0.2	7.9	-	1.1
Latin America	17.6	9.9	5.2	4.7	-	1.8	1.8	-	-	5.9	-	-
Asia	122.8	103.6	31.5	142.8	29.3	16.5	-	16.3	0.2	2.0	-	0.7
Africa	5.0	4.6	-	4.6	-	-	-	-	-	-	-	0.4
Socialist countries of Europe	-	-	-	-	-	-	-	-	-	-	-	-
Socialist countries of Asia	5.4	3.3	1.6	1.5	0.2	1.8	-	0.1	-	0.3	-	-

a/ Exports of tin metal as defined in the SITC item 687.1 (tin and tin alloys, unwrought), by destinations as reported by exporting countries. In some cases, such destinations do not represent the final destination. For example, tin exported to Singapore was re-exported, the destinations of these re-exports being (in tons): Total: 28,301; Developed market economy countries: 22,686, of which United States: 2,269; EEC: 4,840; others: 9,577; developing countries: 4,715; all to Asia; socialist countries of Europe: 270; unspecified: 630.

b/ "Total developing countries" includes Yugoslavia. Sub-totals may not add, due to unspecified destinations included in the relevant sub-group by the reporting countries.

Sources: Quarterly Statistical Bulletin, International Tin Council; national trade statistics.

Table 12

Tin metal a/: Exports by destination, 1987
(000 tons)

Origin \ Destination	World	Developed market economy countries				Developing countries				Socialist countries of Europe	Socialist countries of Asia	Countries not elsewhere specified
		Total b/	United States	EEC (12)	Other	Total b/	Latin American	Asia	Africa			
World	159.3	99.6	23.3	49.9	26.4	45.7	1.7	43.2	0.1	10.8	-	3.2
DME countries	27.3	22.3	0.2	19.6	2.5	0.9	0.1	0.3	-	4.1	-	-
United States	1.3	1.1	-	-	1.1	0.2	0.2	-	-	-	-	-
EEC (12)	25.4	20.8	0.2	19.4	1.2	0.6	-	0.2	-	4.0	-	-
Others	0.6	0.4	-	0.2	0.2	0.1	-	0.1	-	0.1	-	-
Developing countries	114.4	64.5	15.1	28.0	21.4	40.0	1.6	38.1	0.1	6.7	-	3.2
Latin America	22.9	18.2	11.1	7.1	-	1.9	1.6	0.3	-	2.8	-	-
Asia	89.5	44.9	4.0	19.5	21.4	38.1	-	37.8	0.1	3.8	-	2.7
Africa	2.0	1.4	-	1.4	-	-	-	-	-	0.1	-	0.5
Socialist countries of Europe	-	-	-	-	-	-	-	-	-	-	-	-
Socialist countries of Asia	17.6	12.8	8.0	2.3	2.5	4.8	-	4.8	-	-	-	-

a/ Exports of tin metal as defined in the SITC item 687.1 (tin and tin alloys, unwrought), by destinations as reported by exporting countries. In some cases, such destinations do not represent the final destination. For example, tin exported to Singapore was re-exported, the destinations of these re-exports being (in tons): Total: 28,301; Developed market economy countries: 22,686, of which United States: 2,269; EEC: 4,840; others: 9,577; developing countries: 4,715; all to Asia; socialist countries of Europe: 270; unspecified: 630.

b/ "Total developing countries" includes Yugoslavia. Sub-totals may not add, due to unspecified destinations included in the relevant sub-group by the reporting countries.

Sources: Quarterly Statistical Bulletin, International Tin Council; national trade statistics.

32. World exports of primary tin metal increased continuously from 1978 to reach an all time high of 187,300 tons in 1981 (see table A10), reflecting the increase in smelting capacity in developing countries. However, the world economic downturn in the early 1980s led to a severe contraction in the volume of tin metal exports. Since 1982, the level of exports has fluctuated around 155,000 tons.

33. During this period, important changes in the pattern of tin metal trade took place, not only between developed and developing countries but amongst developing countries themselves. The 1985 tin crisis and the subsequent change in market conditions, as well as the sharp drop in tin prices, had far-reaching consequences on the capacity of traditional suppliers to export to the rest of the world. The shift in favour of developing countries, which had characterized the 1970s and early 1980s, was reversed as developed countries, especially the United Kingdom, came back strongly in 1986 and 1987, expanding their overall tin metal exports.

34. Bolivia, which traditionally has been a significant tin metal exporter with exports of 18,000 tons in 1981, decreased its exports dramatically to less than 2,000 tons in 1987 as mine production decreased and the country had serious problems with its smelting operations 8/. Nigeria and Zaire had practically ceased exporting tin metal by 1987. Exports from Malaysia and Thailand contracted severely throughout the period, while Indonesia maintained its tin metal exports at around 24,000 tons. In contrast, Brazil increased its exports from less than 2,000 tons in 1978 to over 21,000 tons in 1987. China has also expanded its tin metal exports from over 5,000 tons in 1978 to almost 18,000 tons in 1987. However, Malaysia remains the largest tin metal exporter with about 50,000 tons in 1987, or 31.2 per cent of world exports.

35. In total, developing countries' exports increased continuously up to 1981 when they represented around 85.4 per cent of world exports (see table A10). However, in the following years, the volume of exports from these countries fluctuated sharply, decreasing to 114,000 tons in 1987, or 72 per cent of world exports.

36. Tin metal exports of developed market economy countries were constant until 1982 at around 20,000 tons. They fell sharply in 1983 to 15,000 tons and fluctuated in the following years up to 1987, when they amounted to 27,300 tons, or 17 per cent in world exports.

Table 13
Tin metal a/
Imports by origin 1978 and 1987
(000 tons)

Destination	United States		EEC (12)		Japan		DMEC	Total
Origin	1978	1987	1978	1987	1978	1987	1978	1987
World	46.8	42.7	47.8	47.4	28.6	33.6	131.1	130.6
Developed market economy countries	0.8	3.6	10.2	21.7	-	0.1	16.7	29.5
United States	-	-	0.1	0.4	-	-	3.8	2.2
EEC (12)	0.8	1.3	8.0	19.0	-	-	10.3	22.2
Other	-	2.2	2.1	2.3	-	0.1	2.6	5.0
Developing countries	44.3	30.4	36.1	23.9	28.4	29.9	111.0	86.8
Latin America	7.6	17.6	1.7	3.5	-	0.4	10.0	22.3
Asia	36.7	12.6	30.1	19.3	28.4	29.5	96.7	63.2
Africa	-	0.2	4.3	1.0	-	-	4.3	1.2
Socialist Europe	-	-	-	0.1	-	-	-	0.1
Socialist Asia	1.6	8.7	1.5	1.7	0.2	3.7	3.3	14.5

a/ SITC 687.1. Imports by origin as reported by importing countries. Due to the existence of an important transit trade, this table can not be directly compared with trade flows derived from the export side. Because of the rounding, totals may not add.

Sources: National trade statistics.

37. Tin metal imports of developed market economy countries have stagnated around 130,000 tons and their share in world imports has decreased from 76.4 per cent in 1978 to 70 per cent in 1987. (see table A11) The United States, which depends almost entirely on imports for its supply of tin, is the world's largest importer of tin metal with 42,700 tons in 1987. Tin metal imports into the United States stagnated at the beginning of the 1980s at around 46,000 tons, fell drastically in 1982 to 29,200 tons and have since fluctuated around a level of 40,000 tons.

38. The European Economic Community is the largest tin metal importer in the world as a group but in 1987, 40 per cent of its imports originated from other countries members of the EEC. Japan, the world's third most important tin metal importer, saw its imports fluctuate around 30,000 tons in the last decade with the exception of 1982, when they decreased to 26,200 tons. In 1987, Japan's tin metal imports increased slightly to 33,600 tons, or 18 per cent of world imports.

39. Developing countries increased their tin metal imports significantly; in 1987 volumes were almost three times those of 1978. They stood at 34,200 tons in 1987, or 18.3 per cent of world imports. Most imports into these countries come from other developing countries, often within the same geographical region. The largest importers are in Asia (India, Republic of Korea, Singapore, Hong Kong and Taiwan) and in Latin America (Argentina, Chile, Colombia, Mexico and Venezuela). Turkey and Yugoslavia are also significant tin metal importers.

40. For the socialist countries of Eastern Europe, the general trend in tin metal imports was negative between 1978 and 1987 and total imports in the latter year amounted to 21,900 tons, or 12 per cent of world imports. The USSR accounts for 54 per cent of total tin metal imports of this group of countries. Imports by the USSR decreased in 1987, as did imports by Poland and Czechoslovakia.

41. As table A15 indicates, world tinplate exports amounted to an estimated 3.258 million tons in 1978, reached a peak in 1980 and fluctuated in the following years, recovering slightly in 1987 to an estimated 3.648 million tons. Tinplate exports increased at an annual average of 1.3 per cent between 1978 and 1987.

42. The share of tinplate traded in the world is quite small compared to total world production as most of the tinplate produced is consumed domestically. However, the share of exports in production has increased from 25 per cent in 1978 to 31.4 per cent in 1987.

43. Developed market economy countries are the largest producers, exporters and consumers of tinplate in the world. France, the Federal Republic of Germany and the United Kingdom are the largest producers within the EEC. France was the leading exporter in 1987, but its exports decreased by 13 per cent in 1987 compared to 1978. Exports by the Federal Republic of Germany decreased by 17 per cent during the same period, while exports by the United Kingdom increased by 38 per cent and those of Spain were 15 times higher than in 1978. Tinplate exports from the United States almost doubled between 1978 and 1980, decreased in 1981 through 1985, recovered in 1986 to fall again in 1987 to 144,200 tons, a drop of 77 per cent compared to 1980. Japanese exports fluctuated between 1978 and 1987 but their share in total world exports remained almost constant at around 25 per cent.

44. Tinplate exports from developing countries fluctuated between 1978 and 1981, then increased continuously up to 1987, when they stood at 249,200 tons, a level five times that of 1978 due to the increase in exports by Brazil, Venezuela and developing countries in South East Asia. However, developing countries depend to a large extent on tinplate imports (see table 17), the volume of which increased substantially up to 1981, when they accounted for almost 50 per cent of world imports, and decreased almost continuously afterwards to reach 1.3 million tons in 1987, or 35 per cent of world imports. The decline in developing countries' tinplate imports reflects an

the one hand the increase in their tinplate production capacities, and on the other hand the impact of debt on their economies and the cutback in their total imports. In 1987, China's tinplate imports were almost four times their 1978 level.

45. Tinplate trade in the Socialist countries of Eastern Europe takes place mainly between countries in the group. Both exports and imports decreased over the last decade

46. World trade in tin semi-manufactures is small since most of the production is consumed domestically. As table 14 shows, exports increased at an annual average of 3.7 per cent between 1978 and 1987 and stood at 8,900 tons in the latter year. Developed market economy countries are the largest exporters of tin semi-manufactures and their share in world exports increased from 59 per cent in 1978 to 65 per cent in 1987.

Table 14

World exports of tin semi-manufactures in 1978 and 1987

	Tons 1978	Share in percent	Tons 1987	Share in percent	Annual average increase 1978-1987 in per cent
World	6,400	100.0	8,900	100.0	3.7
Developed market economy countries	3,800	59.0	5,800	65.2	4.8
Developing countries	2,300	36.0	2,800	31.5	2.2
Socialist countries of Eastern Europe	200E	3.1	200E	2.2	-
Socialist countries of Asia	100E	1.6	100E	1.1	-

E = Estimate

Source: UNCTAD secretariat

47. Tin semi-manufactures exports from developing countries increased at an annual average of only 2.2 per cent and their share in world exports went down from 36 per cent to 31.5 per cent in this period as they increased their own domestic consumption. Most exports originated from Mexico, Hong Kong, India, Malaysia, Singapore and Taiwan, while Brazil, Peru and Thailand ceased their exports completely in 1987. Between 1978 and 1987, China exported an estimated 100 tons per year of tin semi-manufactures with the exception of 1982 to 1984, when its exports were estimated to be double this amount. Exports by the socialist countries of Eastern Europe were constant around 200 tons or 2.2 per cent of world exports in 1987.

Table 14

World imports of tin semi-manufactures in 1978 and 1987

	Tons 1978	Share in per cent	Tons 1987	Share per cent	Annual average in charge 1978-1987
World	10,800	100.0	9,400	100.0	-1.5
Developed market economy countries	5,400	50.0	6,000	63.8	1.2
Developing countries	3,600	33.0	3,400	36.2	-0.6
Socialist countries of Eastern Europe	1,800	16.7	-	-	-

Source: UNCTAD secretariat

48. Developed market economy countries are also the largest importers of tin semi-manufactures. Their share of world imports increased from 50 per cent in 1978 to 64 per cent in 1987. Developing countries increased their share of imports from 33 to 36 per cent during this period, while the socialist countries of Eastern Europe ceased their imports completely since 1980.

49. World trade in tin waste and scrap is very small and mainly takes place between developed market economy countries, although some developing countries are involved on a very small scale. World exports increased from 1978 to 1980 to a peak of 10,700 tons (see table A12) when the real price of tin was at its highest, and demand for tin waste and scrap, as a cheaper alternative material, increased. In the following years, world tin waste and scrap

exports fluctuated to regain in 1987 the 1978 level, around 9,600 tons. The share of developed market economy countries in world exports decreased slightly from 98 per cent in 1978 to 96 per cent in 1987 with the United States accounting for 67 per cent of world exports in the initial year and 47 per cent in 1987.9/ The share of developing countries, in world exports during this period increased from 2 to 4 per cent. Hong Kong, Malaysia and Singapore accounted for all tin waste and scrap exported by developing countries in 1987.

50. Developed market economy countries' share of world imports fell from 100 per cent in 1978 to 82 per cent in 1987, while that of developing countries increased from zero to 17 per cent. The United States accounted for 45 per cent of developed market economy countries' imports in 1987 while, Mexico and Singapore accounted for all tin waste and scrap imports into developing countries in that year.

(C). Supply and demand in Latin America and the Caribbean

1. Tin supply and demand in the region and in individual countries

51. The Latin American and Caribbean region has been a source of tin to the world tin industry since the 1820's. The growth of the armaments industry in Europe and North America, plus the invention of the tin vacuum-packed can produced a surge in the demand for tin. Output in Bolivia expanded faster than in other producer countries. Bolivia accounted for 11 per cent of world production in 1900; by 1921 this had climbed to 26 per cent. In 1945, after several years in which Malaysian tin supplies to the West had been cut off by the Japanese invasion, Bolivia's contribution reached an all time high of 48 per cent of world supply 10/. Until 1978, Bolivia was the second largest tin producer in the world; in 1987 it ranked 7th as output was reduced to an estimated 8,000 tons. Brazil, where tin production started in the 1970's, became the world leading producer in 1988 with an estimated output of 44,000 tons.

52. Between 1978 and 1987, demand for tin in the region has increased at an annual average of 5.3 per cent (see table A4). Argentina, Bolivia, Brazil, Chile, Mexico, Peru and Venezuela accounted for 95.5 per cent of total metal consumption in 1987, with Brazil alone accounting for more than half the consumption.

Table 16

Tin demand in Latin America by product, 1978 to 1987
(000 tons)

	Primary tin metal		Annual average	Share %	Secondary tin metal		Tinplate (A.C.) a/		Annual average	Share %
	1978	1987	1978-1987	1987	1978	1987	1978	1987	1978-1987	1987
Argentina	1.0	1.0	-	6.5	-	-	74.4	118.6	5.3	10.5
Bolivia	0.6	1.1	7.0	7.2	-	-	4.2	1.5	-10.8	0.1
Brazil	5.2	7.8	4.6	50.6	0.2	0.2	552.3	415.8	-3.1	37.0
Chile	0.7	1.0	4.0	6.5	-	-	41.9	51.0	2.2	4.5
Mexico	1.6	2.5	5.0	16.2	-	-	297.2	202.7	-4.2	18.0
Peru	0.4	0.5	2.5	3.3	-	-	32.7	68.0	8.5	6.1
Venezuela	0.2	0.8	16.6	5.2	-	-	126.8	106.0	-2.0	9.4
Others	0.5	0.7	3.8	4.5	-	-	185.4	161.1	-1.5	14.3
Total	10.2	15.4	4.7	100.0	0.2	0.2	1314.9	1124.7	-1.7	100.0

a/ Apparent consumption.

Source: UNCTAD secretariat.

53. Apparent consumption of tinplate decreased by an average of 1.7 per cent per year over the period as most countries reduced their imports due to the economic difficulties of the region and the increase in domestic production, particularly in Argentina, Peru and Venezuela. Argentina, Chile and Peru were the only countries where tinplate consumption increased between 1978 and 1987. In 1987, Brazil and Mexico accounted for more than half of the total tinplate consumed in the region (see table 16).

Argentina

54. Tin reserves in Argentina are estimated at 22,663 tons of tin content and represent around 0.23 per cent of world reserves. The tin industry of Argentina is currently represented by the Sociedad Minera Pirquitas - Picchetti Cia. SA, the second largest mining operation in the country after St Joe International Corporation's (United States) Aguilar Mine. Both mine enterprises are in the province of Jujuy, in the northern part of the country. However, total tin supply from domestic sources is quite small and ranges around a maximum of 450 tons (see table 19). Due to the lack of smelting capacity for low grade material in Argentina, up to 1982 most of the tin produced in the country was sent to Capper Pass in the United Kingdom. Empresa Estansa S.A. smelted tin imported mostly from Bolivia. After 1982, following the Malvinas conflict, Empresa Estansa S.A. developed the necessary technology to process the tin produced in Argentina. In 1986, Polymetal S.A., also started production of tin metal. Another source of supply of tin metal consists of recycling tin from tinplate, bronzes, lead solder anodes, etc.

55. From 1978 to 1980, Argentina increased its tin in concentrates imports especially from Bolivia. As tin metal production started by Empresa Estansa S.A., imports ceased completely from 1982 to 1985. They were resumed in 1986 to feed the new established smelting company Polymetal S.A. Exports stopped after 1985 for the reasons explained earlier.

56. Between 1978 and 1987, output of tin metal in Argentina increased at an annual average of 8.4 per cent, and stood at 186 tons in 1987. However, due to the increasing demand for tin, especially for the production of tinplate imports of tin metal increased at an average of 9.2 per cent per year between 1978 and 1986 to reach an all-time high of 1,344 tons in the latter year. They declined sharply in 1987 to 726 tons. In recent years, Brazil has displaced Bolivia as the main source of Argentina's tin metal imports.

Sociedad Minera Pirquitas - Picchetti Cia - S.A.

57. The complex tin ore concentrate from Pirquitas is blended at the company's Rio Blanco plant. The low grade tin concentrates are roasted and volatilized to concentrate the tin prior to smelting. This concentrate is then processed at the Estansa smelter utilizing the United Kingdom's Capper Pass tin refining technology to obtain three products: tin dust grading 40 per cent to 50 per cent, tin matte, and tin slags containing 0.3 per cent tin. The high grade tin concentrates, grading 40 to 50 per cent tin are also processed at the Estansa smelter in Palpala, Jujuy, by direct reduction methods to obtain the mineral, which is further refined by an electrolytic process. About 80 per cent of the concentrates are processed in the two smelters with an 80 per cent to 85 per cent recovery. The slags are exported to Belgium.

58. The international tin market collapse in October 1985, severely affected the Pirquitas Mine. Tin imports from Brazil's low cost alluvial operations dominate Argentina's domestic markets 11/, and Pirquitas has lost most of its customers. Argentina's new economic policies, known as "Plan Austral", have provided little assistance to the domestic mining industry. Since tin can be imported from Brazil or Bolivia at lesser cost, the Pirquitas Mine and the two associated smelters, la Cuprifera Argentina S.A.I.C and the Estansa S.A., have encountered financial difficulties. They have instituted an emergency plan, which includes legal action to protect their operations from being shut down. It is also felt that government financial and foreign exchange policies which determine two different parities for the dollar and the financial rate penalize exports as they institute an indirect tax of approximately 20 per cent on exports. On the other hand, public enterprises are exempted from taxes on imports while private companies have to pay an import tax.

59. Although, the domestic supply of tin has decreased since 1985 and tin demand has to be met increasingly through imports, there are some prospects for increased supply in the future. A large disseminated tin deposit in an area near the Pirquitas Mine is being explored. A property at Anfalla, a vein type deposit containing tin, silver and lead, has been targeted for development by the government 12/. Argentina's national development bank, Banade, has expressed interest in reactivating the Tinosgasta mine at Vil Achay in Catamarca in a joint-venture with Sociedad Minera VIL. Achay. The tin would be marketed domestically 13/.

60. Tinplate is the major end user of tin in Argentina, accounting for 48 per cent of consumption. Between 1978 and 1987, production of tinplate increased at an average of 6.2 per cent per year and apparent consumption grew at an annual average of 6.4 per cent. Imports of tinplate have also increased.

Table 17

Estimated consumption of tin by end-use in Argentina

Tinplate	48%
Solder	33%
Alloys	16%
Chemicals	2%
Other uses	1%

Source: Estadistica Minera de la Republica Argentina, Ministerio de Economia, Secretaria de Mineria, January, 1988.

Sociedad Mixta Sid rurgica Argentina S.A.(S.O.M.I.S.A)

61. This is a state-owned company and the only enterprise producing tinplate in Argentina, with an estimated capacity of 110,000 tons of tinplate a year. However, actual production has been below full capacity; in 1987 total output represented approximately 77 per cent of total capacity. SOMISA's output meets only 10 to 20 per cent of total tinplate demand in the country. Also, only certain specifications of tinplate are produced (see table 18). The difference is met through imports, in 1987 mainly from Brazil, Venezuela, Spain and Japan:

Table 18

Tinplate specifications produced in Argentina

Designation	Thickness	Designation	Thickness
E 0.2	1.1	E3	16.8
E 0.5	2.8	E3/1	16.8/5.6
E 1	5.6	E3/2	16.8/11.2
E 1/0.2	5.6/1.8	E4	22.4
E 1/0.5	5.6/2.8	E4/1	22.4/5.6
E 2	11.2	E4/2	22.4/11.2
E 2	11.2/5.6	E4/3	22.4/16.18

Source: SOMISA, December, 1988.

62. In recent years, competition from other materials has brought about a need to reduce costs through a reduction of the thickness of tin used. Thus, the average tin thickness of tin plate produced by SOMISA went down from 0.2448 mm in 1974 to 0.2406 in 1986. There is also a project to increase installed capacity by 30 per cent through the introduction of new equipment for the production of tinplate in reels.

63. In 1988, apparent consumption of tin plate in Argentina was estimated around 130,000 tons. It is expected to increase between 150,000 and 170,000 tons in 1995.

Table 19

Argentina
Supply and demand of tin-in-concentrates, tin metal, and tinplate
1978 to 1987
(tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Tin in concentrates										
Production	362	386	351	413	342	291	274	454	379	169 F
Exports	310	200	335	402	88	144	90	57	0.0	0.0
Imports	100	225	552	0.0	319	0.0	0.0	0.0	131	161
Tin metal										
Production	90	100	90	133	86	152	152	231	230	186
Exports	-	-	-		-	-	-	-	-	-
Imports	664	980	674	612	997	874	914	469	1,344	726
Apparent consumption a/	1,022	1,382	1,131	1,069	1,320	1,156	1,204	835	1,737	1,112E
Secondary tin										
Production	120	120	125	130	130	130	130	135	135	200E
Tinplate										
Production b/	53,000	67,000	40,000	52,000	84,000	96,315 c/	85,962 c/	80,942 c/	84,199 c/	88,211 c/
Exports	0.0	0.0	0.0	0.0	0.0	42	2	92	179	0.0
Imports	21,400	53,400	54,300	28,500	35,800	34,700	15,500	16,252	41,253	30,590
Apparent consumption	74,400	120,400	94,300	80,500	119,800	130,973	101,460	97,102	125,273	118,801

a/ Apparent consumption including national production, imports of temporary exports and secondary tin.
b/ ITC Tin Statistics, 1976-1986.
c/ Statistics from the Argentinian National Institute for Statistics and the Census (IMOFC) and Sociedad Mixta Siderurgica Argentina (SOMISA).
Source: Estadistica Minera de la republica Argentina y Datos para Analisis de Mercados, Ministry of the Economy; ITC Tin Statistics, 1976-1986.

Bolivia

64. Bolivia's tin reserves are extensive (see table 20). However, most of the deposits necessitate underground mining which makes operations very costly. To a large extent, the problems Bolivia has experienced in the last decade stem from this basic characteristic of its deposits, which makes it diff cult for the country to be competitive with other tin producers, especially Brazil.

Table 20

Bolivia's tin reserves a/

	Proven and Probable	Possible
COMBIBOL Mine Reserves (underground)	143,700	50,000
Medium Miners	250,000	300,000
Small Miners	60,000	100,000
Total	453,700	450,000

Note: a/ As of December 1988.

Source: Ministry of Mines and Metallurgy.

65. In 1970, Bolivia's tin-in-concentrates output amounted to 30,881 tons and the country ranked as the second world producer after Malaysia. However, since then its position has deteriorated very fast. The annual rate of change in tin in concentrates production was negative between 1978 and 1987 (-13.7 per cent, see table 21) and total output in 1987 was almost a quarter of production in 1978.

66. There are three main sources of supply of tin in Bolivia: The Corporacion Minera de Bolivia (COMIBOL), the Medium Miners and the Small Miners.

Table 21

Bolivia

Supply of and demand for tin-in-concentrates, tin metal and tinplate, 1978 to 1987

(tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Tin in concentrates										
Production	30.881	27.781	27.271	29.830	26.773	25.278	19.911	16.136	10.479	8.128
Exports	13.827	11.354	8.080	5.520	3.240	2.510	4.660	4.434	8.618	8.255
Imports	–	–	–	–	–	–	–	–	–	–
Tin metal										
Production	16.181	15.696	17.533	19.937	18.920	14.164	15.842	12.859	7.673	2.680 e
Exports	15.462	14.356	13.682	17.952	17.068	11.620	13.611	9.605	7.027	1.849
Imports	–	–	–	–	–	–	–	–	–	–
Consumption	600	1.000	1.000	1.000	1.500	2.400	1.800	1.900	1.100	1.100
Tinplate										
Production	–	–	–	–	–	–	–	–	–	–
Exports	–	–	–	–	–	–	–	–	–	–
Imports	4.200	4.100	2.800	8.500	3.500	2.300	1.900	1.900	1.500	1.500
Apparent consumption	4.200	4.100	2.800	8.500	3.500	2.300	1.900	1.900	1.500	1.500

Source: UNCTAD secretariat.

Corporación Minera de Bolivia (COMIBOL)

67. COMIBOL is the largest state owned enterprise and the main producer of tin in Bolivia. Already by 1979, COMIBOL had an accumulated deficit of over US$ 153 million. Long-term financial difficulties have led to less investment that would have been minimally desirable. The result has been declining operational efficiency and increasing production costs.

68. During the first half of the 1980's COMIBOL was responsible for just over 65 per cent of tin mine output, with the medium size miners accounting for 23 per cent and the small and individual miners for 11 per cent. The 1985 world tin market collapse led to the most serious mining crisis in the history of Bolivia as production and exports fell to their lowest levels. In 1987, COMIBOL output was 2,171 tons compared to 10,035 recorded in 1985. To confront this situation, a New Economic Policy (NEP) was put into force in August 1985 to restructure, redimension and rehabilitate the state mining and metallurgical industry.

69. The Government has restructured COMIBOL with the purpose of adapting it to the new international economic conditions, eliminating its huge deficit and seeking to establish efficient and income generating enterprises. In the new structure of COMIBOL operations have been decentralized

70. This restructuring policy has changed the structure of the Bolivian tin industry dramatically. COMIBOL,'s share in the country's tin in concentrate production was reduced to just 2 per cent in 1987 compared with 69 per cent (23,306 tons) in 1977. On the other hand, the small miners and cooperatives contributed with 70 per cent of total output in 1987 compared to only 10 per cent in 1977. The production by medium miners also fell during the period although their production share increased (see table 22).

Table 22

The structure of tin concentrate production in Bolivia
(in tons of tin)

	1977	1987
COMIBOL (state)	23,306 (69%)	180 (2%)
Medium companies	6,967 (21%)	2,295 (28%)
Small miners	2,557 (7%)	4,061 (50%)
Cooperatives	1,066 (3%)	1,665 (20%)
TOTAL	33,896 (100%)	8,201 (100%)

Source Asociacion Nacional de Mineros Medianos - Memoria, 1987. La Paz, Bolivia.

71. The explanation for this performance lies in the fact that several ureconomic mines have been leased by COMIBOL to labour cooperatives who have kept them in production.14/. A large number of COMIBOL's mines were closed because of high operational costs.

72. Although the production shares shown in table 21 constitute the short run result of governmental measures after 1985, may this reason change, it is possible to conclude that COMIBOL will not recover its previous share in tin concentrate output. Furthermore, the government has decided to attract foreign and local private capital which could be invested either in association with the state or by itself.

73. Production of tin metal in Bolivia also decreased dramatically between 1978 and 1987 and stood at an estimated 2,680 tons in 1987, a level six times less than that of 1978. Tin metal exports also decreased at an average annual rate of 21 per cent during this period and stood at 1,849 tons in 1987. The government owned smelting company, Empresa Nacional de Fundiciones (ENAF) accounts for the major part of production. There are also a few privately owned smelters.

Empresa Nacional de Fundiciones (ENAF)

74. ENAF was formed in 1966 with the aim to increase the added value of the country's exports 15/. The smelter, located at Vinto, seven kilometers from Oruro, was built in 1970 and became operational in 1971 with an initial capacity of 7,500 tons a year for high grade ores. For treating low grade and complex tin concentrates, a new smelting plant was set up in 1980 with a capacity of 10,000 tons a year. The low grade smelter receives the concentrates that formerly went to Capper Pass and Metall-gesellschaft.

75. Since 1980, capacity utilization has averaged less than two-thirds, ENAF has been almost constantly in deficit, and this has led to the build-up of a heavy debt burden. Strikes and work stoppages have often resulted in heavy losses in production. Between 1981 and 1985, national smelters accrued a foreign debt of over US$ 400 million and a loss of approximately US$ 180 million 16/. However, in 1985, the Government has launched a major restructuring programme, aimed at not only the tin industry but the whole mineral - metallurgical policy of the country 17/.

76. For tin in particular, the new policy has meant a dismissal of more than

twenty thousand employees from both COMIBOL and ENAF who were eventually non-operational workers. Another important measure has been the merger of ENAF with COMIBOL. Thus, the Bolivian government continues to control mineral smelting and metal refining. The smelters located in Vinto and Oruro 18/ have been transfered to COMIBOL's administration. The private smelters are limited to small operations in tin fuming plants (Fundesta o Oruro and Hormet).

77. Since their transfer to COMIBOL, some problems have been partially solved, but for the last four years Bolivian tin smelters have suffered from severe ore shortage as domestic tin production has decreased. In addition, primary producers have preferred to sell their output to foreign smelters that offer better purchasing terms.

78. Current smelting costs at Vinto are US$ 875 per metric ton. For Fundiciones de Vinto (former ENAF) the new restructuring policy entails the change of its energy source from fuel oil to natural gas reducing its operating costs, off-gases treatment to reduce environmental contamination and the introduction of a new method of refining 19/. Vinto's current labour force totals 580 workers, down from over 2,000 in 1985. In 1987, capacity utilization was less than 9 per cent as only about 2610 tons of primary tin metal was produced in 1987 compared with 7673 tons in 1986 and 7103 tons in 1985. The company's method of sales and acquisition has also changed. Tin metal sales are increasingly done through bids made by interested buyers instead of long-term contracts. This has lead to some improvement in prices

79. Fundesta o de Oruro S.A. (Pen Smelter) has a nominal tin smelting capacity of 5,000 tons a year. Following heavy losses for a number of years leading to a debt of more than US$ 20 million, the Ministry of Mines and Metallurgy intervened, and it was put under COMIBOL's supervision in 1984. The smelter has not, however smelted any tin since 1980 and it has only produced limited amounts of tin powders.

80. Compania Metall rgica Industrial y Comercial Hormet S.A. Of La Paz, is private fuming plant and lead smelter. It produced only 57 tons of tin in 1987.

81. In 1988, tin in concentrate production is estimated to be around 10,000

tons. The projections for the next five years assume that COMIBOL will produce around 5,000 tons 20/ with a possible increase during the period to 7,000 tons. The Medium Miners Association estimate that their output should be stable during the next few years (possibly five years) with a tendency to fall drastically thereafter since their deposits are small (making new investments in smelting uneconomical). The same kind of analysis would apply to the small and cooperative miners. No investment is being made in these operations and for similar reasons (selective mining and hence low recoverable reserves) the tendency should be for their output to be stable and then decrease.

82. This means that Bolivian tin in concentrate output could achieve a peak level of around 13,000 tons in the next one or two years and then decline to an average of 10,000 tons until the middle of the next decade.

83. However, conditions in the Bolivian mining industry are much better than five years ago. The government's mining development plan includes the reduction of the State's role in the industry and an opening to private investment, a revision of the current mining code, implementation of an alternative mining taxation system. Bolivian financial resources alone are not sufficient to renovate and develop the sector. Table 23 shows the objectives of the new strategy for economic and social development for the years 1989-2000.

Table 23

Projections of tin production in Bolivia
1989 - 2000
(metric tons)

By sub-sector	1988	1989 - 1992	1993 - 1996	1997 - 2000
COMIBOL	3,840	6,700 - 7,000	8,000 -10,000	10,000
Medium Miners	2,500	2,800 - 3,000	3,900 - 4,900	4,900
Small Miners + Cooperatives	4,310	5,100 - 5,900	5,100 - 5,100	5,100
Total	10,650	14,600 15,900	17,000 20,000	20,000

Note: Production with joint ventures from 1992.

Source: Economic and Social Development Strategy, 1989-2000 - Ministry of Mines and Metallurgy.

84. While Bolivia has been an important supplier to the world tin market fo many decades, its domestic demand has remained small and limited to a few sectors, especially soldering, alloys and the pewter industry (in 1986, the share of domestic consumption of tin metal was 14.3 per cent of total output). Tin metal consumption reached a peak in 1983 of 2,400 tons and fel to an estimated 1,100 tons in 1987.

85. As there is no tinplate industry in Bolivia, local demand is met throug imports. Apparent consumption of tinplate had a negative average growth rat of 10.8 per cent per year between 1978 and 1987. It almost doubled between 1978 and 1982 when it stood at 8,500 tons and decreased thereafter to about 1,500 tons in 1987 (see table 21). Tin demand in Bolivia is not expected to increase significantly in the immediate future.

Brazil

86. Tin has been produced in Brazil since the beginning of the century, first on a small scale in the states of Rio Grande do Sul and Minas Gerais where the ore was associated with pegmatites. The important resources of th state of Rondonia (then a Federal Territory) were discovered in the 1950's and became the main source of tin in the 1960's.

87. In 1970, Brazilian tin in concentrates production amounted to 3,950 tons, 90 per cent of which came from the Rondonia tin province. This tin wa mainly produced by individual miners, the "garimpeiros", who were attracted in hundreds to this rich area. Although they were responsible for the discoveries in the region it must be emphasized that their activities were extremely wasteful. Because of primitive methods used, they had to concentrate their activities on the high grade portions of the ore reserves leaving behind large quantities of concentrate which if not blended with the richer ore become uneconomic. Their activities also prevented any kind of assessment of the ore reserves.

88. Up to the early 1970's Brazil was a net importer of tin. The modern phase of the Brazilian tin industry started in 1971 when mining activity in Rondonia came to be considered legal only when exercised through organized mining companies 21/. The first impact of this measure was a reduction in the country's output, but with the use of modern mining equipment and investment in the region , tin output increased. The 1970's could be seen a

a learning phase since mining companies themselves tended to restrict themselves to the higher grade deposits 22/ and conditions of work were still primitive. The entire infrastructure had to be created including roads, villages, hospitals and all kinds of social facilities for the workers.

89. Between 1978 and 1987, Brazil tin-in-concentrate production increased at an annual average of 17.8 per cent to reach 28,500 tons in 1987 (see table 24). This remarkable increase is mostly due to the discovery by Paranapanema of the Pitinga deposit in 1981 in the Amazon Stat . In November 1987, Garimpeiros began mining a major new field at Ariquemes, an area of Rondonia (Alto Paraiso) previously abondoned by British Petrolium (B.P.), after preliminary exploration. The subsequent mining by garimpeiros pushed national production to an all time high in 1988,at an estimated 44,000 tons, making Brazil, the world's leading tin producer.

Table 24

Brazil

Supply and demand of tin-in-concentrates, tin metal and tinplate

1978 to 1987

(000 metric tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Tin in concentrates										
Production	6.5	6.6	6.9	8.3	8.2	13.3	20.0	26.5	27.7	28.5
Exports	–	–	–	–	–	–	–	–	–	–
Imports	2.3	4.2	1.9	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Tin metal										
Production	9.3	10.1	8.8	7.8	9.3	13.0	18.9	24.7	27.5	29.1
Exports	1.7	1.5	2.8	4.9	4.2	8.7	14.6	20.1	19.2	21.1
Imports	–	–	–	–	–	–	–	–	–	–
Reported consumption	5.2	5.4	5.0	2.9	5.1	4.0	4.2	4.3	6.0	7.8
Secondary tin										
Production	0.2 e	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2 e
Apparent consumption	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Tinplate										
Production	501.4	536.8	594.6	403.2	447.9	311.0	378.5	360.9	446.3	499.2
Exports	0.8	17.0	8.5	3.0	22.7	35.3	25.9	44.3	79.9	92.8
Imports	51.7	39.8	47.0	28.9	26.8	15.0	14.2	13.5	17.6	9.4
Apparent consumption	552.3	559.6	633.1	429.1	452.0	370.7	366.8	330.1	384.0	415.8

Source: ITC, Metallgeselschaft; national statistics and UNCTAD secretariat estimates.

90. Brazilian tin reserves have increased tremendously in the last decade. However, not much is known however about the country's exact tin producing potential. According to the Ministry of Mines and Energy, Brazil's tin reserves are estimated at 324,531 tons of tin contained, corresponding to 8.3 per cent of world reserves 23/. However, more recent estimates for the Pitinga Mine alone were around 575,000 tons contained tin 24/.

91. Today, the major deposits are in Mapuero, Rio Xingu, Rio Iriri, Teles Pires, Central Eastern Goias and Rondonia. Until recently Rondonia was the chief tin producing area in Brazil but it has now been overtaken by Amazonas.

Table 25

Structure of production of tin in Brazil by companies
(tons)

	Concentrates	Smelted metal				
Companies	1987	1979	%	1987	%	1988E
	19,251	2,465	35	20,435	70.8	18,000
Brascan/CESBRA	3,000	1,990	29	3,230	11.2	
Brumadinho	1,390	1,640	24	1,550	5.4	8,000
Rhodia	1,297	-		1,278	4.4	
COMIPA	581	-		550	2.0	
BEST/CIA	1,367	-		1,217	4.2	
Others	1,637	825 a/	12	571 a/	2.0	
Alto Paraiso (Garimpeiros Production)	-	-	-	-	-	18,000
Total	28,523	6,950	100	28,831	100	44,000E

E = Estimates
a/ including garimpeiros' production

Source: Anuario Estatistico del Sector Metalurgico (MICO), Brazil Informativo de Setor de Estanho. SNIE, Brazil 1988, CONSIDER, MIC, 1988.

92. Table 24 indicates that in 1987, Paranapanema accounted for 70 per cent of tin output in Brazil and CESBRA a little over 11 per cent, while other companies had a share of 18 per cent, including garimpeiros' output. In 1988, output from Alto Paraiso alone was estimated around 18,000 tons.

Paranapanema

93. Paranapanema is a privately owned company. It consists of seven divisions operating in three sectors - mining, smelting and construction. At the apex is the holding company, Paranapanema SA Mineracao, Industria e

Construc o. The holding company was founded in 1961 and went public in 1971. Its shares are traded on Brazil's principal stock exchange. In 196 the company acquired tin mining rights in the Amazon region, where substantial cassiterite deposits had recently been discovered. Pitinga Mi was the principal factor behind the increase in Paranapanema's output in re[illegible]t years which stood at 20,435 tons in 1987 (see table 25). Pitinga i located about 200 miles northeast of Manaus and occupies an area of 96.5 square miles. Its reserves of 575,000 tons of high grade ore (grades of 4 Kg Sn/cubic metre) are sufficient for nearly 30 years production at a rate of about 20,000 tons of primary tin. Almost 90 per cent of Paranapanema's production originates from Pitinga Mine.

94. Paranapanema's strategy has traditionally been to organize its production activities along vertical lines in order to promote self-sufficiency and reap value-added advantages. In 1977, it incorporate Mamor Mineracao e Metalurgia S.A., for smelting casseterite into tin. Th 60 per cent cassiterite which is received at Pirapora is treated to upgrad it to 72 per cent tin. This high grade concentrate is smelted to produce tin metal which is refined and finally cast into tin. The Mamor brand ti registered on the London Metal Exchange, is 99.9 per cent pure ingots, whi is superior to the 99.8% pure "high grade" used in the international marke and the 99.8% index used in the United States market. Mamor also produc a large part of its own smelting equipment as well as the mining equipment used by Paranapanema. This equipment is also made available for sale to Brazilian companies and is exported to other countries.

Companhina Estanifera do Brazil (CESBRA)

95. CESBRA is the second largest tin producer in Brazil accounting for 11 per cent of tin in concentrate output in 1987 and 6.3 per cent of tin meta exports in 1988 (see tables 25 and 26). The ownership of the group is entirely foreign and is divided evenly between Brascan (Canada) and Britis Petroleum (U.K.). All the company's mining operations are located at the Santa Barbara - Jacunda complex in Rondonia. CESBRA activities include exploration, mining, smelting and refining. The group operates a tin smelter at Volta Rodonda and has mining and prospecting interests through its subsidiaries.

96. Since the fall in the tin price at the end of 1985, CESBRA's operatic have been rationalized and mining concentrated in three areas. The Group is mining relatively rich deposits and has sufficient high grade ore

reserves to permit operations during an extended period of time. A new mine was brought on stream in Rondonia in early 1987.

Brumadhino group

97. The Brunadhino group is a wholly private Brazilian company. Mining operations were initiated in 1970 in Rondonia through a subsidiary company - Mineracao Oriente Novo. In 1980, in association with the Government of the State of Goias, two other companies were formed - Metais de Goias (METAGO) and Goias Estanho S.A.

98. Monsa is the principal mining company of the Brumadinho Group. It was the Brazilian mining company hardest hit by the collapse of the tin price. The mines remaining in operation are Monte Negro and the Sao Lourenco - Nacisa mine complex, both of which are low-grade operations. The mines closed down were at Alto - Candeisa and Oriente Novo. Operations at Cachoeirinha were suspended.

99. In order to achieve greater vertical integration, the Group acquired a 70 per cent share in the metal works Bera do Brazil Industria e Comercio de Metais Ltda. in September 1983. Bera do Brazil is the third primary tin metal producer in the country after Paranapanema and CESBRA. Its output represented about 5.4 per cent of national production and exports in 1987. The Brumadhino Group also produces its own mining equipment through CIMAQ Industria y Comercio and part of its tin production is kept for the manufacture of tin products for domestic use by EMEL - Monsa Estanho e Ligas Ltda.

Best/CIA group

100. There are five companies in the Best/C/A group, including Cerimbra S/A Minerios e Metais, Cia Mineracao Sao Lourenco, Cia. Industrial Amazonense (C.I.A.), Best Metais e Soldas (a smelting company with a capacity of 100 tons of tin metal per month) and Soc. Bras de M tais (tin smelting with a capacity of 100 tons per month). Mining operations are located in Rondonia and Goias. In 1987, the Best/CIA group's share in tin output was around 4.2 per cent while its share of tin metal exports in 1988 was 5 per cent.

Table 26
Export quotas established by CACEX,
Banco do Brazil

	Volume	Share in per cent
Paranapanema	17,399	65.6
CESBRA	1,672	6.3
Rhodia/COMIPA	1,577	6.0
Brumadinho	1,435	5.4
Best/CIA	1,292	5.0
Mequimbras	285	1.0
CIF (Metallurg)	190	0.7
Subtotal	23,850	-
Technical reserve a/	2,650	10.0
Total	26,500	100

a/ Small companies, non-members of the National Syndicate of Tin Miners (SNEE) each have an export allocation of about 200 tons and include Rio Negro, Impar, Metalcon, Min. da Amazonia, Grupo Benesli (Madeira Mamor) and Min. Aratons.

Source: CACEX, Banco do Brazil S.A., carteira de COMERCIO EXTERIOR, Communicado No. 192, 17 May 17/5/1988.

101. In Brazil, all tin companies are virtually fully integrated into metallurgy. The smelters are located in the south-eastern part of the country 25/. Since Brazil is a relatively large tin metal consumer (the largest among the major producing countries), it developed its own processing capacity early. During the 1970's, the country was a net importer of tin concentrate.

102. Between 1978 and 1987, tin metal output in Brazil increased at an annual average of 13.5 per cent, while exports increased at 32.3 per cent. (see table 24).

103. Although demand for tin in Brazil also increased between 1978 and 1987, it did not follow the rise in domestic output. Consumption of tin metal grew at an annual average of 4.6 per cent during the period and fluctuated sharply. It fell in 1981 to 2.900 tons due to the economic recession which severely affected the major tin consuming industries, in particular tinplate, automative and electric-electronic sectors, and increased again in 1982. In 1987 tin metal consumption amounted to 7,800 tons and in 1988 it is estimated to have been around 7,960 tons.

104. The per capita tin consumption rate in Brazil is around 0,04 Kg, much lower than that prevailing of industrialized countries such as the United States, Canada, the Federal Republic of Germany or the United Kingdom.

105. In Brazil, like most other countries, demand for tin depends mainly on two industrial sectors, namely tinplate and solder alloys. Table 27 indicates that almost 77 per cent of total Brazilian tin consumption was accounted by these two sectors and that tinplate had the largest share at 40.7 per cent in 1987.

Table 27

Brazilian tin consumption by end-use
1978-1988
(tons)

Year	Tinplate	%	Solders/Alloys	%	Others	%	Total
1978	2,209	44.1	1,470	29.4	1,325	26.5	5,004	100
1980	2,230	44.5	1,400	27.9	1,384	27.6	5,014	100
1981	1,711	51.7	1,063	32.1	534	16.2	3,308	100
1982	1,798	36.7	1,568	32.0	1,534	31.3	4,900	100
1983	1,735	43.8	1,181	29.8	1,044	26.4	3,960	100
1984	1,806	41.6	1,440	33.1	1,098	25.3	4,344	100
1985	1,747	39.6	1,625	36.9	1,036	23.5	4,408	100
1986	2,003	34.8	2,235	38.7	1,526	26.5	5,764	100
1987	2,293	40.7	1,801	31.9	1,543	27.4	5,637	100
1988a/	2,900	41.4	2,300	32.9	1,800	25.7	7,000	100

a/ Forecast

Source: SNIEE.CONSIDER

106. Brazilian tinplate output increased between 1978 and 1980 and decreased in the following years to 499,200 tons in 1987. Between 1978 and 1987 the annual rate of change of tinplate production was negative (-0.05 per cent). In contrast tinplate exports increased at an average of 69.6 per cent per annum while imports decreased by an average of 17.3 per cent per year during the period. Apparent consumption of tinplate also decreased in this period at an annual average of 3.1 per cent.(see table 24)

107. In 1987, per capita consumption of tinplate in Brazil was estimated to be around 3 Kg, while that of the Federal Republic of Germany was 10Kgr, which shows that per capita consumption of tinplate in Brazil is still low. Companhia Siderurgica Nacional (CSN) is the only company producing tinplate in Brazil. It is part of the Siderbr s Group, which consists of nine steel corporations including C.S.N. The plant is located in the city of Volta Redonda. Tinplates produced are known by the trade mark Brastin. (see table 30). CSN., produces also Tin Free Steel (T.F.S., chromium coated) and Black plates. The production lines of Brastin, T.F.S., and Black-plate total 1 million tons per year of installed capacity which if fully used would allow Brazil not only to be self-sufficient, but also to become one of the largest producers of tin-mill products in the world.

108. At present there are five electrolytic tinning lines in operation with a tinplate production capacity of 810,000 tons per year. A sixth line is scheduled to come on stream in the near future thus bringing the company's electrolytic tinplate production capacity to over 1 million tons per year. With the new line in operation, C.S.N's tin consumption is expected to rise to some 3,500 tons per year from 2,500 tons in 1987, boosting the country's total tin consumption to some 7,000 tons in 1988 26/.

109. Packaging is the largest end-use sector of tinplate in Brazil, especially for food products such as, vegetable oils, fruit, vegetables, meat, milk, beer and carbonated drinks, and paints and chemical products (see table 29).

110. Over the last decade, technological progress and research have led to a reduction in the tin used in the production of tinplate in Brazil. Table 30 shows that the quantity of tin used to produce a ton of tinplate went down from 4.4 Kg in 1978 to 4 Kg per ton in 1987. It is expected to decrease further to 3.5 Kg per ton in 1988. CSN is carrying out tests with a view to reduce tin coatings to 0.10mm thickness, markedly less than the company's current thickness of 0.16 mm. This would reduce costs and allow tinplate to compete with other materials such as paper, glass, plastics and aluminium products. 27/.

Table 28

Production and consumption of tinplate in Brazil

1978 - 1989

(000 tons)

	1978	1986	1987	1988E	1989E
Production	501,400	401,938	456,276	560,000	700.000
Consumption	552,200	340,000	340,000	380,000	500,000

E - Estimate

Source: Grupo Siderbras, C.S.N., 1988.

Table 29

Tinplate consumption by end-use in Brazil in 1986

(metric tons)

Product	Tons	Per cent
Vegetable oil	197,700	32.0
Fruit/veg/meat	113,000	18.3
Paints/chemical products	78,100	12.7
Milk/milk products	67,600	10.9
Crown/screw caps	48,400	7.9
Other/non-food products	25,100	4.1
Fish	24,700	4.0
Beer	16,400	2.7
Lubricating oil	13,400	2.2
Batteries	11,100	1.8
Carbonated beverages	10,100	1.6
Other food products	9,100	1.5
Vegetable fats	1,700	0.3
Total	616,400 a/	100.0

a/ C.S.N. sample representing 93.4% of reported consumption
Source: Cia Siderurgica Nacional (C.S.N.).

Table 30

BRASTIN tin coating specifications

	Type	Tin Coating (g/m2) Nominal On each side	Nominal On both sides	Minimum verified by Triple Spot test a/ On both sides	
Equal coating	10	1.1	2.2	1.8	
	25	2.8	5.6	4.8	
	50	5.6	11.2	10.4	
	75	8.4	16.8	15.6	
	100	11.2	22.4	20.2	
		Side A	Side B	Side A	Side B
Differential coating	D 50/25	5.6	2.8	5.2	2.4
	D 75/25	8.4	2.8	7.8	2.4
	D 100/25	11.2	2.8	10.1	2.4
	D 100/50	11.2	5.6	10.1	5.2

Notes:

a/ The result of the triple spot test is the average of the determinations made in a three test specimen, according to ASTM-A-624 and ASTM-A-626 standards.

Source: C.S.N.

Table 31

Tin used (kilogrammes) per ton of tinplate produced in Brazil

	1978	1978	1980	1981	1987	1988
Kg/ton	4.4	4.2	4.1	4.2	4.0	3.5E

E = Estimate.

Source: Grupo SIDERBAS, C.S.N.

111. Solders and alloys are the second largest end user of tin in Brazil, accounting for approximately 32 per cent of total tin consumption in 1987 (see table 27). It is generally estimated that the automative industry accounts for approximately 38 per cent, electric-electronic industries 32 per cent, telecommunications 6 per cent and other uses 24 per cent. With the advent of television in the 1970's and more recently of video-cassettes, and as a result of the development of the informatics industry in Brazil, the use of tin in soldering and alloys has increased. In the automotive industry, although the largest subsector, total tin consumption is estimated to be decreasing as competition from plastics and aluminium is being increasingly felt.

112. The manufacturing of tin chemicals, is the third most important outlet for tin after the production of tinplate and solder. Inorganic compounds are produced in Brazil by CESBRA (Cia Estanifera Do Brazil). These compounds include tin (IV) oxides used in the manufacture of products with varying surface charactistics required in the production of stable ceramic pigments; tin (II) for the opacification of sanitary ware and of SnO2 metastannic acid which has superior qualities in the production of grey Sn/Sb pigment. The value-added in the production of tin chemicals is high. Table 32 indicates the estimated annual consumption of inorganic chemicals. Paranapanema, the largest tin producing company in Brazil is also contemplating the prospect of entering this promising market through a joint-venture with a big international chemical group.

Table 32

Approximate annual Brasilian consumption of inorganic tin chemicals

(tons)

SnO2	150
Stannous octoate	170
Stannic chloride	200
Stannous chloride	160
Sodium stannate	100
Potassium stannate	80
Other metal stannate	50
Stannous sulphate	120
Tin salts, carboxylates	80
	1.110

Source: CIA - Estan fera do Brazil (CESBRA - December 1988)

Mexico

113. Tin production in Mexico is small, while demand is quite significant. The deficit is being met through imports, amounting an estimated 4,900 tons of tin-in-concentrates in 1987. In 1978, tin in concentrate output was 300 tons. It then decreased between 1979 and 1982, increased in the following years to reach a peak in 1986 of 600 tons and fell in 1987 to 400 tons (see table 33).

MEXICO

Table 33

Supply of and demand for tin in concentrates, tin metal, Tinplate

(000 metric tons)

Tin-in-concentrates	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Production	0.3	0.0	0.1	0.0	0.0	0.3	0.4	0.4	0.6	0.4
Exports	-	-	-	-	-	-	-	-	-	-
Imports	1.1	0.4	1.4	1.5	0.5	1.3	2.5	3.8	4.4	4.9
Tin Metal										
Production	1.0	1.3	1.4	0.9	0.9	1.2	1.6	1.6	2.0	3.2
Exports	-	-	-	-	-	-	-	-	-	-
Imports	0.3	0.4	0.2	0.5	0.4	0.5	0.4	0.3	0.3	0.3
Reported consumption	1.6	1.6	1.8	1.8	1.4	1.6	1.6	1.8	2.0	2.5
Tinplate										
Production	183.1	177.9	146.5	99.4	124.8	130.0	130.0	147.7	198.3	184.0
Exports	1.8	6.7	2.3	1.8	1.7	3.4	2.0	0.1	12.2	5.7
Imports	115.9	138.8	226.3	208.0	163.2	67.9	95.4	70.2	52.9	24.4
Apparent Consumption	297.2	310.0	370.5	305.6	286.3	194.5	223.4	217.8	239.0	202.7

Source: UNCTAD secretariat.

114. Although Mexico is not a large producer of tin it has a fully integrated tin industry, based on both national output and imports, from beneficiation and concentration of tin ore to smelting and processing into tin plate, solders, alloys and tin chemicals etc.

115. Metales Potosi S.A. in San Luis Potosi is the major tin metal producer in Mexico, with a rated capacity of 4,800 tons per year mostly from imported concentrates. Other companies include Esta o Electro S.A. (6,000 tons per year installed capacity), Procesadora De Casiterita, S.A.., Normetales S.A., Fundidora de Esta o S.A. (1,200 tons per year installed capacity) and Cia Nacional de Esta o S.A.

116. Between 1978 and 1987, tin metal output in Mexico increased at an annual rate of almost 14 per cent to reach 3,200 tons in 1987. Imports of tin metal into Mexico fluctuated around 300 tons while consumption grew at an annual average of 5.1 per cent.

117. It is estimated that tinplate accounts for the largest share of tin consumption in the country (40-45 per cent) followed by solder (20-25 per cent), Babbit metal (5-10 per cent), bronze (4-6 per cent) and other uses, including tin chemicals, alloys and the electric industry (15-30 per cent).

118. Production of tinplate fluctuated during the last decade and was 184,000 tons in 1987 at almost the same level as in 1978. While tinplate imports decreased (from 115,900 tons in 1978 to 24,400 tons in 1987); tinplate exports increased during the same period. Apparent consumption of tinplate decreased at an average of 4.2 per cent per year between 1978 and 1987 and stood at 202,700 tons in 1987.

119. Tinplate is mostly produced by Altos Hornos de Mexico, a state owned company with a rated capacity of 285,000 tons/year and Hylsa, a private company with a capacity of 50,000 tons/year (production goes mostly to crowns for beer bottles). Only around 55 per cent of production capacity is used. In 1988, Altos Hornos tinplate output was estimated around 130,000 tons. In recent years, the company has experienced serious problems as production costs were high. The counter-inflationary policy 28/ and the subsidization of certain economic sectors like food packaging (in 1987, a 1 per cent discount on current prices was granted by Altos Hornos de Mexico S.A. to certain food packaging companies) is felt to be detrimental to the company. The current price of tinplate barely covers costs of production and the company might not be able to continue its production in the future.

120. The packaging sector is the largest consumer of tinplate in Mexico, especially for food products. Solder is the second largest consumer. A wide range of solders and alloys are produced in the country, including industrial solders (silver bearing solders, tin/antimony solder, "lead free" alloy solder), electronic solders and metallurgical powders, both for domestic consumption and exports.

121. Mexiestano, S.A., a subsidiary of Metales Potosi S.A., a privately owned enterprise, produces inorganic tin chemicals in addition to high grade tin and specification solders. Mexiestano's chemical products are manufactured from metallic tin. The products include stannous sulfate (SnSO4) potassium stannate (K2 SnO3 - 3H2O) and sodium stannate (Na2 Sn O3). About 42 per cent of the Company's production is exported to the United States or to Central America (Guatemala, Salvador, Honduras etc.,).

122. Although exploration to locate tin deposits in Mexico has been carried out since tin imports are a significant drain on foreign exchange, Mexican tin output is not expected to increase in the near future (1.3 per cent per year for 1988-1994)29/. However, demand for tin in Mexico is expected to continue to increase therefore, tin imports are projected to grow at a rate of 5 per cent between 1988 and 1994 30/. Tinplate demand in Mexico is forecast to increase by 3 per cent pear year from 1989 to 2000, while tinplate supply is forecast to increase by approximately 4 per cent per year during the same period 31/.

Peru

123. Peru is the third largest tin producer in Latin America. Between 1978 and 1987, tin in concentrate output in Peru increased from 800 tons to 5,300 tons. The bulk of the tin produced in the country is exported (around 83 per cent in 1987 and 96 per cent in 1986, see table 34). Most deposits are located in the Department of Puno, Province of Nelgar in the district of Antanta, high up in the Andes at an altitude of 4,800 meters above sea level in the southern part of Peru. Reserves are located at two sites, san Rafael with 2,330,598 tons of 1.04 per cent of copper and 3.03 per cent of tin, and Santo Domingo with 28,285 tons holding 1.38 per cent copper and 0.71 per cent tin 32/.

124. The mining is operated by Minsur S.A.. At the present time, 85 per cent of the tin ore produced comes from the San Rafael vein. Current mining

Table 34

Peru

Supply and demand of tin-in-concentrates, tin metal and tinplate industry, 1978 to 1987

(000 metric tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Tin in concentrates										
Production	0.8	0.9	1.1	1.5	1.7	2.4	2.2	3.8	4.8	5.3
Exports	0.9	0.5	0.7	0.9	2.1	3.1	3.2	2.4	4.6	4.4
Imports	–	–	–	–	–	–	–	–	–	–
Tin metal										
Production	–	–	–	–	–	–	–	–	–	–
Exports	–	–	–	–	–	–	–	–	–	–
Imports	0.1	0.1	0.6	0.4	0.2	0.4	0.3	0.6	0.4	0.2
Consumption	0.4	0.4	0.4	0.6	0.6	0.4	0.3	0.6	0.5	0.5
Tinplate										
Production	30.0	52.0	65.0	52.0	45.7	45.0	40.0	38.0	49.4	64.0
Exports	0.0	4.6	4.8	0.0	1.3	0.2	0.0	0.0	0.0	0.0
Imports	2.7	2.6	6.4	10.6	9.8	4.7	7.4	2.0	3.0	4.0
Apparent consumption	32.7	50.0	66.6	62.6	54.2	49.5	47.4	40.0	52.4	68.0

Source: IIC, Metalgesellschaft Statistics, National Statistics, SIDER Peru and UNCTAD estimates.

rates are 80 tons per day of tin ore with an average mine head grade of 2.75 per cent tin.

125. The San Rafael mine was initially operated by a small miner who sold it in 1960 to Lampa Mining Company, a small scale copper ore mining company. In 1967, Lampa sold the mine to a subsidiary of W.R. Grace who operated the mine up to July 1977 when it was purchased by Peruvian concerns (Brescia family). Minsur S.A. is a Peruvian private company. Gravimetric and flotation methods are used to test the ore extracted at a treatment plant adjacent to the San Rafael mine. Two grades of tin in concentrates are produced - a medium grade "A" with 45 per cent tin content and a low-grade "B" with 21.35 per cent tin content. The final concentrates are transported by truck and train to Matarani port, some 500 Kms away, to be shipped to the receiving works for smelting.

126. For many years Minsur was not directly involved in the marketing of its tin. Most of the concentrates were sold by tender on an f.o.b. Matarani basis to traders on annual contracts. Occasional spot sales were made if production exceeded anticipated levels. It was only in January 1986, following the tin crisis, that there was a change in the company's sales policy. As there was a general reluctance to price tin-in-concentrates without any visible quotation such as the LME, Minsur was forced into tolling agreements with various smelters; at the beginning with Capper Pass in the United Kingdom (one of the largest and few custom smelters in the world which treats complex and low grade concentrates 33/ and more recently to Tex Tin in the United States. The tin metal produced is directly marketed by Minsur agents in the European and North American markets (Amalgamated Inc. in New York and Wildshaw Company in London). The new strategy has the additional advantage of providing some hedge against currency movements by having part of the material treated in a U.S. dollar area and part in the Sterling area 34/.

127. Although there exists excess capacity for tin smelting in Latin America, especially in Bolivia, a number of factors stand in the way of the development of cooperation in this sector within the region. The political, social and economic problems experienced by Bolivia in recent years, especially in the mining and metallurgical sector, and strikes, were some of the considerations which led Minsur S.A., to search for smelters outside of the region. The lack of adequate, reliable and cheap transportation in Latin America also hinders the development of greater economic and trade interaction in the region. The building of a train link for example between

Bolivia and Peru would reduce considerably the costs of transportation between the two countries and facilitate greater exchange.

128. In view of the lack of a tin smelter in Peru, Minsur S.A. has applied to the Peruvian Government, through its subsidiary company Funsur, for the necessary permits to build a smelter in the country. The project provides for the production of high-grade tin meeting United States grade "A" specifications, to begin in the early 1990's. The tin produced would be exported and marketed directly to consumers in Europe and North America as today but some would also go to Latin America where existing trade agreements could give certain advantages. However, the project has not yet been initiated due to the country's severe economic and social problems. The investment climate is uncertain and it is difficult to raise the needed capital.

129. Tin metal for domestic consumption is mostly acquired through imports, especially from Bolivia, and from the small production by Fundicion de Metales Bera del Peru S.A., and Italmundo (approximately 80 tons per year). Fundicion de Metales Bera produces tin metal by a pyrometallurgical process in rotary furnaces using an Indonesian method and also undertakes some tin recycling.

130. Tin metal consumption in Peru is estimated to be around 600 tons per year, an estimated 80 per cent of which is accounted for by tinplate for packaging with 20 per cent going to solders and other uses. Between 1978 and 1987, tin consumption increased from 400 to 500 tons.

131. Table 35 shows apparent consumption of tinplate in Peru by sub-sectors. In 1988, food packaging had the largest share (76.4 per cent, of which 44.4 per cent for milk and milk products and 23 per cent for canned fish). Beverages had a share of 15 per cent while other sectors, including batteries, and shoe-polish containers, used around 9 per cent.

132. In 1987, 95 per cent of total Peruvian demand for tinplate was covered by domestic production. Empresa Siderurgica del Peru (SIDER Peru S.A.), a Peruvian public enterprise, is the only company producing tinplate in the country with an installed capacity of 70,000 tons per year with one line of production. A second line is projected for 1995. Between 1978 and 1987, output increased from 30,000 tons to 64,000 tons due to strong internal demand. However, in 1988, production declined significantly in spite of

continued strong domestic demand as the company was experiencing severe financial problems (only around 21,529 tons were produced by SIDER Peru in 1988 while demand was estimated to be around 64,820 tons).

133. In 1980, plans to expand the metallurgical sector in Peru including the production of new steel specifications appropriate for tinplate production, were drawn up. The project was later dropped, although the plant for tinplate was already constructed this led to the need for continued imports of steel to operate the plant.

Table 35
Apparent consumption of tinplate in Peru
by sub-sectors
(tons)

End-use	1985	%	1987	%	1988E	%
Milk/milk products						
Sider Peru	17,091		23,480		15,500	27.0
Imports	-		2,026		10,000	17.4
Sub-total	17,091	43.1	25,506	37.6	25,500	44.4
Canned fish						
Sider Peru	8,005		17,490		11,100	19.3
Imports	376		-		2,000	3.5
Sub-total	8,381	21.3	17,490	25.8	13,100	22.8
Crown caps (beer and carbonated drinks)						
Sider Peru	5,315		9,404		6,750	11.7
Imports	-				1,700	3.0
Sub-total	5,315	13.5	9,404	13.9	8,450	14.7
5 gallon containers (for vegetable oil)						
Sider Peru	3,138		4,107		3,300	5.7
Imports	37		-		-	
Sub-total	3,175	8.0	4,107	6.0	3,300	5.7
Fruits and vegetables						
Sider Peru	812		2,964		1,800	3.2
Imports	-		-		200	0.3
Sub-total	812	2.0	2,964	4.4	2,000	3.5
Shoe polish						
Sider Peru	519		1,039		700	1.2
Imports	-		-		-	
Sub-total	519	1.3	1,039	1.5	700	1.2

Table 35 (continued)

End-use	1985	%	1987	%	1988E	%
Batteries						
Sider Peru	1,072		1,695		700	1.2
Imports	-		-		160	0.3
Sub-total	1,072	2.7	1,695	2.5	860	1.5
Other uses						
Sider Peru	1,676		4,133		3,500	6.1
Imports	1,293		1,489		-	
Sub-total	2,969	7.5	5,622	8.3	3,500	6.1
Total						
Sider Peru	37,628	95.6	64,312	95.0	43,350	75.5
Imports	1,706	4.4	3,515	5.0	14,060	24.5
Total	39,334	100.0	67,827	100.0	57,410	100.0

E = estimated.

Source: SIDER Peru, December 1988.

Table 36
Reported tinplate consumption in Peru
1979 to 1989 F

Year											
1979	1980	1981	1982	1983	1984	1985	1986	1968	1988	1989 F Maximum/	/Minimum
49,381	62,300	58,673	51,940	37,851	41,656	39,334	52,185	67,827	58,072	71,400	58,000

F = forecast.

Source: Ministerio de Energia y Minas, Peru.

Table 37
Specifications for tin coatings in tinplate

Classification Sider Peru	Designation coating g/m2	Thickness of tin thickness g/m2		Minimum average	
	each side	both sides		both sides	
Tin coating	E 1	2.8	5.6	4.9	
	E 2	5.6	11.2	10.5	
	E 3	8.4	16.8	15.7	
	E 4	11.2	22.4	20.2	
	E 5	15.1	30.3	28.0	
		Side A	Side B	Side A	Side B
Differential tin coating	E 2/1	5.6	2.8	4.75	2.25
	E 3/1	8.4	2.8	7.85	2.25
	E 3/2	8.4	5.6	7.85	4.75
	E 4/1	11.2	2.8	10.1	2.25
	E 4/2	11.2	5.6	10.1	4.75
	E 5/1	15.5	2.8	14.0	2.25

Source: SIDER Peru S.A. December 1988.

134. All inputs for the production of tinplate are imported. Therefore, production costs are high and the margin of profit on tinplate is tenuous. In addition, the pricing policies determined by the Finance and Industry Ministries which subsidize the food sector (packaging) keep tinplate prices down. The new fiscal policies and the increase of the import tax on steel products from 2 to 10 per cent to limit imports, are other factors which inflate the production costs. Sider Peru has been running at a loss and has accumulated a significant debt. In 1988, in spite of a strong domestic demand for tinplate, the company was unable to produce the quantitities required due to a shortage of steel and inability to purchase it.

135. Tinplate imports increased from 2,700 tons in 1978 to 10,600 tons in 1980 and decreased significantly in the following years to a low of 2,000 tons in 1985. Since 1986, tinplate imports have increased again and stood at 4,000 tons in 1987. Apparent consumption of tinplate increased by 8.5 per cent in the same period.

136. In recent years, various difficulties have stood in the way for the harmonious development of the Peruvian mining sector in general, including the tin industry. The Government's foreign exchange policy is considered by most mining exporting companies as harmful to exporters. After a two year freeze, the currency depreciated at the end of 1988. This led to a general surge of prices in the domestic market which increased production costs considerably. In addition, companies face a shortage of foreign exchange and find it difficult even to import replacement parts for equipmentand other inputs required for production. Hence, some companies have been obliged to cut down production significantly due to the lack of imported items.

137. The differential exchange rate policies adopted recently are considered harmful as they have a depressing effect on export receipts. For exorts of tin, 60 per cent of the value is exchanged at the official rate (approximately 500 intis to a US dollar in December 1988), 30 per cent as a Free Certificate (about 700 intis to a US dollar in the same period) and 10 per cent is withheld as an export tax. This, combined with the effect of inflation which has been very high, is eating away profits. It is being felt that current financial policies do not promote exports in Peru and have a detrimental effect on costs of production.

138. In addition, delays in the release of imported materials and power shortages at some plants have had a negative effect on levels of production.

A number of companies, especially small and medium sized companies that had raised loans in order to increase production, have been severely affected by the current economic crisis.

139. In this environment of uncertainty and economic problems, it is difficult to foresee what the demand for and supply of tin in Peru will be in the short and long term. Minsur S.A. expects tin mine production to increase by 20 per cent from current levels in 1990. The main objective is to improve the efficiency of production through better equipment and high extraction levels from the rock. Table 38 shows Sider Peru's projections for tinplate demand in Peru from 1989 to 2000.

Table 38

Projections for tinplate demand in Peru

1989-2000

Year	Metric Tons
1989	61,156
1990	62,549
1991	63,935
1992	65,323
1993	66,716
1994	68,097
1995	69,489
1996	70,887
1997	72,296
1998	73,697
1999	75,090
2000	76,484

Source: SIDER Peru, 16-12-1988.

Venezuela

140. At present, there are no known economic reserves of tin in Venezuela. Therefore, demand for tin is met entirely through imports of tin metal. These have increased considerably from 171 tons in 1978 to 1,014 tons in 1987. Primary tin metal consumption grew at an annual average of 12.3 per cent during the same period with a peak of 860 tons in 1985 and a decrease in the two following years when it was estimated around 800 tons.

141. **The largest single outlet for primary tin metal imports is tinplate, especially for food packaging. Another important end-use sector is** soldering, particularly in the automotive industry (car radiators, air-conditioning equipment and electronic components) and the electronic industries.

142. CVG Siderurgica del Orinoco (SIDOR) is a publicly owned Venezuelan enterprise and the sole company which produces tinplate. Installed capacity is of 220,000 tons using an electrolytic process. Between 1978 and 1987, tinplate output increased at an annual average of 3.9 per cent, although it fluctuated sharply and actually fell drastically between 1978 and 1982 from 81,722 tons to 16,083 tons. In 1980 a project was started with a view to expand the tinplate plant using new equipment and technology from Nippon Steel. Delays in the completion of the installation led to a reduction in the projected output. The economic problems experienced in 1982 also led to the use of available steel for the production of other products than tinplate. However, in 1983 the growth in tinplate production was resumed, and 116,064 tons were produced in 1987. The earlier drop in tinplate output was compensated by a increase in imports from 58,743 tons in 1980 to 152,141 tons in 1981 and 100,746 tons in 1982. However, tinplate imports then fell from 1983 to 1987 when they stood at 11,000 tons.

Table 39

Venezuela
Supply of and demand for tin metal, and tinplate,
1978 to 1987
(metric tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Tin metal										
Production	--	--	--	--	--	--	--	--	--	--
Exports	--	--	--	--	--	--	--	--	--	--
Imports a/	171	116	136	203	175	254	581	963	780	1,014
Consumption b/	200	100	100	200	200	300	351	860	800	800
Tinplate c/										
Production	81,722	73,190	64,774	55,814	16,083	71,812	109,863	90,000	115,000	116,064
Exports	13,600	6,128	7,731	7,371	3,972	314	4,392	3,700	19,700	20,000
Imports	153,139	113,399	58,743	152,141	100,746	35,313	18,431	9,000	10,600	11,000
Apparent consumption	231,261	180,461	115,786	200,584	112,857	107,125	128,294	5,300	105,900	106,000

Source:

a/ O.C.E.I. Anuario de Comercio Exterior de Venezuela, 1977-1987, Estadisticas de Importaciones.
b/ Reported consumption: 1979 to 1985: National Statistics, 1985 and 1987: ITC Statistics.
c/ 1978 to 1984 Statistics from CVG Siderurgica del Orinoco S.A., Gencia Planificación Comercial, Division Investigacion de Mercados ("Sector Envases, aspectos resaltantes de su actividad durante 1988" by Raul Velasquez, December 1988. These statistics for production, exports and imports include tinplate and chromium plate. 1985 to 1987: only tin plate from ITC Statistics, 1 June 1988.

Table 40

Tinplate specifications in Venezuela

Thickness of tin coating			
Equal		Differential	
Type	Total on each side	Type	Total on each side
E11	5.6 (2.8/ 2.8)	E21	8.4 (5.6/2.8)
E22	11.2 (5.6/ 5.6)	E31	11.2 (8.4/2.8)
E33	15.8 (8.4/ 8.4)	E32	14.0 (8.4/5.6)
E44	22.4 (11.2/11.2)	E41	14.0 (11.2/2.8)
(+)	2.24 (1.12/1.12)	E42	16.8 (11.2/5.6)
		E43	19.6 (11.2/8.4)

Source: C.V.G. Siderurgica del Orinoco S.A. (Sidor).

143. In 1988, Sidor deliveries to the packaging sector amounted to 165,806 tons, an increase of 30 per cent over the previous year. However, demand was estimated at 183,766 tons 35/ as the needs of the packaging sector could not be met by Sidor's output. The price of tinplate compared to other competitive materials is one of the reasons which explains the attractiveness of the product. Like in other Latin American developing countries the food sector is subsidized by the state and prices of tinplate products have been kept down. In 1988, Sidor adopted a new policy to correct the existing distortions between cost structures and prices. A special request was made to the national executive to bring tinplate prices in line with current operating costs and material demand. The decision became effective on 15 December 1988 with an average increase of 10 per cent of 1988 prices.

144. The inability of Sidor to meet domestic demand, has led the packaging industry to increase imports and to search for cheaper alternative materials. Despite the control imposed on tinplate prices in Venezuela, national tinplate prices are in some instances higher than those of competitive materials. Actually, most of the raw materials needed for the production of packaging products are imported at a preferential exchange rate thus reducing the real cost of the product. Also, the impact of new technologies in facilitating the production of new competititive products has further strengthened the trend towards the use of other materials than tinplate. This trend has become

increasingly significant in recent years in milk and milk products, food items in powder, fruit juices, carbonated drinks, edible oil and paints, where the share of glass, plastics and plasticized paper has expanded, gradually displacing tinplate packaging.

143. The economic problems experienced in the last few years in Venezuela and the decline in the purchasing power of the population also led to a contraction of demand for food products which had a depressing effect on the level of consumption of tinplate.

Table 41

Share of materials used in the packaging sector in Venezuela in 1985
(in million units)

	Million packages units	Share in %
Plasticized paper	1,120	20
Tinplate	972	18
Aluminium	450	8
Glass	1,100	20
Plastics	1,500	27
Other	350	6
Total	5,500	99

Source: C.V.G. Siderurgica del Orinoco, C.A.

Table 42

Venezuela
Imports of tin and tin products,
1977 to 1987
(metric tons)

Year	Tin	Alloys	Bars and shapes	Wires	Plates, sheets and strip of tin	Powders and flakes	Accessories for tubes	Tubes and hollow bars	Collapsible tubes	Other manufactures	Total
1977	256	263	10	28	5	1	1	1		8	573
1978	171	168	14	43	121	3	:			4	525
1979	116	395	5	34	5	5	:	183		1	744
1980	136	51	18	15	3	:		111	3		337
1981	203	59	58	43	5	3		:	2	:	373
1982	175	41	15	62	338	:	45	:	5	:	681
1983	254	3	8	72	127	2	1		6		473
1984	581	31	106	41	61	5	:	:	1		826
1985	963	2	2	26	6	9	2	:	1	:	1011
1986	781	1	8	29	8	4	6	:			837
1987	1015	:	12	41	2	:					1070

: = Less than 1 ton.

Source: O.C.E.I. Anuario de Comercio Exterior de Venezuela, 1977--1987.

146. Competition between tinplate and other materials is expected to continue and increase in the near future. However, raw materials for competing products as well as the equipment and technologies needed for their production are entirely or partially imported at a preferential dollar rate, which represent a drain on foreign exchange reserves. . Tinplate is the only product for which most of the inputs, with the exception of tin, are produced in the country.

147. In addition the installed capacity of 220,000 tons of tinplate which could meet domestic demand entirely, is at present only used at an approximate rate of 60 per cent. A number of measures would need to be adopted to rehabilitate the tinplate industry in Venezuela. One of these would be the adjustment of costs and prices, which has already been initiated.

148. Table 42 shows imports of tin and tin products into Venezuela from 1977 to 1987. Tin imports' share in total imports has increased from 32.6 per cent in 1978 to 95 per cent in 1987. Tin alloy imports ceased almost completely in 1987, while imports of other tin semi-manufactures have declined.

Other countries in the Latin American/Caribbean region:

149. Colombia and Chile are the two other countries in the Latin American/Caribbean region in addition to those already mentioned earlier which have production capacity for tinplate. Table 43 gives details about the installed capacities in these countries and the process being used.

Table 43
Production capacity for tinplate
in Colombia and Chile
(tons)

	Installed capacity	Process used
Colombia		
Holasa (Medellin)	70,000	Electrolytic
Chile		
Acero Commercial S.A. (Talcahuano)	88,000	Electrolytic

Source: World Tinplate Survey, Canning International, 1988.

150. while in Colombia the capacity is almost fully used, Chile, like the other countries in the region with the exception of Brazil, has been unable to fully use its significant existing tinplate installed capacity. In 1987, tinplate output in Chile represented approximately 47.7 per cent of installed capacity. However, in both countries tinplate output has fluctuated between 1978 and 1987 and is largely intended for the domestic market. Colombia has succeeded in reducing its dependence on tinplate imports which have dropped by almost 84 per cent from 1978 to 1987 when they stood at 900 tons. In contrast, Chile's imports have increased significantly from 2,200 tons in 1978 to 12,000 tons in 1987. All the other countries in the region depend on imports either from within or outside the continent to meet their needs of tinplate.

151. Data on tin semi-manufacturing is very scarce and difficult to obtain. However, in general tin semi manufactures are imported, especially from industrialized countries.

2. Production gaps between different stages of processing: Latin American producers in an international context

152. In the late 1970's, Bolivia was still one of the world's major tin concentrate producers, but had one of the lowest degrees of vertical integration into smelting Bolivia did not produce tin metal until 1970 when the Empresa Nacional de Fundiciones (ENAF) started its operation. Although a young company it was soon involved in the same kind of difficulties as the much older state mining company, COMIBOL. The upward trend in metal production was broken during the restructuring process of the Bolivian tin industry which started in 1985. One of the factors which has prevented Bolivia from having a high degree of processing is the complex nature of its

ore, which requires relatively more sophisticated methods of processing

153. In the case of Brazil, the trend is different. A net importer of the mineral raw material in the late 1970's when its tin concentrate production was still incipient, Brazil already had sufficient processing capacity to meet its domestic consumption of tin metal. The country's integration backwards was achieved with the full development of the Rondonia tin province and has been kept since then. Since the Brazilian ore is relatively clean of impurities, it is easy to process, and this has made it possible to maintain a high rate of processing.

Table 44

Degree of processing in selected countries

(Smelter/mine output ratio)

	1978	1981	1985	1987
Bolivia	0.52	0.67	0.78	0.25
Brazil	1.43	0.94	0.93	1.02
Peru	0	0	0	0
Argentina	0.25	0.50	0.80	0.50
Mexico	-	-	4.00	8.00
Indonesia	0.94	0.92	0.94	0.92
Malaysia	1.15	1.17	1.23	1.46
Thailand	0.96	1.03	1.08	1.04
Australia	0.44	0.33	0.42	0.08
Europe	6.40	4.80	4.41	5.48

Source: tables A1 and A2

154. Peru, the third tin in concentrate producer in Latin America, does not have any smelting capacity so far, and exports all its concentrate, mainly to the United States. However, there are plans to build a smelter with enough capacity to treat its increasing mine output. Argentina is only a minor producer of concentrate and has not attracted enough investments in the smelting phase to absorb its domestic production. Mexico, on the other

hand, stimulated by its relatively high domestic consumption (second in Latin-America only to Brazil), has developed enough processing capacity for its own needs thus becoming a net importer of concentrates.

155. In South East Asia, Indonesia and Thailand have developed their mine and smelting capacities and have established themselves as metal exporters. Malaysia, until 1987 the world largest concentrate producer, still has the largest metal output, and treats imported ore from various countries in the region, including China and Australia.

156. In Australia, the main concentrate producer, Renison Goldfields Consolidated, which is responsible for almost 90% of the country's output, is not an integrated company. Its ore is toll-smelted mainly in Malaysia, and is then marketed by Renison itself. Smelting capacity in Australia has been reduced since 1985 with the closure of an independent smelting facility.

157. In Europe, only the United Kingdom is a relatively important producer of both concentrate and tin metal. Based on the country's experience with its domestic ore it has developed important smelting capacity based on imported concentrate, mainly of complex nature. With smelters also in the Netherlands and Spain, Europe as a whole has an important smelting capacity.

3) Exports of Tin concentrates, tin-metal and Tinplate from the Latin American/Caribbean area and intra-regional trade

158. Tin is mainly produced by developing countries and consumed by the developed world. This is true also for Latin America and the Caribbean, as only a small percentage of total tin exports from the region goes to the region itself. Tin is mostly exported to countries in the region with established iron and steel industries for the production of tinplate (Argentina, Chile, Columbia, Mexico, Peru and Venezuela) and for soldering.

159. In the 1970's, Bolivia was the main supplier of tin to Latin America. However, since the tin crash of 1985 and the ensuing difficulties by Bolivia in recent years, Brazil has become the leading tin exporter to the region (see table B2). Table 45 shows the shares of Latin America tin-in-concentrates, tin metal and tinplate exports to various regions in 1978 and 1987.

Table 45

Destinations of Exports of tin-in-concentrates
Tin Metal and Tinplate from Latin America in 1978 and 1987,
percentage shares

Region	Tin-in-concentrates		Tin metal		Tinplate	
	1978	1987	1978	1987	1978	1987
Latin America and Caribbean	10.5	3.9	10.2	7.0	83.0	16.7
North America	24.8	48.8	29.6	48.5	17.9	3.2
Western Europe	64.7	43.4	26.7	31.0	-	15.9
Japan	-	3.9	-	-	-	0.1
Developing countries	-	-	-	1.3	-	37.1
Socialist countries	-	-	33.5	12.2	-	19.9

Source: UNCTAD secretariat

160. The share of exports to the region itself as well as total volumes, has decreased significantly for tin-in-concentrates and tin metal. For tinplate however, although the share of Latin American exports to the region has declined from 83 per cent to 16.7 per cent, actual tonnages exported have increased from 8,800 tons in 1978 to 21,700 tons in 1987. The United States has become the leading trading partner, as imports from Latin American countries, of both tin in concentrates and tin metal have increased significantly, reinforcing their dependence on the North American market. (see tables 45, B1 and B 2). For Western Europe, although its imports of Latin American tin-in-concentrates have declined, tin metal and tinplate imports from the region have expanded. Tinplate exports have been diversified with significant quantities now going to Western Europe, other developing countries and socialist countries.

161. In summary, one can say that reliance on the North American market, especially the United States, for exports of tin in concentrates and tin metal

has been reinforced in recent years, while intra-regional trade has failed to expand in the last decade, especially for those two products. Latin American tin producers seem unable to penetrate the neighbouring markets. In contrast, intra-regional trade in tinplate has increased although its share of exports has gone down. Tinplate exports to the United States, although higher in terms of volumes, have been contained by the introduction of "voluntary restraint agreements", thus forcing Latin-American exporters to search for new markets.

162. There are a number of constraints and difficulties which hamper the development of intra-regional trade and which explain the failure of Latin American tin producers to expand exports in the region itself. Some of these are as follows:

(i) Lack of transportation, both in terms of inland and shipping routes. The transportation cost for exports within Latin America are sometimes higher than those for exports to the rest of the world.

(ii) The limited size of domestic markets for tin, both at the primary stage and for processed products, does not allow the development of economies of scale in this sector. The higher the stage of processing, the higher are the levels of imports from outside the region, since existing production facilities are not equipped to produce high quality products. In general, the goal of the major tin industries in Latin-America is to satisfy domestic needs and become self-sufficient.

(iii) Pricing policies and subsidies prevailing in the majority of countries producing tin products, keep prices for steel and tinplate (which is mostly used in the packaging food sector) low, and thus affect the development and the level of investment in the tin industry.

(iv) The relatively high tariffs levied in particular on processed tin products in many countries in the region, in addition to other charges and costs due to the application of non-tariff measures for both imports and exports, have a dampening effect on the level of trade in the region.

(v) **The magnitude of external debt of the majority of countries in Latin America and the Caribbean has necessitated reduced levels of imports in general and lower levels of investment in industry.**

II Processing Technology and Costs of Production

163. The mining stage is the most important stage of the tin industry as opposed to aluminium where the key phase is the smelting. The most important reason for this is that tin is a relatively scarce metal and economic deposits, are not common. Therefore, the cost of mining accounts for the major share of the total costs of tin production.

A. Mining

164. Cassiterite, a tin oxide mineral, is essentially the only economic source of tin metal. This mineral is most commonly associated with granitic rocks. Because of the high specific gravity of cassiterite and its chemical stability it tends to form residual or placer deposits as a result of weathering, which destroys the parent granitic rock leaving cassiterite and other associated heavy minerals in relatively high concentrations. These residual deposits may be further concentrated by gravity in the case of eluvial deposits, and flowing water (river or sea tides) in the case of alluvial deposits.

165. The methods of mining depend on the type of deposit. There are essentially four types of mining methods: dredging, gravel pumping, open pit and underground 36/

166. Primary or lode deposits are essentially mined through under-ground methods as with any metal disseminated in hard-rock deposits. The ore body is accessed by shafts and tunnels and the ore drilled and blasted. It is a high cost process. The mining of tin through open pit methods is relatively uncommon and when it happens it is similar to the mining of other minerals.

167. Bolivia has always been the major underground mining tin producer. Virtually all its production originates from the exploitation of lode deposits which, given low investment and administrative problems, make the Bolivian tin mines one of the world's least efficient operations.

168. On the other hand, one of the world's largest underground mines in

Australia is rated as an efficient operation because of its high level of mechanization. In the United Kingdom, underground mining also has a higher productivity than in Bolivia because of a higher degree of mechanization and better planning 37/.

169. A comparison of recovery rates in underground mining in the main producing countries may indicate the efficiency of the operations in each country. Recovery rates are also influenced by the ore grade and nature; table 46 indicates the average tin grade.

Table 46
Estimated recovery rates of underground mines in selected countries

Countries	Share (%) of total tin content recovered in concentrate	Ore average grade (% of tin)
Australia	74	1.1
England	74 to 80	1.0 to 1.4
Indonesia	68	1.3
Peru	70	2.9
Bolivia	45 to 60	3.0

Source: Press reports and interviews with industry officials.

170. The Residual alluvial deposits are almost exclusively mined either by gravel pump or dredging methods. Gravel pump mining is traditionally known for its low capital requirement, high labour intensity and high cost of production. Although, the technique has been in use for at least 70 years 38/, it has remained essentially the same apart from the technological development of equipment. According to Tin International gravel pump mining accounts for more than 50% of the world output. In this method, powerful jets of water are used to break the tin-bearing ground. The slurry which is formed (a combination of mud, sand and gravel) is then pumped by the gravel pump to the concentration station for screening and gravity concentration.

171. According to the U.S. Bureau of Mines, gravel pumps present the following advantages over dredging methods: (1) the topography is relatively unimportant: (2) selective mining can be practiced: (3) capital cost is low: (4) complete extraction of the material is possible and (5) ground at various depths can be worked with the same equipment.

172. Because of the low capital intensity of gravel pump operations, the technique has been widely adopted by individual prospectors both in Brazil and in South East Asia. In many instances it represents the most efficient mining method available for exploiting residual deposits.

173. Dredging operations account for nearly 30% of world output. Essentially they consist of a floating equipment which digs the bottom of artificial or natural lakes, estuaries and shallow coastlines and concentrates the ore on board. A modern dredge may have a capacity ranging from 1.5 to 2.5 million tons per month with an average digging depth of about 21 meters. There are two main types of dredges: the bucket line or ladder dredge and the bucket wheel dredge. The former, more efficient and with lower cost, has a rotating line of buckets as digging mechanisms. The second has the advantage of lower capital and operating costs, but the operating scale is much smaller and there is no concentrating equipment on board. In Thailand, an important method of mining is the suction boat which in the early 1980's employed around 60,000 people. Much of this activity is seasonal and has been drastically reduced since the tin price collapsed in late 1985.

174. In Brazil, dredge mining is also important, especially at the Pitinga deposit in the Amazon region.

175. Off-shore dredging is also common in South East Asian countries (Malaysia, Indonesia and Thailand) where important deposits have been explored for many years.

176. The concentrates obtained from dredging and gravel pump operations in general have a tin content of 20 to 30%. This concentrate is then upgraded to 70 or 75% in a more complex concentrating plant where relatively more sophisticated methods, such as magnetic or electrostatic separation, acid leaching and flotation, can be employed.

177. Given the nature of residual deposits, the recovery rate of operations

is relatively high, ranging from 90 to 95% of the metal content. This contrasts with the recovery rates obtained in the exploitation of underground deposits. As was seen above, according to the U.S. Bureau of Mines, recovery rates at mines in Australia, Bolivia, South Africa and England are seldom above 70%. In the case of Bolivia in particular, it can be as low as 50% 39/.

B. Smelting

178. After beneficiation of the ore, the concentrates are sent to smelters for reduction and recovery of the tin metal. The production of tin metal can include one or more stages, depending on the grade and chemical composition of the concentrate. Concentrates originating from residual or placer deposits are relatively clean and have high grades of tin they can therefore be smelted directly. This is done by heating the concentrate with carbon until it melts (which happens at around 12000C to 13000C). Smelting can be undertaken in reverberatory, rotary or electric furnaces, the choice of which usually dependent on economic rather than technical reasons 40/. For example, in countries where oil is easily available, reverberatory furnaces are more commonly used, as in the case of Asian Countries. When electricity is the major source, electric furnaces are preferred, as in the case of Brazil. Bolivia, where earlier oil-fired reverberatory and rotary furnaces were used is now undertaking, as part of the rationalization process of its industry, a project to introduce natural gas as the energy source. Reverberatory furnaces are also considered to yield cleaner slags and to present superior efficiency in smelting fine grained concentrates. On the other hand, the electric furnaces are considered more appropriate for small scale operations for energy saving reasons 41/.

179. In countries where the concentrates are obtained from underground mines or lode deposits, and for this reason are more complex chemically, some steps are necessary before smelting. This is the case of the concentrates produced in Bolivia, averaging 30% to 50% tin, which have to be roasted to remove arsenic and sulphur. Still lower grade concentrates, also common in Bolivia, averaging between 5% and 25% tin, can be treated by a fuming process which produces tin oxide dust from a stannous sulphide gas obtained from the concentrate. This tin dust (with 45% to 60% tin) is then smelted in the conventional way.

180. Studies already undertaken in Bolivia aim to apply the fuming process to tailings from mine operations. These tailings, although available in very large volumes have a very low grade making their processing uneconomic under present market conditions.

181. The smelting process produces two products, an impure metal which has a tin content below the commercial standard of 99.8%, and an iron rich slag containing from 10% to 25% tin which is then resmelted to yield a slag of no more than 1% tin 42/. In some cases, a fuming process is used to recover tin from slag, by which a second stage of smelting may be avoided and the loss of tin in slag is reduced.

182. Refining of tin metal to increase its grade to 99.8% is mostly done through heating the impure metal to a temperature above the melting point of pure tin but below the melting point of the impurities 43/. Refining also produces a slag (dross) which is resmelted. After refining, tin is cast to desired forms for marketing.

183. One of the most important developments in tin processing technology in recent years has been the vaccum destillation in tin refining, which was first successfully developed and employed by China. Brazil seems to have been the first western country to adopt this technology on a commercial basis after buying it from China in a package form. Malaysia was the second country to adopt it, and Bolivia is also acquiring the process and should soon start its operations.

184. Another important improvement which the industry is striving to develop - so far without success - is a process of agglomerating the charge which feeds the smelter. This charge consists of tin concentrate, coal and limestone, and the smelting process loses much of its potential productivity due to the different densities of the three main components, which leads to a non-homogeneous mixture in the furnace. The successful development of an agglomeration technique would make possible, a substantial increase in productivity according to the industry.

185. Another development which is under way in Brazil is the recovery of by-products from tin mining and processing 44/. As can be seen in table 47 in the next section, mining of residual deposits does not commonly involve the recovery of associated minerals and metals, contrary to what is the case

in most hard-rock mines. This is not only because the residual deposits are cleaner than lode deposits, but also has to do with technological requirements and the necessary marketing ability.

186. Placer deposits may be associated with tantalum, niobium, rare earth minerals and Zirconium. Thailand and Malaysia are in fact major world sources of tantalum pentoxide through tin slags. Lode deposits, on the other hand, tend to be associated with silver, lead, and zinc, Bolivia is trying to increase production of silver and zinc which, in some instances, occur associated with tin.

C. Costs of production

187. Very little is published about costs of production in the tin industry. This kind of information is so scarce that some producing countries have recommended that the Association of Tin Producing Countries (A.T.P.C) should undertake studies of this subject in order to fill the gap. The information would be of particular interest to ATPC, according to some producers, in view of its on-going efforts to stabilize the tin market and reduce excess stocks through a scheme of supply restriction. Since the supply rationalization scheme organized by ATPC depends on the level of stocks as well as on the price level, costs of production would be an important element in determining the "fairness" of a selected price target.

188. The most comprehensive and updated published material on tin industry operating costs is the U.S. Bureau of Mines "Tin Availability" of 1986 which contains 1982 figures updated to 1984 value. One important characteristic of the cost figures presented in the study is that they are "weighted averages calculated over the life of the deposit or region" 45/

189. Costs of production in the tin industry vary with country specific factors such as availability of infrastructure, tax systems, and labour costs, and also according to the geological characteristics of the deposit which determine the scale of the operation, mining method, and availability of by-products.

190. The results obtained by the USBM are listed in the table 47. Although the figures are in 1984 dollar terms and hence antecedent to the 1985 tin price collapse, they give an indication of the competitiveness of the various producing countries.

191. It should be stressed, however, that operating costs show only part of the picture - although probably the main part. Capital charges are also an important component of each company's competitiveness.

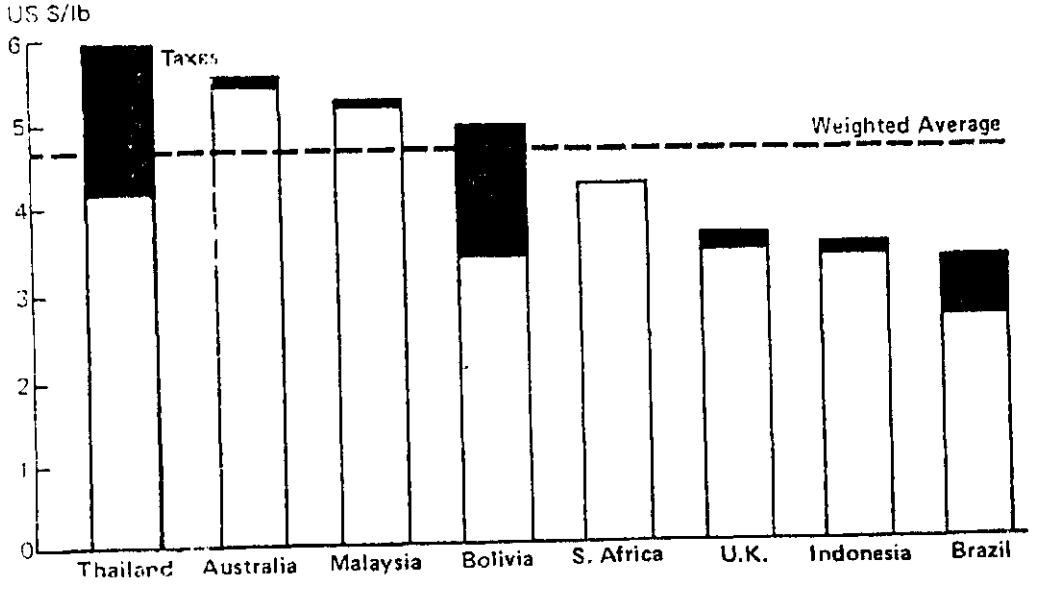
192. As shown by the last column of table 47 Brazil already in 1984 had the lowest total operating costs. Compared with the South-East Asian countries, which also employ gravel pump and dredging methods, the costs in Brazil were lower because of the higher grade deposits. Costs of smelting and refining in Brazil are twice as high as in Thailand and Malaysia, mainly because of the long distance between mining and smelting facilities (from 3,500 Km to 4,000 Km).

193. Among countries producing from underground mines, Bolivia and Australia were the highest cost producers. Bolivia, also had the highest smelting and refining costs and among the highest tax costs.

194. The results are summarized in figure 1. It is worth noting that the USBM study does not assign the highest production cost to Bolivia. Estimates, operating costs in 1984 however, shwed Bolivia to be the highest cost producer at US$ 8.00 per pound of tin metal, followed by the high cost gravel pumping operations in South East Asia (see figure 2).

Figure 1

Average opertaing costs (US$.lb)



Source: Eccles, R. op. cit. with data from USBM

Table 47

Estimated operating costs and by-product credits for producing deposits, 1984 US dollars per pound of refined tin a/

Country	Number of mines or deposits	Cost					By-Product Credits	Net Cost
		Mining	Beneficiation	Smelter-Refinery b/	Taxes c/	Total d/		e/
Producing mines:								
Australia	7	3.50	2.50	0.60	0.10	6.80	1.20	5.60
Bolivia	27	2.50	90	1.20	1.60	6.10	1.10	5.00
Brazil	13	1.70	70	20	70	3.40	0	3.40
Indonesia	7	1.90	1.30	20	20	3.60	0	3.60
Malaysia	34	4.30	80	10	10	5.30	0	5.30
South Africa, Republic of	3	2.30	1.90	10	0 f/	4.30	0(f)	4.30
Thailand	25	2.50	1.50	10	1.80	6.00	10	4.90
United Kingdom	4	2.50	1.10	- 1.00	20	4.80	1.20	3.70
Other								
Namibia, Nigeria, Zaire & Zimbabwe	4	2.30	1.20	30	10	4.00	20 3.80	
Argentina, Burma, Japan & Peru	6	1.90	60	2.40	10	5.10	2.30	2.80
Total Weighted Average	130	3.00	1.20	30	40	4.90	20	4.70

Source: Bleiwas, D. et. al. Op. cit.

a/ Based on 1982 data. Costs were updated to 1984 U.S. dollars

b/ Includes all transportation costs f.o.b. refinery.

c/ Includes federal, state, property, and severance taxes plus royalties.

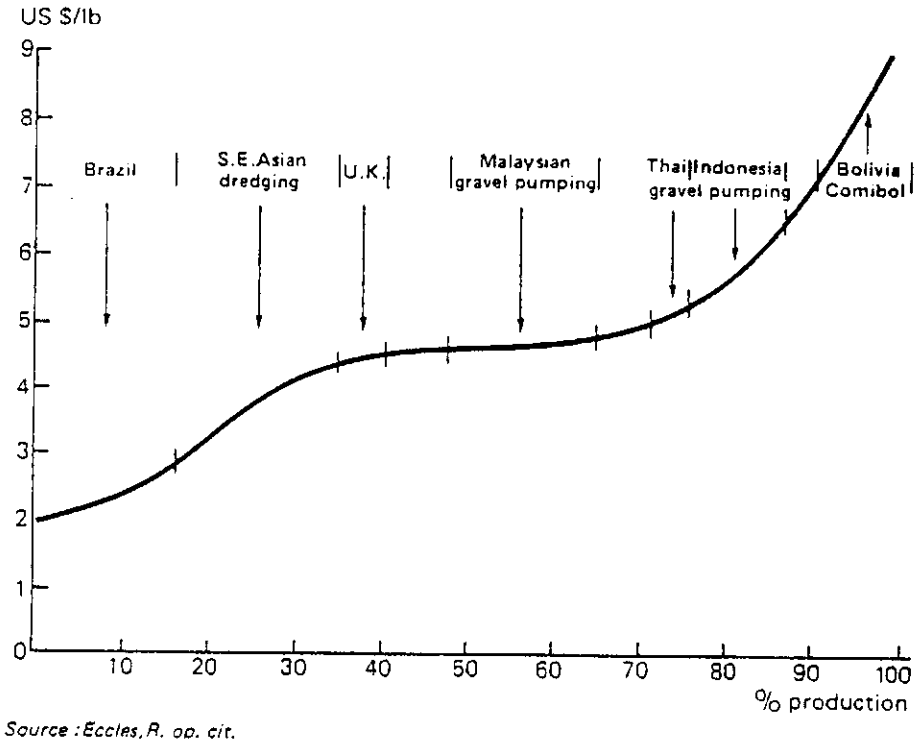
d/ Summation of mine, mill, smelter-refinery costs and taxes. Data may not add to totals shown because of independent rounding.

e/ Total cost minus by-product credit

f/ Rounding to the nearest $0.10 makes this value appear as 0

Figure 2

MMRS - Estimated 1984 operating costs (US$/lb)



Source : Eccles, R. op. cit.

195. Another way of looking at cost figures is by country and mining method. This is shown in table 48. Malaysia and Thailand have the highest costs in gravel pump operations because of the high degree of exhaustion of their resources, while Brazil, with higher grade deposits, has the lowest cost. According to the USBM, direct costs account for around 70% of total mining and beneficiation costs in gravel pump mining. The main cost item at this stage is energy which in South East Asia and Brazil accounted for up to 40% of the direct costs. Labour, with 25%, and materials and miscellaneous with 35%, accounted for the rest. More recent estimates of the cost structure of the South East Asian producers 46/ show a relative reduction of power costs in the total operating costs due to declining oil prices.

Table 48

Estimated production costs and by-product credits for producing mines by mining method, dollars per pound of refined tin a/

MINING METHOD AND COUNTRY	NUMBER OF MINES	TOTAL AV CAPACITY 10 MT/YR OF REFINED TIN	COST					BY-PRODUCTS CREDITS	NET COSTS
			MINING	BENEFICIATION	SMELTER-REFINERY b/	TAXES c/	TOTAL d/		e/
Underground									
Bolivia	24	14.0	2.60	0.90	1.20	1.60	6.40	1.20	5.20
South Africa, Republic of	3	2.0	2.30	1.90	.10	0	4.30	0	4.30
United Kingdom	4	6.0	2.50	1.10	1.00	.20	4.80	1.20	3.70
Southeast Asia: Burma, Indonesia, Malaysia, and Thailand	4	3.0	1.90	.60	.50	.30	3.30	.10	3.20
Others: Argentina, Australia, Japan, Peru and Zimbabwe	7	13.0	2.00	1.20	1.30	.20	4.60	.90	3.70
TOTAL OR WEIGHTED AV	42	38.0	2.20	1.10	1.00	.50	4.90	.80	4.10
Open pit:									
Australia	3	2.0	10.60	5.80	.60	.10	17.00	6.90	10.10
Thailand	4	5	2.40	.90	.30	1.40	4.90	.20	4.70
Others: Brazil, Malaysia and Namibia	3	2.00	2.00	1.40	.10	0	3.50	0	3.50
TOTAL OR WEIGHTED AV	10	4.50	4.30	2.50	.30	.20	7.20	1.90	5.30
Dredge:									
Indonesia	3	12.0	3.10	f/	.20	.20	3.50	0	3.50
Malaysia	22	15.0	3.10	f/	.10	.10	3.40	0	3.40
Thailand	10	12.0	2.90	f/	.10	1.60	4.60	0	4.60
Others' Australia, Bolivia, Brazil, and Nigeria	6	4.00	4.50	f/	.30	.30	5.20	0	5.20
TOTAL OR WEIGHTED AV	41	43.00	3.10	f/	.20	.40	3.80	0	3.80
Gravel pump:									
Brazil	10	6.0	2.50	f/	.20	.70	3.50	0	3.50
Indonesia	3	11.9	3.60	f/	.20	.10	3.90	0	3.90
Malaysia	10	31.0	5.40	f/	.10	.10	5.60	0	5.60
Thailand	10	17.0	5.10	f/	.10	2.00	7.20	0	7.00
Others' Australia, Bolivia, Burma and Zaire	4	3.0	3.50	f/	.30	.30	4.00	0	4.00
TOTAL OR WEIGHTED AV	37	68.9	5.00	f/	.10	.40	5.40	.02	5.40

Source: US Bureau of Mines. Op. Cit.

a/ Based on 1992 data. Costs were updated to Jan 1984 dollars.

b/ Includes all transportation costs f.o.b. refinery.

c/ Includes Federal, State, property, and severance taxes plus royalties.

d/ Summation on mine, mill, and smelter-refinery costs and taxes. Data may not add to totals shown because of independent rounding.

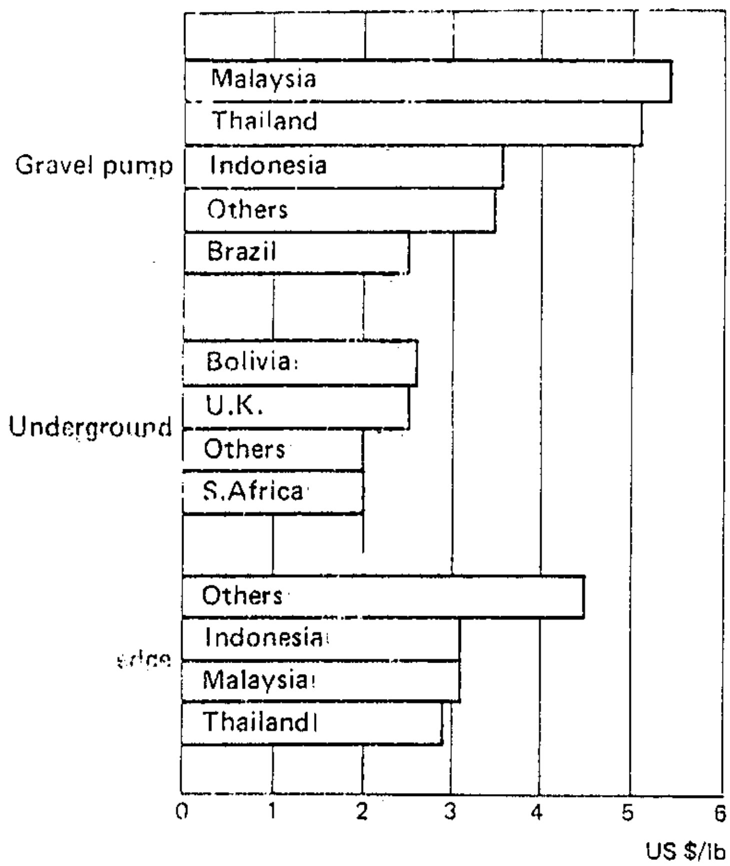
e/ Total cost minus by-product revenues.

f/ Mining and beneficiation costs are combined in the mining costs column because most dredge and gravel pump operations were vertically integrated through the beneficiation stage.

Figure 3

USBM-ESTIMATED COST ESTIMATED OPERATING COSTS
BY MINING METHOD Jan. 1984 $/lb

(before taxes and by-product credits)



Source: Burke, op.cit.

196. In the case of underground mining, the reasons which make it the highest cost mining method per ton of ore have already been referred to. However, the relatively high tin content in some underground mines lead to a low cost of production in terms of refined metal recovered. Thus, although Bolivia was the highest cost underground producer in the early 1980's the South East Asian gravel pump operations had even higher costs. While underground mining accounted for essentially all Bolivian production, this was not the case of the South-East Asian producers in relation to gravel pump operations which represented at that time from one third to half of total production. The consequence was that after the 1985 tin market crisis, the South-East Asian countries had reduced their output by approximately 40% (not necessarilly only in gravel pump operations) while Bolivia had to reduce the bulk of its production. But in fact, Bolivian costs of production were probably much higher owing to the depreciation of the Peso. Thus while total average costs in 1984 dollar terms were estimated to be around US$ 5.7 per pound of tin they were in fact above US$ 9.00 in 1982. Other estimates indicate that between 1980 and 1984, the Bolivian cost of production per pound of refined metal increased from US$ 7.00 to more than US$ 9.50 47/.

197. According to recent estimates by the industry, close to 90% of the Brazilian output is considered to be in the US$ 3,500 to US$ 4,000 per ton of refined tin cost range. The low cost output in Brazil includes both Paranapanema's Pitinga deposit in the Amazon state and the Ariquemes deposit where production carried out by "garimpeiros" but the output is controlled by Paranapanema. In 1988 each operation accounted for a similar share in the Brazilian output (around 18,000 tons each). The remaining 10% of the country's production comes from the deposits of the Rondonia tin province which are on average in the US$ 6,000 cost range with some deposits at US$ 5,000 and others at US$ 7,000 per ton of refined tin.

198. Recent Bolivian costs are more difficult to estimate since the effects of the restructuring are not yet fully absorbed. However, industry officials, although recognizing that their costs are probably above the US$ 6,000 cost range, argue that what is left of the Bolivian output can be considered as marginally profitable - that is with costs just below US$ 7,000. Furthermore, the large Comibol's Huanuni mine is planned to reopen at a US$ 6,600 per ton of refined tin.

199. Peru's prospects is to increase its annual production to 7,000 tons of tin in concentrate and maintain its relative competitiveness at a cost of around US$ 6,500 per ton.

200. The only country displaying costs comparable to Brazil, is Indonesia. T. state company (P.T. Timah) has a small share of the country's production (6% or 2,000 tons) at a cost of around US$ 3,000/ton. The major share of this country's production is however split between high cost gravel pump operations (around and above US$ 7,000/ton) and relatively low cost off-shore dredging (in the US$ 5,000 to US$ 5,500 cost range). Although Indonesia is the only South East Asian country to increase its output after the 1985 crisis, the country will require substantial investments to increase its production further, since the major prospects require off-shore dredging, one of the highest capital intensive mining methods. Also, after 1985, one of the options adopted by P.T. Timah to reduce its production costs included reducing maintenance expenditure and development investments which may harm its growth plan for the next 5 years or so.

201. Tin production in Malaysia and Thailand is not expected to grow significantly over the next five years. The major share of both countries' output lies between the US$ 5,500 and the US$ 6,500 cost range an there are no expected major new findings. However, higher tin prices in the next years, e.g., above US$ 8,500 per ton of refined tin, may bring back high cost gravel pump and dredging operations which had been cut after 1984.

D. Nature and state of extractive and processing technology for tin and its transfer to the region

202. Technical change plays a key role in industrial development and it certainly does so in the case of the tin industry. However, it is generally recognized that the world tin industry metal industries in general has a mature technology .

203. The distinctive characteristic of mature technologies and hence mature industries are that (a) the process of dynamic competition (which involves leadership by innovation) tends to give place to static competition when the static barriers to entry prevail, (economies of scale, large capital requirements, control over natural resources etc.) The mature industry is characterized by the stability of its oligopolistic structure and relatively lower rates of growth.

204. Compared to other segments of the industry, natural resources industries can, in fact, be considered to display a precocious technological maturity . This means that contrary to other segments of the industry, mining industries display (a) static barriers to entry (b) oligopolistic stability, from the early phases of their histories. Also, In most cases, including tin, processing technologies remain essentially the same since their first development.

205. Furthermore, the leading companies are induced to vertical integration as a way to expand the market, improve profit margins by internalizing the process of product differentiation and hence acquiring more stability during the business cycle and, to increase the degree of technological appropriability and cumulativeness.

206. Tin extractive and processing technologies are characterized by a lower degree of difficulty and complexity than those for example of the aluminium industry. Individual mining of cassiterite accounts for a large share of world tin mine production, and tin concentrates can be treated at backward smelters. This, coupled with much lower capital requirements has made possible an industry structure where small and medium size firms play a major role, contrary to what has happened in the case of aluminium.

207. The consuming companies (steel and chemical producers for instance), could be seen as the active agents in the development of the tin industry. However, because they could always rely on stable and independent sources of supply, as tin represented only a small input in the production of their final products, they were not obliged to integrate backwards to produce a minor input. This also explains why recycling of tin has not developed in the same proportions as for other metals, such as aluminium. This may in turn explain why research and development in the tin industry has lagged behind. The major consuming companies are only indirectly interested in tin related R&D, while the tin producing companies lack the financial resources.

208. As pointed out earlier, the producing countries have realized the necessity of filling this gap at an early stage and The Internationational Tin Research Institute (I.T.R.I.) was established already in the 1930's. It is entrusted with the task of maintaining and extending the use and effectiveness of tin in modern technology. It is financed by the governments of five tin producing countries - Indonesia, Malaysia, Nigeria, Thailand and Zaire. Although the Research Institute represented a major

initiative and a major effort for these countries, the I.T.R.I annual budget is less than US$ 5 million, less than what a single leading company in for example aluminium industry, invests in R&D.

209. In terms of Latin American producers, Brazil has been able to master the extractive and processing technology during the past fifteen years. Leading companies like Paranapanema are able to construct a large part of their equipment. According to company officials, the "marketing technology" is more difficult to master than processing technology. As already mentioned in the section on Brazil, the Cesbra Group has also developed its own extractive and processing technologies.

210. In the case of Bolivia and Peru, extractive technology is more complex, since lode deposits are mined, but both countries have a long tradition in mining and are thus able to rely, in large proportion, on their own expertise. However, it should be stressed that after the nationalization of mining in Bolivia in 1952, the State Company (COMIBOL) was not able to maintain the same performance, and productivity declined steadily. In Mexico, tin is mostly mined by small individual miners using traditional mining equipment.

211. As regards processing, Bolivia is more dependent on foreign technology and expertise because of the complexity of the ore. In addition, the country's experience with smelting and refining is not comparable to its experience in mining. Bolivia is in fact receiving assistance from the Federal Republic of Germany for mine feasibility studies and technical assistance for the modernization of the Vinto smelter; a Japanese company has also undertaken studies on the feasibility of concentrating and smelting mine waste in Bolivia; and finally, the United Nations is conducting geological exploration.

212. In the case of Peru, because of the complexity of the ore produced, its low grade and the absence of an appropriate smelter in the country to treat it, most of the tin output continues to be exported to smelters abroad for treatment and processing.

III Development of supply and demand until the mid 1990's

A. The global economic environment:

213. World demand for primary tin is a function of short and long-term changes in levels of economic activity, price movements in tin and other materials, and structural changes in the tin-using industries. The following account tries to assess the relationship between tin consumption on the one hand and economic growth and levels of income on the other in the light of recent price changes and structural developments in the tin-using industries.

214. Although, as seen in Chapter I section B, there was little correlation between long-term growth in GDP in developed market economy countries and tin demand in the 1970s and the 1980s, for developing countries, however, there was a positive relationship between long-term economic growth and tin consumption in the same period. The distinction between developed market economy countries and developing countries can be understood in terms of differing stages of development reached by the tin industries. The tin industry in developed market economy countries has reached a mature stage and a high level of diversification in activities including services has been achieved over the last decades. By contrast, in many developing countries, the tin industry is still relatively new. Provided that a country's economy is growing at a sufficient rate, it may be possible for the tin industry to invest in the production of increased tonnages of products such as tinplate, for example.

215. Nevertheless, in the short term, in any country, a sudden increase or decrease in economic activity is likely to be accompanied by a surge or decline in demand for tin. Such effects are likely to occur regardless of the economic grouping to which the country belongs. Therefore, world GDP growth is one tool that can be used, although with caution, to measure and forecast world tin demand in the short and long term. Economic growth and trade policies in developed market economy countries have a direct bearing on the export opportunities of developing countries and serious effects on their economies in general and vice-versa. As seen in the early 1980's, slower growth and increased protection in the industrial countries led to depressed commodity prices for the often heavily indebted developing countries which in turn had to adopt restrictive policies leading to a compression of imports from the industrial countries. Table 49 shows growth rates for world output and population in 1973 to 1987,

as well as some assumptions about future world economic growth to the year 2000. These data were prepared by the World Bank and are reproduced here as background to the demand projections discussed in section C of this chapter, which are based on World Bank projections using this set of assumptions.

Table 49

Assumptions about the growth of world output and population

average annual rate of change

in percent

	Historical		Baseline Projections	
	1973-80	1980-87	1987-90	1990-2000
Developed market economy countries	2.4	2.5	2.6	3.0
GDP				
France	2.8			2.5
Germany, Federal Republic	2.3			2.6
Japan	3.7			3.7
United Kingdom	1.0			2.1
United States	2.2			3.0
Developing Contries a/	5.3	4.0	4.5	4.9
o/w Sub Saharan Africa	2.8	0.2	3.1	3.7
Highly indebted countries	5.2	1.0	3.1	3.9
Asian NIES	9.1	7.6	6.5	6.1
High income exporters	7.9	-2.4	1.9	2.9
Population				
Developed market economy countries	0.7	0.6	0.5	0.3
Developing Countries a/	2.1	2.0	2.0	1.8

a/ 90 country sample.

Source: World Bank, Price Prospects for Major Primary Comodities, Report No.814/88

216. In 1987 and 1988, per capita incomes in virtually all industrial countries continued to grow steadily. Moderate increases in gross domestic

product, some improvement in the terms of trade and slow population growth (see table 49) have raised per capita incomes and that trend is likely to continue in the medium term according to most forecasts. The improvements in the economic situation in the OECD countries coupled with low tin prices in th· international market, have already been translated in increased demand for tin in 1987 and 1988.

217. For developing countries, there are regional differences, and prospects, in the short term at least, seem highly uncertain especially for Africa and Latin America. The majority of countries in South and East Asia have achieved consistent increases in per capita incomes, above those of most developing countries, and prospects for decisive improvement are much better there than in other regions. In most countries of Africa, per capita incomes have fallen and at least in the short term, prospects for the whole continent remain highly uncertain. For the majority of Latin America and Caribbean countries per capita income fell in 1987 and 1988 and there is little prospect for an early reversal.

218. Inflation accelerated considerably in 1987 and 1988, reaching three digits in the large countries. The need to confront domestic disequilibria and a heavy debt burden (which may increase if interest rates rise) make it unlikely that investment ratios (wich have fallen markedly since the onset of the debt crisis) will soon recover. Therefore, sustainable growth is not expected in the foreseeable future.

219. In this rather gloomy pattern of economic developments it is difficult to make any forecasts for tin demand in developing countries. However, there are some bright spots as most non-fuel primary commodity prices experienced an upturn in 1988 and early 1989 as a result of sustained demand increases in developed market economy countries and structural adjustments within industries wich led to markedly reduced capacity. Also, the on-going Uruguay Round of multilateral trade negotiations with the objective of developing a more open, viable and durable multilateral trading system, raises hopes for greater liberalization of world trade and improved access for developing countries exports.

220. Developed countries still account for the major share of tin consumption in the world and this is because, as is the case for most metals, the level of tin use is closely related to level of income. Table 50 shows tin consumption per capita in selected countries in 1978 and 1987.

Table 50

Tin consumption per capita in selected countries in 1978 and 1987

(Kilogrammes per person)

	Primary Tin metal a/		Tinplate b/	
Developed market economy countries	1978	1987	1978	1987
	0.20	0.16	13.19	9.91
Australia	0.25	0.15	17.06	18.60
Canada	0.22	0.15	19.70	14.04
France	0.18	0.13	9.35	7.98
Germany, Fed. Rep	0.22	0.28	8.24	10.29
Italy	0.10	0.10	8.56	8.98
Japan	0.26	0.27	8.67	6.84
Spain	0.12	0.07	9.08	7.98
United Kingdom	0.22	0.11	17.97	11.20
United States	0.21	0.15	18.14	10.13
Socialist Europe	0.12	0.11	1.16	0.74
Czechoslovakia	0.21	0.19	6.38	7.12
Germany, Dem. Rep.	0.18	0.20	2.56	3.06
U.S.S.R	0.10	0.10	0.71	0.106
Developing Countries	0.01	0.01	1.33	1.18
Argentina	0.03	0.03	2.71	3.80
Bolivia	0.11	0.16	0.79	0.22
Brazil	0.04	0.05	4.76	2.93
Chile	0.06	0.07	3.86	4.06
Mexico	0.06	0.08	12.0	6.76
Peru	0.02	0.02	1.98	3.27
Venezuela	0.01	0.04	9.00	5.79
Korea, Rep of.	0.06	0.09	2.53	4.42
Malaysia	0.02	0.12	5.26	5.51

a/ not including secondary consumption

b/ defined as production minus exports plus imports

Source: UNCTAD secretariat

221. Although per capita consumption of primary tin metal has declined between 1978 and 1987 in the majority of developed market economy countries with the exception of the Federal Republic of Germany and Japan, levels of tin use are still much higher than those in developing countries in spite of the increase achieved in those countries during the same period. The significant increase in per capita tin metal consumption in the Federal Republic of Germany can partly be explained by the decline in its population in recent years.

222. Structural changes in the tin using industries and technological innovations also have a direct bearing on the level of tin demand as mentioned earlier. Over the last two decades, there has been a significant change in the intensity of use of tin, especially in the production of tinplate. During the early 1980's, average tin coating weights fell rapidly in the OECD area as can makers replaced side seam soldering equipment with welding machinery which permitted thinner tin coatings. Further decrease in the average coating weight is anticipated world wide, but for technical reasons, there is a lower limit below which the tin coating no longer functions satisfactorily.

223. In developing countries, while the intensity of use of tin in tinplate through thinner coatings has also declined, although to a lesser extent than in the industrial countries, this has been compensated by an expansion in consumption for both tinplate and other uses.

B. Developments in major end-use markets

224. Against the background of projected moderate economic growth in the developed market economy countries of 2.6 per cent/year in 1987-1990 and 4.5 per cent/year in developing countries and the overall decrease in the intensity of use of tin outlined above, this section reviews recent developments in tin uses, sector by sector, in an attempt to assess the prospects for world primary tin consumption.

225. Tin has both old and new applications Tinplate, solders, bronzes and bearings are often regarded as the traditional established markets while organic chemicals, tin in cast iron and tin in powder metallurgy are relatively new uses. New applications have shown a significant increase in recent years as the cost effectiveness of tin is often greater because relatively small quantities have important benefit in high cost applications 48/.

226. A basic feature of tin-end-use markets is the threat posed by substitute materials such as aluminium and tin-free steel (T.F.S) for tinplate, and the use of other joining materials for solder. Tin demand is very sensitive to competition from other materials and this has led to a loss in the share of certain markets. However, there are distinct differences between the markets of developed and developing countries and also between markets in the same economic grouping due to a number of factors including consumer preferences. Table 51 shows tin metal consumption by major use in selected countries in 1987. While tinplate has the largest share in tin consumption in the majority of countries listed, in the United States and Japan solder has become the major end-use.

Table 51
Tin metal consumption by major use
selected countries - 1987
metric tons and per cent

	Tinplate	%	Solder	%	Brass/Bronze	%	Other uses b/	%	Total	%
U.S.A	10,357	23.4	15,240	34.5	3,559	8.1	15,040	34.0	44,196	100.0
U.K.	3,616	36.8	871	8.9	1,438	14.6	3,898	39.7	9,823	100.0
France	3,489	47.4	1,400	19.0	300	4.1	2,172	29.5	7,361	100.0
F.R.G	3,014	17.4	2,608	15.0	177	1.0	11,548	66.6	17,347	100.0
Italy a/	2,450	36.6	1,250	18.6	1,400	20.9	1,600	23.9	6,700	100.0
Japan a/	9,061	28.8	13,722	43.5	N.A	-	8,738	27.7	31,521	100.0
Total	31,978		35,091		6,874		42,996		116,948	

a/ data for Italy and Japan refer to 1986 as 1987 figures are not complete

b/ other uses: include chemicals babbitt white metal, and other miscellaneous uses

N.A: Not available

Source: International tin Council, Tin Statistics, june 1988
Metallgesellshaft: Metal Statistics, 1988.

Tinplate

227. The per capita consumption of tinplate in industrialized nations has been falling while at the same time demand for tinplate has been increasing in some regions of the rest of the world. Total world production of tinplate has decreased over the years and a significant change in the pattern of production has taken place. Whereas in 1978 the United States, Western Europe and Japan accounted for almost 79 per cent of world tinplate production, in 1987, their share had gone down to around 71 per cent as a greater number of countries, especially in the developing world, expanded their output. In 1987, production of tinplate was 4.1 million tons in the EEC countries, 2.2 million in the United States and 1.7 million in Japan (see table A14). The same year developing countries produced an estimated 2.1 million tons of tinplate. In addition to the geographical shift in tinplate supply, the world tinplate industry has been steadily adopting new technology to meet the competition presented by alternative materials and new environmental requirements.

228 Tinplate remains the largest single outlet for primary tin, of total tinplate consumption, 80 per cent is used in the packaging industry, especially for human and animal foods including cans for fruit juices, coffee drinks and other non-carbonated beverages. By far the largest category, in tonnage forms, of canned human foods produced are vegetables and vegetable juices, soups, dairy products, seafoods, meat and poultry products, baby foods, powdered coffee, pasta products and cooking sauces. A significant proportion of canned foods, particularly fruits, vegetables, seafoods, dairy products and meat are produced for export rather than home consumption.

229. However, demand for canned food is a function of income. The industrial countries remain the largest consumers of canned foods for both people and animals. By contrast, in developing countries, levels of income do not allow people to afford canned foods, apart from essentials such as milk products and cooking oil.

230. Such factors as demographic trends, growing levels of microwave oven ownership, increased preferences for eating outside the home and for fresh or frozen foods rather than processed foods have a bearing on the level of demand for canned food.

Table 52

Estimated world a/ Tinplate demand by sector and economic grouping

	1977		1987	
	Million tons	%	Million tons	%
Food cans b/ open top and general line	8.4	63	6.9	62
of which developed market economy countries	6.2		4.4	
others	2.2		2.5	
Carbonated beverage cans	1.1	8	0.9	8
of which developed market economy countries	1.0		0.7	
Others	0.1		0.2	
General packaging containers	2.2	17	1.8	16
of which developed market economy countries	1.6		1.2	
Others	0.6		0.6	
Aerosol cans	0.4	3	0.5	5
of which developed market economy countries	0.3		0.4	
Others	0.1		0.1	
Closures	0.7	5	0.6	5
of which developed market economy countries	0.5		0.4	
Others	0.2		0.2	
Non-packaging uses	0.5	4	0.4	4
of which developed market economy countries	0.4		0.3	
Others	0.1		0.1	
Total	13.3	100	11.1	100
of which developed market economy countries	10.0		7.4	
Others	3.3		3.7	

a/ Excluding Albania, China, the German Democratic Republic, The People's Republic of Korea, The Mongolian People's Republic and the USSR.

b/ Includes cans for non-carbonated beverages but excludes aerosol cans for foods.

Source: data based on information received by the International Tin Council 49/

231. Table 52 shows approximate estimates for world tinplate demand (excluding centrally planned economies of eastern Europe and Asia) by sector and economic grouping in 1977 and 1988. It appears that while demand in developed market economy countries has declined slightly in all end-use sectors with the exception of aerosol cans, in other countries demand for tin has slightly increased or has remained stable.

232. Tinplate packaging for both food cans and general packaging containers (paints, lacquers, varnishes, solvents, motor oil etc) has had to contend with increased competition from plastics and composite containers. In recent years, aseptic packaging of liquid foods (e.g. fruit juices) in paper based laminates instead of metal cans has been developed. With the extension of the aseptic processing technique to soups and other food products (e.g. meat in stews and chopped up tomatoes) even greater competition from aseptic packs can be expected in the future. However, it is worth noting that the recently developed liquid nitrogen technique, which enables cheaper and lighter carbonated beverage cans to be used for non-carbonated beverages, is helping the metal can to meet the threat posed by aseptic packs. Developments in plastics packaging with new multilayer plastic cans are currently undertaken. They are however, still at a development stage, but in the beverage sector PET (polyethlylene terephthalate) bottles have succeeded in gaining a share of the markets for packaged beer and soft drinks. In the long term, plastics are expected to supplement the threat posed by aluminium 50/. Nevertheless, most of this growth is still likely to be in relatively small volume "up market" products and the overall effect on the production of foods in metal cans is likely to be modest.

233. New technological developments in Electrolytic Chromium, Coated Steel (ECCS) or Tin Free Steel (T.F.S.) can making have made the latter a strong competitor to tinplate. The advance of two-piece steel food cans which are made from ECCS, by the DRD (draw, redraw) process is benefitting ECCS rather than tinplate, particularly in Japan and the EEC where steel makers have increased ECCS coating capacity significantly in recent years 51/. In Japan, deliveries of tinplate by Japanese manufacturers for open top and general line cans manufacture were about 3.4 per cent lower than in 1986 while deliveries of ECCS were about 5 per cent higher (see table 55). However, in the United States, tinplate deliveries to can manufacturers for open top and general line cans, after declining between 1977 and 1986, increased in 1987 by 1.4 per cent compared to the previous year, while ECCS deliveries were 3.7 per cent lower (see table 53).

234. In view of existing technological trends and price differentials in the short term, ECCS is expected to continue to gain a larger market share from tinplate in food-can making. In the longer term, prospects may largely depend on the extent to which laser-welding replaces resistance wire-welding systems or soldering in the joining of the side seams of three-piece can bodies. Whilst wire-welding systems generally require the use of tinplate, laser-welding systems can use ECCS.

Table 53
United States Tin mill product deliveries a/ to the packaging market

	1977	1982	1983	1984	1985	1986	1987
				%			
Open top and general line cans b/ (thousand tonnes)	4,408	2,914	2,873	2,724	2,550	2,547	2,761
of which, Tinplate (%)	77	74	72	72	73	71	72
Electrolytic Chromium, Coated Steel(%)	18	23	24	26	25	27	26
Blackplate (%)	5	3	4	2	2	2	2
Crown caps and other closures (thousand tonnes)	246	201	217	198	172	173	149
of which, Tinplate (%)	66	48	49	50	49	54	55
Electrolytic Chromium, Coated Steel(%)	33	51	49	48	50	45	44
Blackplate (%)	1	1	2	2	1	1	1
Drums, pails, miscellaneous boxes, containers and components b/ (Thousand tonnes)	172	90	99	97	90	65	39
of which, Tinplate (%)	55	61	51	54	50	49	64
Electrolytic Chromium, Coated Steel(%)	1	12	19	3	3	5	0
Blackplate (%)	44	27	30	42	44	45	36
Total packing uses (thousand tonnes)	4,826	3,205	3,189	3,019	2,812	2,785	2,949
of which, Tinplate (%)	76	72	70	70	71	69	71
Electrolytic Chromium, Coated Steel(%)	18	24	26	26	26	28	26
Blackplate (%)	6	4	4	4	3	3	3

a/ Direct shipments from U.S. manufacturers to users in the U.S.A.
b/ Includes small quantities of other tin mill products.
Source: American Iron and Steel Insitute.

Table 54

U.S.A Tin mill product deliveries a/ to non- packaging markets

	1977	1983	1984	1985	1986	1987
				%		
Automotive uses (thousand tonnes)	135	99	99	80	86	88
of which, Tinplate (%)	61	59	59	54	51	53
Electrolytic Chromium, Coated Steel (%)	1	2	1	1	1	1
Blackplate (%)	7	6	7	4	4	2
Others (%)	31	33	33	41	44	44
Household appliances, and utensils (thousand tonnes)	37	29	24	16	14	10
of which, Tinplate (%)	43	62	67	69	64	70
Electrolytic Chromium, Coated Steel (%)	0	0	0	0	0	0
Blackplate (%)	49	31	25	19	22	20
Others (%)	8	7	8	12	14	10
Other domestic and commercial equipment (Thousand tonnes)	80	52	42	39	38	30
of which, Tinplate (%)	39	38	36	33	26	37
Electrolytic Chromium, Coated Steel (%)	0	2	7	10	13	10
Blackplate (%)	58	56	55	54	58	50
Others (%)	3	4	2	3	3	3
Electrical equipment(thousand tonnes)	28	24	23	14	16	11
of which, Tinplate (%)	39	46	52	28	19	18
Electrolytic Chromium, Coated Steel (%)	0	29	22	36	44	55
Blackplate (%)	61	25	26	36	25	18
Others (%)	0	0	0	0	12	9
Other non-packaging uses (thousand tonnes)	131	82	84	76	80	97
of which, Tinplate (%)	19	26	29	44	56	40
Electrolytic Chromium, Coated Steel (%)	2	0	1	0	4	4
Blackplate (%)	79	74	67	55	40	55
Others (%)	0	0	3	1	0	1
Total non-packaging uses (thousand tonnes)	411	286	272	225	234	236
of which, Tinplate (%)	40	44	46	46	47	45
Electrolytic Chromium, Coated Steel (%)	1	3	4	4	7	6
Blackplate (%)	47	39	36	33	28	31
Others (%)	12	14	14	17	18	18

a/ Direct shipments from U.S. manufacturers to users in the U.S.A
Source: American Iron and Steel Institute.

Table 55

Japan: Tinplate and ECCS deliveries to the home market

Fiscal year	1977	1982	1983	1984	1985	1986	1987
				%			
Open top cans							
(thousand tonnes)	595	608	662	763	751	752	858
of which, Tinplate (%)	72	61	56	46	45	41	39
Electrolytic Chromium, Coated Steel (%)	28	39	44	54	55	59	61
18 litre cans							
(thousand tonnes)	212	270	280	278	277	278	312
of which, Tinplate (%)	93	58	54	46	46	41	39
Electrolytic Chromium, Coated Steel (%)	7	42	46	54	54	59	61
General line cans							
(Thousand tonnes)	364	424	454	435	424	430	461
of which, Tinplate (%)	75	73	70	73	71	69	67
Electrolytic Chromium, Coated Steel(%)	25	27	30	27	29	31	33
Crown caps							
(thousand tonnes)	58	42	42	36	32	36	34
of which, Tinplate (%)	53	43	24	22	25	31	26
Electrolytic Chromium, Coated Steel(%)	47	57	76	78	75	69	74
Other uses							
(thousand tonnes)	82	80	77	73	77	86	93
of which, Tinplate (%)	32	24	25	19	26	38	37
Electrolytic Chromium, Coated Steel(%)	68	76	75	81	74	62	63
Total (thousand tonnes)	1,311	1,424	1,515	1,585	1,561	1,582	1,758
of which, Tinplate (%)	73	61	57	52	51	48	46
Electrolytic Chromium, Coated Steel(%)	27	39	43	48	49	52	54

Source: Japan Iron and Steel Institute.

Table 56
Tinplate recycling in Europe

	Tinplate for packaging (tons)	Tinplate recycled
Austria	35,000	19,000
Belgium	180,000	30,000
Denmark	105,000	18,000
France	480,000	162,00
F.R.G	650,000	338,000
Italy	530,000	107,000
Netherlands	100,000	77,000
Switzerland	55,000	22,000
U.K.	750,000	125,000
Total	2,885,000	898,000

Source: International Tin Research Institute.

235. Aluminium has also been competing with tinplate in the manufacture of food cans, however to a lesser extent than ECCS (T.F.S.) or plastics. It is in the beverage sector for beer and soft drinks that aluminium has continued to gain greater market shares in many parts of the world, especially in the United States, Japan, Australia, Italy and the Republic of Korea, where aluminium holds all or a large part of the market. In the majority of developing countries and in some European countries like the United Kingdom, France, the Federal Republic of Germany, the Netherlands, Spain and Belgium, tinplate has a major market share. Recycling developments and the new legislation associated with it 52/ have played a crucial role in the battle between aluminium and tinplate.

236. While the aluminium industry in the United States and elsewhere has effectively developed the recycling of purchased consumer aluminium cans, the steel industry has lagged behind. However, in recent years, steel companies have realized, although belatedly, the crucial importance of recycling and have started recycling activities of the tinplate can 53/.

237. Tinplate is indeed ideally suited to centralized collection for recycling because of its ferromagnetism, and today many schemes are in operation throughout the world to increase the rates of recovery from the domestic waste stream. However, there is still need to increase public awareness about the recyclability of tinplate 54/. Table 56 indicates approximate levels of tinplate recycling in some countries of western Europe. Secondary products are regarded as very high quality raw materials and are in constant demand by makers of special steel 55/.

238. Recent efforts by the steel industry in many parts of the world to develop tinplate can recycling and the opening or planned opening of new tinplate lines by the US steel industry and elsewhere are signs that the tinplate industry may be able to stop the erosion of its market share in the beverage sector, an area which has shown the strongest potential for consumption.

239. In 1988, higher aluminium prices coupled with comparatively low tin prices, brought some can makers to shift in favour of tinplate. At least three new tinplate beverage can lines are reportedly under construction in the United States, while other tinplate lines have been recently built, or are reportedly under construction, in other countries such as the United Kingdom, Singapore, Malaysia, and the Republic of Korea 56/.

240. New technological developments in tinplate can making, such as improvements in D&I (drawn and ironed), DRD (drawn and redrawned) and welded can technology, will further help to improve the competitiveness of tinplate cans. The International Tin Research Institute (ITRI) has initiated a programme in cooperation with steel companies in the United States and Europe to develop post-wash chemical treatments that will provide additional corrosion resistance to D&I cans 57/.

241. A competitive DRD process that will use coil-fed tinplate is also under development. These cans will be finished by electrocoating and should be available in 1989. The process also appears to offer substantial economic benefits over existing DRD processes. Work is also in progress to optimize the productivity of welded can-making. In a joint programme, tinplate suppliers, can-makers, and Soudronic Ltd. are evaluating the effects of basis weight, temper (box annealed versus continously annealed), tin coating weight, surface topography, steel composition, and welder variables on the quality of welded cans. The recent development by Weirton Steel of a new steel easy-open end will further help to enhance the competitive position of the tinplate beverage can. This end has particularly good opening characteristics.

242. In view of the above, the medium-term outlook for tinplate in world beverage can materials market is modestly encouraging. Outside the United States, as long as the steel companies are prepared to use every means at their disposal to fight the aluminium can, tinplate will, by and large, hold its share of beverage can materials markets which are themselves expected to continue to expand.

243. An area of potential growth is the aerosol market. Table 52 shows that world demand for aerosol cans increased significantly between 1977 and 1987. In the United States, United Kingdom and the Netherlands tinplate dominates the market for the containers. However, in other countries, such as Japan, Italy, France and Switzerland, aluminium aerosol containers pose strong competition to tinplate. But opportunities for growth do exist in a number of countries.

244. The market for closures such as crown closures for bottles and lids for glass jars accounted for about 5 per cent of world tinplate demand in 1987. In spite of increased competition from plastics and aluminium,

tinplate has regained some ground in the last few years.

245. Non-packaging uses account for only a small percentage of world tinplate demand, an estimated 4 per cent in 1987. The end-use industries in this sector include the manufacture of automotive components such as oil and air filters, gaskets, trim head-lamp reflectors etc. Other outlets include household appliances and utensils such as kitchenware, trays and other domestic and commercial uses, as well as electrical and electronic equipment. Plastics and aluminium are strong competitors to tinplate in this sub-sector.

246. In order to assess the prospect for world tinplate demand one should consider world economic growth, especially in the largest consuming areas namely the industrial countries, changes in tinplate capacity and developments in the price of cans.

247. The World Bank forecasts an average growth rate of 2.6 to 3 per cent per annum for the developed market economy countries between 1987 and 2000. For developing countries, an average rate of growth of 4.5 to 4.9 per cent per annum in the same period is forecast, although with some countries, such as those in South East Asia, growing more rapidly, while the highly indebted countries, especially in Latin America, would be growing more slowly (see table 49).

248. Table C2 in the statistical annex shows a survey prepared by Canning International in 1988 on world tinplate capacity. This survey shows that installed tinplate capacity for 1987 amounted to 20.6million tons, which is well in excess of world demand. However, much of this capacity remained idle, as only about 42per cent was used to produce tinplate (8.54million tons).

249. The upward trend in world tinplate capacity is likely to continue as additions to tinplate capacity are projected in a number of countries such as Brazil, Indonesia, Thailand and Taiwan. In China, an estimated 250,000tons of additional tinplate capacity is sheduled to be brought on stream by the end of 1990. Dual line capacity has also increased significantly in the EEC and in a number of developing countries such as Colombia, India, the Republic of Korea, Malaysia and Thailand. Therefore, world tinplate capacity is expected to increase substantially, in particular in developing countries of South East Asia and Latin America. However, while Brazil and Colombia produce their own steel, since they have established

national steel industries, Indonesia, Malaysia and Thailand import the steel base for their products from Japan. Considering the high exchange rate for the yen, the competitiveness of their locally produced tinplate may therefore not be as high as that of other packaging materials.

250. Regarding the price of tinplate, the expected increased world tinplate capacity is likely to continue to exceed world tinplate demand and consequently to have a dampening effect on tinplate prices. This would help to counteract the upward pressures experienced recently on tinplate prices due to increased cost of the steel base 58/. Tinplate is expected to retain its price advantage compared to aluminium..

251. Taking into account the economic background, tinplate capacity and price and technological developments outlined above, Western World demand for tinplate is expected to decline slightly at an estimated average of 0.4per cent per annum between 1987 and 1992. Demand in developed market economy countries is expected to decline slightly but this should be partly compensated by an increase in tinplate demand in developing countries. World tinplate production is expected to remain stable. It is also espected that the amount of tin used per ton of tinplate produced will continue to fall slowly in the medium term.

252. Table 57 shows forecasts for tinplate production and tin used to make tinplate in the world excluding China and the socialist countries of Eastern Europe.

Table 57

Forecasts for tinplate production and tin used to make tinplate

million tons

	1987	1992	projected growth rate
Apparent tinplate consumption a/	10.7	10.5	-0.4
Net exports to China, PR and Socialist countries of Eastern Europe	0.5	0.3	-
Tinplate production	11.4	11.4	-
Tin used (Kg) per ton of tinplate produced	4.8	4.6	-
Tin used (thousand tons)	55.0	52.0	-1.1

a/ Apparent consumption is defined as total tinplate production minus exports plus imports, excluding centrally planned economies of Eastern Europe and Asia.

Source: UNCTAD secretariat

Solders

253. The second largest application for tin is in solders for joining metals. Solders are basically alloys of tin and lead. Most tin solders contain from 30 to 70 per cent of tin. The range of applications is very wide. Table C3 in the statistical annex describes soft solder alloy compositions and areas of usage.

254. In 1987, solder superceded tinplate as the major outlet for tin consumption, particularly in the United States and Japan (see table51). However, the volumes produced are small in the majority of countries and are generally consumed in the country or region of origin.

255. The major outlets of tin soldering include the electronics industry, plumbing uses, the automobile industry and other engineering applications.

256. New technological developments in recent years have adversely affected the amount of tin used in soldering. The trend to reduce amounts of solder used in conventional joints or to replace conventional joints by surface mount joints in which the electrical contacts of the electronic devices are soldered directly to the surfaces of the PCB's copper tracks, have reduced levels of tin used in solder in the electronics industry. However, this has been somewhat compensated by higher levels of production of electronic products.

257. Another development, but one which is in favour of tin solder, is the increasing concern of a number of governments about lead levels in potable water for drinking. Legislation has been passed by a number of countries, including the Federal Republic of Germany and the United States, 59/ restricting the use of lead containing solders in drinking water systems. The concern over lead leaching has resulted in the use of lead free solders which are typically tin alloys with either antimony or silver. This trend is expected to continue, thereby increasing tin consumption. The overall outlook for solder therefore is that demand for primary tin to make solder is likely to increase only modestly in DMCEs, while solder is expected to be a major market in developing countries through the 1990s.

Bronze

258. Bronze continues to be an important use of tin expecially in the

United States, the United Kingdom and Italy (see table 51). However, between 1978 and 1986, bronze had a negative growth rate of around 4 per cent in developed market economy countries and demand has continued to decline in reponse to structural changes in bronze industries. For developing countries, data on the level of tin consumed in brass/bronze are rather scarce.

Tin chemicals

259. The manufacture of tin chemicals, both organic and inorganic compounds, are becoming a significantly growing outlet for tin. Organic compounds are chiefly used as P.V.C. stabilizers, biocides and catalysts, while inorganic tin compounds are used in the ceramic and glass industries, in plating applications and as catalysts

Table 58

Estimated world tin consumption of tin chemicals in 1986

tons

PVC Stabilizers	7,300 (O)
Biocides	3,550
(Antifouling)	1,400 (T)
(Agrochemicals)	1,700 (T)
(Wood preservative)	450 (O)
Glass industry	3,000 (O)
Ceramics industry	2,800
(Opacifiers)	1,300 (N)
(Pigments)	1,000 (O)
(Electrodes)	300 (N)
Plating Chemicals	2,150 (O)
Catalysts	
(Polyurethane)	900 (N)
(Silicone)	600 (N)
Total:	28,150

N: Stable future
T: Threat to future
O: Opportunities to increese
The data in brackets relate to the best estimates for tin use in specific sectors.
The values do not add up to those in the major categories as they were calculated using other means.

Source: Courtesy of the Association of Tin Producing Countries.

260. Table 58 gives an approximate estimate of world tin chemical consumption by sub-sector, which amounted to around 28,150 tons in 1986, an estimated 15 per cent of total consumption. The chemical market is expected to show reasonably strong growth through 2000, but sufficient data do not exist to analyse this market in detail.

Other uses

261. Other major outlets for primary tin include tinning (for example the tinning of copper wire and hot-dip tinning and electroplating in the electronics industry), and the production of alloys and pewter. Despite strong demand for tinned copper wire by the aircraft construction industry, demand for tin for the tinning of copper wire has generally been declining in reponse to factors such as the use of PVC coatings instead of tin. Demand for tin to make pewter ware is estimated to have remained stable. The lack of detailed information on end use trends in this sector do not, however,.allow a forecast of future growth.

C. Expected global supply and demand situation in the mid 1990s

262. Demand forecasts for primary tin metal which have been prepared by the World Bank are summarized in table 59 and are based on macro-economic assumptions contained in table 49.

263. World primary tin consumption is projected to decline at an annual average rate of 1.7 per cent during the 1987-1995 period and this rate will increase to 2 per cent to the year 2000. Given the low level of projected real tin prices when compared to prices typical prior to 1985, the decline in world tin consumption is seen as a reflection of on the one hand the low long-term price elasticities of demand and on the other, the negative impact of technological developments which are expected to continue.

264. However, when considering World Bank projections it should be taken into account that they constitute a prudent assessment based on past performances and severely negative trends in world tin consumption, especially in the industrial countries. In addition, these projections are based on an estimated 1987 world tin consumption which is much lower than actual reported consumption (see table A4), and do not take into account the increased tin demand in 1988 and early 1989 in the industrial countries.

Table 59

World demand projections for primary tin metal in the period 1987 to 2000 (thousand metric tons and growth rates in per cent per year)a/

	Actual	Projected			Growth rates	
	1987c/	1990	1995	2000	1987-1995	1987-2000
Industrial countries	119	117	104	91	-1.7	-2.0
North America	38	34	30	25	-2.9	-3.2
United States	35	31	26	22	-3.6	-3.5
EEC 10	44	43	40	36	-1.2	-1.5
Japan	32	32	30	27	-0.8	-1.3
Non-Market countries	40	38	37	37	-0.9	-0.6
Developing countriesb/	49	53	55	57	1.4	1.2
Asia	29	33	36	39	2.7	2.3
America	14	15	15	15	0.9	0.5
China	13	19	21	22	6.2	4.1
World	208	208	196	185	-0.7	-0.9

a/ the World Bank classification of countries into regional groups does not in all cases coincide with the one used by UNCTAD
b/ including Greece, Israel, Portugal and Yugoslavia
c/ estimate

Source: World Bank, Price Prospects for Major Primary Commodities, Report No. 814/88

265. Since 1985, continued growth in the OECD countries, the lower tin price, technological improvements and promotion by certain tin-using industries have contributed to the rise in tin consumption. With tin prices remaining around the expected equilibrium levels and continued research and development in the uses of tin, it is reasonable to expect that over the medium term, consumption will be maintained at least at the current level. On balance, the propects for tin should remain reasonably good, at least in the short term, and current indicators point to a much more encouraging outlook than several years ago. However, a marked difference exists between the expected performance of the industrial and the developing countries.

266. While tin consumption in the industrial countries is projected to decline by 1.7 per cent annually during 1987-1995 and 2 per cent to the year 2000, tin consumption in developing countries is expected to increase at an annual rate of 1.4 per cent from 1987 to 1995. The World Bank projections

are based on assumptions similar to the assessments made in the previous section of this chapter regarding the various end-use sectors. However, the outlook for solder seems at present more encouraging, as the sector has weathered the worst effects of technological change and usage has been aided by strong construction and automobile industries. Demand for primary tin to make solder is likely to increase slightly in developed market economy countries and should become a major factor in developing countries through the 1990s. Also, the chemical market is expected to show reasonably strong potential growth through the year 2000, especially in fire and smoke retardant applications.

267. Table 60 shows installed capacity for primary tin metal and tinplate in 1987 and actual output in non-socialist countries (see also tables A2, A14, C1 and C2, in the statistical annex). The reason for excluding socialist countries is that reliable data on production capacities in centrally planned economies are not easily available. The first observation that could be made is that for both tin metal and tinplate there is a high level of excess capacity around the world. For primary tin metal, less than 50per cent of world installed smelting capacity is actually used, one reason being the sharp decline in world tin-in-concentrate output in recent years and the ensuing shortage of feed. Following the collapse of the tin market in 1985, worldwide mine output declined between 1985 and 1987 as many high cost mines closed.

Table 60

Production capacity for primary tin metal and tinplate in 1987

metric tons and percentage shares

Primary tin Metal	Installed Capacity	%	Actual Output	Excess Capacity	Capacity Utilization %
Developed market economy countries	85,900	21.7	25,400	60,500	29.6
Western Europe	45,100	11.4	17,600	27,500	39.0
United States	30,000	7.6	3,900	26,100	13.0
Japan	3,300	0.8	900	2,400	27.3
Developing Countries	310,220	78.3	124,600	185,620	40.2
Africa	15,500	3.9	1,600	13,900	10.3
America	90,800	22.9	35,200	55,600	38.8
Asia	203,920	51.5	87,800	116,120	43.1
Total	396,120	100.0	196,100	200,020	49.5
Tinplate					
Developed market economy countries	16,942,000	84.5	9,229,600	7,712,400	54.5
Western Europe	7,040,500	35.1	4,217,200	2,823,300	59.9
United States	5,862,435	29.2	2,276,700	3,525,735	38.8
Japan	2,418,000	12.0	1,722,800	695,200	71.2
Developing countries	3,108,111	15.5	2,121,200	986,911	68.2
Africa	90,000	0.4	36,000	54,000	40.0
America	1,563,111	7.8	1,052,200	510,911	67.3
Asia	1,545,000	7.7	951,500	593,500	61.6
Total	20,050,111	100.0	11,584,800	8,465,311	57.8

Source: UNCTAD secretariat.

268. Another observation is that excess capacity is greater in developed than in developing countries. As developing tin producing countries integrated forward (their total installed capacity in 1987 represented a share of 78.3 per cent of total existing smelting capacity in the world excluding non-market countries) greater shares of locally produced tin ore were smelted domestically. The geographical shift in tin smelting is likely to be enhanced in the future in favour of developing tin producing countries. Smelting is a very competitive industry and only highly cost-effective smelters will be able to survive in the long-run. Some smelters have already closed down in Australia (Sydney Smelter), the United States and elsewhere.

269. Over 50 per cent of world primary tin metal capacity is in South East Asia and smelted output in 1987 represented about 45 per cent of world production. Although output of both tin-in-concentrates and tin metal have decreased significantly in recent years, South East Asian countries, especially Malaysia, continue to dominate the scene in world tin smelting and this is likely to continue at least in the short run.

270. In view of the above, world tin smelting capacity is unlikely to increase in the future, although there are plans to establish a smelter in Peru to treat the ore produced in the country. However, considering the serious economic problems Peru is presently experiencing, there is little likelihood that the project will be undertaken in the near future. Bolivia, in its new restructuring policy for the tin mining sector, has planned to restrict the tin smelting capacity of the Vinto Smelter to 8,000 tons per year a reduction of almost 64 per cent.

271. In Brazil, although there is a lack of smelting capacity as a result of substantial increases in national tin mine output, no increase in capacity is projected for the near future.

272. Considering the increased world tin output in 1988 and early 1989, it is expected that there will be less excess tin smelting capacity in the world and the level of smelting activity will be higher than that of 1985-87 period.

273. For tinplate, developed market economy countries have a much greater share of world installed capacity, around 84.5 per cent in 1987, while developing countries' tinplate capacity is still relatively small, although

expanding.

274. While there is also excess world capacity for tinplate, levels of operation are somewhat higher; world output corresponded to almost 58 per cent of installed capacity in 1987. As was the situation for tin metal, developing countries have a higher utilization rate (approximately 68 per cent of output) than industrial countries. Indicators point to an erosion of the dominant position of developed countries in both production and consumption of tinplate.

275. Although tinplate capacity in Latin America and Asia is more or less the same, output in the former has been larger due to increased production in most tinplate producing countries in that region, particularly Argentina, Brazil, Chile, Colombia and Peru.

276. Tinplate capacity is expected to increase significantly, especially in developing countries as there are several projects to install additional lines of production. In Brazil a sixth line is expected to come on stream in the near future, thus bringing capacity to over 1 million tons, an increase of about 19 per cent. Argentina also has a project to increase capacity by 30 per cent through the introduction of new equipment. In Peru, a second line is projected for 1995 while in Malaysia, Perstina, the only tinplate producer in the country is considering investing 40 million US dollars in a second line (see also section B on tinplate in this chapter).

277. After an increase to the year 1990, world tin supply is expected to decline to reach its 1987 level. The downward trend in both supply and demand in developed market economy countries will continue and this should be somewhat compensated by an initial increase in both production and consumption in developing countries. However, after 1990, both supply and demand in the latter will also decline. Nevertheless, world tin supply and demand should remain in equilibrium. All tin producing countries including China are expected to decrease their output, the only exception being Brazil whose output is expected to continue to expand substantially.

Table 61

Tin supply/demand balance (000 metric tons)

Production Tin-in-concentrates	Actual 1987	Forecast 1990	Forecast 1995	Forecast 2000	Growth rates 1987-2000
World	184.9	203	196	185	0.0
Developed market economy countries	16.9	13	12	10	-3.9
Oceania	7.7	9	8	6	-1.9
Non-Market	18.5	18	19	19	0.2
Developing countries a/	147.7	172	165	156	0.4
Asia	100.7	114	104	95	-0.4
Malaysia	30.4	34	31	28	-0.6
China	28.0	32	29	27	-0.3
Indonesia	26.2	30	27	25	-0.4
Thailand	14.8	17	15	14	-0.4
Africa	4.5	4	4	2	-6.0
America	42.5	54	57	59	2.6
Bolivia	8.1	10	9	8	0.0
Brazil	28.5	39	44	48	4.0
+ Reduction in Mine Stocks	+6.3	0	0	0	-
= Metal production	191.2	203	196	185	-0.3
GSA Sales b/	4.1	5	5	5	0.0
= Metal available (A)	195.3	208	201	190	-0.2
Metal consumption (B)	220.1	208	196	185	-1.3
Metal Stocks, beginning of period	69.9	25	25	25	-
Change in stocks (A-B)	17.7	-	-	-	-
Metal Stocks, end of period	52.2	25	25	25	-
Mine Stocks, beginning of period	16.6	12	12	12	-
Change in stocks	6.2	-	-	-	-
Mine Stock, end of period	10.4	12	12	12	-

a/ Developing countries include China, P.R. The World Bank classification of countries into regional groups does not, in all cases, coincide with the one used by UNCTAD.
b/ G.S.A: General Services Administration.

Source: Production Tin-in-Concentrates: UNCTAD, Mine and Metal Stocks: International Tin Statistics, Bulletin No. 1, May 1989. Projections: World Bank, Price Prospects for Major Primary Commodities, Report No. 814/88.

D. Demand and supply in Latin America

278. In view of developments in demand and supply outlined in the previous section, the Latin American/Caribbean region is expected to enhance its position as the leading supplier to the world tin market.

279. Brazil, presently the world leading tin producer, will continue to play an important role for world tin supply. Tin supply from Bolivia is expected to remain stable at current levels of around 8,000 tons. In recent years, Latin American tin semi-manufactures have been penetrating other markets in an environment of keen international competition and slow growth in global trade and there has been a large increase in shipments to the United States. However, a significant increase in industrial exports to European and Pacific markets remains a challenge for the future. On the demand side, prospects do not seem very promising, at least in the short term considering the expected low economic growth forecast for the continent. Due to domestic economic disequilibria, high rates of inflation and a heavy debt burden, sustainable growth in the region is not expected in the foreseeable future. Demand for tin is estimated to increase modestly at an average annual rate of 0.5 per cent between 1987 and 2000. Given the significant excess capacity at present in the region, tin consumption may well remain below installed capacity in spite of the planned substantial reduction in Bolivian smelting capacity of around 21,000 tons per year. This may be even more so if new capacity is constructed in Peru as projected. The exportable surplus will be in the range of 44,000 tons which is about 63 per cent of production capacity, taking into account the reduction in capacity in Bolivia.

280. The Latin American/Caribbean tin industry will continue to be export oriented and rely on outside markets for its continued survival and harmonious development. Therefore, the industry has to remain internationally competitive and be attentive to developments in the world market. Furthermore, greater attention will have to be devoted to research and development in new uses of tin to promote the future development of the world tin market.

IV: Opportunities for and constraints on increased Latin-American and Caribbean production.

A Exports to areas outside the region

281. The structural changes already underway in the 1970s, which continued in the 1980s, and the consolidation of the world tin industry following the October 1985 tin crash, which led to the closure of a number of the higher cost tin mines around the world, as well as the emergence of significant new tin producers such as Brazil and China, have resulted in important changes in the pattern of supply and trade for both tin-in-concentrates and primary tin metal. Also, the marked increase in smelting capacity in developing tin producing countries undertaken in the 1960s and 1970s in order to achieve greater vertical integration and reap the benefits of higher value added have also influenced the shift in geographical location of supply and trade.

282. The decline in output of both tin-in-concentrates and tin metal in the industrial countries is expected to continue in the future. This should be compensated by higher output in Asia and Latin America. However, although Latin America is expected to increase its production substantially, particularly of tin metal, South East Asian producers will continue to provide the largest share of both tin-in-concentrates (38 percent) and primary tin metal to the world market (around 66%). World demand for tin will continue its downward trend, although at a slower rate than in the 1970-86 period.

283. The world tin industry will continue to be highly competitive and the greatest opportunities for exports will still exist in the industrial countries, the largest consuming markets for primary tin metal, especially North America, the EEC and Japan which are expected to account for 64 per cent of total world tin metal imports in 1995. Opportunities also exist in developing countries, especially in Asia. The socialist countries of Eastern Europe are expected to decrease the level of their tin metal imports slightly . However, they should remain net importers.

284. The availability of tin metal for exports from China is expected to increase slightly in the short term and subsequently decline after 1995. However, it is difficult to predict how internal demand in the domestic market, for food packaging particularly, is going to develop, and to what extent this would release excess supplies for exports.

285. As regards barriers to trade, the exports of developing countries, including the Latin American/Caribbean region, are accorded duty free treatment on tin ore and concentrates by the industrial countries, the largest consumers of Latin American tin. However, most industrial countries apply tariff protection to further stages of tin processing, which in certain countries starts already beyond the mining stage, as in Austria and Canada, while in other countries such protection starts at the tin semi-manufacturing stage (the EEC, Hungary, Japan, Switzerland) or at the manufacturing stage (Finland, Norway, Sweden). In most developed countries the tariff protection increases with the degree of processing.

286. Table 62 provides details on the tariff rates which are applicable on imports of tin products in major developed consuming countries. The tariff structure affecting imports of tin products into the major markets has undergone significant changes during the past decade through the establishment of liberalization measures in favour of developing countries. Such measures are provided by the schemes of generalized preferences (GSP) of both the developed market economy countries and the socialist countries of Eastern Europe. The GSP schemes of the EEC, Finland, Japan, Norway, Sweden, and Switzerland provide for full exemption from tariffs on imports from developing countries although most of the materials are dutiable at the MFN rates if they originate from other sources. However, there are a number of measures, including quantitative restrictions such as GSP ceilings or "export quota restraints", which impose limitations on the entry of tin products from developing countries into some major consuming countries. Other non-tariff barriers consist principally of legal and administrative measures such as licensing and the requirement of specified domestic contents in finished goods, which restrict imports.

Table 62

General and preferential tariffs for tin products in major consuming developed market-economy countries

(all information at the tariff line)

Description	Tariff rate (%)		
	MFN		
	Pre-Tokyo	Post-Tokyo	Preferential (GSP)
Austria			
Unwrought tin	0.0	0.0	..
Tin solder	3.0	X	1.5
Wrought bars, rods, angles, etc., of tin and tin wire	7.0	5.0	2.8
Wrought plates, sheet and strip	7.0	5.0	2.8
Tin foil, tin powders and flakes	15.0	8.0	5.3
Tubes and pipes and blanks	8.0	5.0	3.0
Canada			
Tin, including alloys (in blocks, pigs, bars or granular form)	0.0	0.0	..
Babbit metal (and type metal in block, bar plate and sheet)	10.0	6.8	0.0
Tin Oxides	0.0	0.0	..
Collapsible tubes of tin	15.0	12.5	0.0
Phosphor tin in blocks, bars, plates,	17.5	10.2	0.0
sheets, strips,rods and wire	7.5	5.5	4.0
Tin in blocks, pigs, bars or granular form	0.0	0.0	..
Tin foil	0.0	0.0	..
Tinplate scrap	17.5	0.0	..
EEC			
Unwrought tin	0.0	0.0	..
Bars, rods, angles, shapes and sections of tin wire	4.0	3.2	0.0
Plates, sheet and strip	3.0	2.5	0.0
Tin foil, (with backing of a weight not exceeding 1Kg/m2)	6.0	4.4	0.0
Tin foil (without backing of a weight not exceeding 1Kg/m2)	5.0	3.8	0.0
Tin powders and flakes	3.5	2.9	0.0

Table 62 (continued)

Description	Tariff rate (%)		
	MFN		
	Pre-Tokyo	Post-Tokyo	Preferential (GSP)
EEC (continued)			
Tubes and pipes and blanks therefor and hollow bars	5.0	3.8	0.0
Pipe fittings	7.0	4.9	0.0
Finland			
Unwrought tin (unalloyed)	0.0	0.0	..
Unwrought tin (alloyed)	0.0	0.0	..
Wrought bars, rods, angles, shapes and sections, and tin wire	1.0b/	0.0	0.0
Wrought plates, sheets and strip	1.0b/	0.0	0.0
Tin foil weighing (excluding any backing) not over 1kg/m2	2.5	0.0	0.0
Tin powders and flakes	0.0	0.0	..
Tubes and pipes and blanks therefor, hollow bars, and tube and pipe fittings	1.0	0.0	0.0
Japan			
Unwrought tin (unalloyed)	0.0	0.0	..
Unwrought tin (alloyed)	5.0	3.2	0.0
Bars, rods, sections, and wire of tin and its alloys	5.0	3.7	0.0
Wrought plates, sheets and strip of tin	5.0	3.7	0.0
Foils, powders, and flakes and its alloys	7.5	4.9	0.0
Tubes, pipes, hollow bars, and tube and pipe fittings and its alloys	7.5	4.9	0.0
New Zealand			
Unwrought tin	0.0	0.0	..
Tin solder	15.0	X	10.0
Wrought bars, rods, angles, shapes and sections, and wire of tin solder	15.0	X	0.0
Wrought angles, shapes and sections of tin other than solder	30.0b/	5.0	0.0
Wrought angles, shapes and wire of tin other than solders	10.0b/	5.0	0.0

Table 62 (continued)

Description	Tariff rate (%)		
	MFN		
	Pre-Tokyo	Post-Tokyo	Preferential (GSP)
New Zealand (continued)			
Wrought plates, sheet and strip of tin (worked)	27.5b/	5.0	0.0
Wrought plates, sheets and strip of tin (other than worked)	5.0	X	0.0
Tin foil	30.0 (maximum)	5.0	..
Tin powders and flakes	0.0	5.0	..
Tubes and pipes, blanks therefor, hollow bars and tube and pipe fittings	5.0	5.0	0.0
Norway			
Unwrought tin (unalloyed)	0.0	0.0	..
Unwrought tin (alloyed)	0.0	0.0	..
Unwrought bars, rods, angles shapes and sections	0.0	0.0	..
Wrought plates, sheets and strip	0.0	0.0	..
Tin foil	5.0	3.8	0.0
Tin powders and flakes	0.0	0.0	..
Sweden			
Unwrought tin (unalloyed)	0.0	0.0	..
Anti-friction metal	0.0	0.0	..
Tin solder	0.0	0.0	..
Other alloys	0.0	0.0	..
Wrought bars, rods, angles shapes and sections	0.0	0.0	..
Wrought plates, sheets and strip	0.0	0.0	..
Tin foil	1.5	1.4	0.0
Tubes and pipes and blanks therefor, hollows bars, and tube and pipe fittings	0.0	0.0	..
Switzerland			
Unwrought tin	0.1	X	0.0
Wrought bars, rods, angles, shapes and sections	0.4	X	0.0
Tin solder (in rolled bands)	0.1	X	0.0
Other tin solder	0.1	X	0.0
Wrought plates, sheet and strip	0.4	0.4	0.0
Tin foil	1.9	1.7	0.0

Table 62 (continued)

Description	Tariff rate (%)		
	MFN		
	Pre-Tokyo	Post-Tokyo	Preferential (GSP)
Switzerland (continued)			
Powders and flakes	0.1	X	0.0
Collapsible tubes of tin	0.4	X	0.0
Other manufactures of tin, unworked	1.5	1.4	0.0
Other manufactures of tin, machined	0.7	0.7	0.0
United States			
Unwrought tin	0.0	0.0	..
Unwrought alloys	0.0	0.0	..
Tin wire (not coated or plated)	6.0	2.4	0.0
Tin wire (coated or plated)	6.0	4.2	0.0
Wrought bars, rods, angles, shapes and sections	6.0	4.2	0.0
Wrought plates, sheets and strips (not clad)	6.0	2.4	0.0
Wrought tin plates, sheets and strips (clad)	12.0	4.8	0.0
Tin powder and flakes	6.0	4.2	0.0
Tin foil	17.5	7.0	0.0
Tin pipes, tubes and blanks therefor, pipe and tube fittings	6.0	2.4	0.0

a/ Rate applicable for part of the tariff line.
b/ Ceiling rate, fully bound.
statistics, the schemes of generalized preferences and other trade data.
Source: UNCTAD secretariat, derived from national foreign trade
Note: Two dots (..) denote that no preference is granted under the GSP. A cross (X) denotes that no concession was made in the mulitlateral trade negotiations.

287. Table 63 shows non-tariff measures affecting trade in tin and tin products and the country imposing the measure. Table 64 shows tariff rates in some latin American and Caribbean countries.

Table 63
Non-tariff measures affecting trade in tin and articles thereof

in selected Latin American and Caribbean Countries

Non-tariff measures	Product	Country(ies) maintaining the measure
I. On exports		
Embargoes	Tin, unwrought and waste(CCCN ex 80.01)	Brazil,Colombia
Exports restraints	Metallic ores and concentrates(CCCN ex 26.01)	Brazil
	Ash and residues containing metals or metallic compounds (CCCN ex 26.03)	Brazil
Export taxes	Wrought bars, rods etc, of tin(CCCN ex 80.02)	Argentina
	Metallic ores and concentrates(CCCN ex 26.01)	Guyana, Haiti,
Licensing (unspecified)	Domestic articles and parts (CCCN 80.06.100)	Jamaica
Non-automatic licensing	Metallic ores and concentrates(CCCN ex 26.01)	Argentina, Colombia, Peru
	Ash and residues containing metals or metallic compounds	Colombia, Argentina
	Tin oxides and hydroxides(CCCN28.28.00.14.00)	Argentina
	Tin, unwrought and waste(CCCN 80.01.02.00)	Colombia
	Wrought bars, rods etc. of tin(CCCN 80.02)	Colombia
	Other articles of tin(CCCN 80.06.00.01.00)	Argentina
	Other articles of tin(CCCN 80.06.89.02;89.99)	Colombia
Restriction (unspecified)	Chlorides and oxychlorides (CCCN ex 28.30)	
	Metallic ores and concentrates (CCCN 26.01)	
	Tin, unwrought and waste (CCCN ex 80.01)	
Quantitative restrictions made effective through State trading operations	Sulphides, Polysulphides (CCCN 28.35)	
Domestic price measure	Metallic ores and concentrates(CCCN ex 26.01)	Brazil

Source: GATT, Non Ferrous Metals and Minerals, MIN. GNG/NG3/W/18, 14 December 1988

Table 64
Tariff rates on tin ore and concentrates, unwrought tin and wrought tin, tin chemicals and finished manufactures in selected Latin American and Caribbean Countries

CCCN Heading	Argentina		Brazil		Chile a/		Colombia		Jamaica	
	MFN	P	MFN	P	MFN	P	MFN	P	MFN	P
Ores and concentrates										
ex 26.01	26%		5%		20%-15%		7%	Free(BO)	Free	
ex 26.03	30%		5%		15%	Free (BO)	13%	Free(BO)	Free	
Unwrought										
80.01	35%,38%	50%(BR,BO)	15%-30%	1,000t	15%	40%(BR) f/	13%,20%	Free(BO)	10%B,A-free	
80.04 b/	10%-38%	71%(CH,PA,UR)	30%	(BO) c/	20%-15%	50%(BO) f/	26%	free(BO)	10%	
Wrought										
80.02	38%	84%(BR),25%(BO),	30%	free (BO)	15%	50%(BO)	33%	free(BO)	10%	
80.03		74%(CH,PA,UR),								
		74%MEX) f/								
	38%		30%		15%		26%	free(BO)	15% B,	
80.04	10%,38%		30%		15%		26%	free(BO)	A:10%	
80.05	38%		35%		15%		59%	free(BO)	10%	
Chemicals										
ex 28.28	35%		20%,40%		15%		26%		5%	
ex 28.30	10%,35%		20%,40%		15%		26%		5%	
ex 28.35	25%		20%		15%		26%		5%	
ex 28.47	10,35%		20,40%		15%		26%		5%	
ex 28.48	10%,14%		20%		15%		20%-33%		5%	
Finished manufactures										
80.06	5%,38%	free(B)	50%	free (BO)	15%		53%,73%	free (BO)	25%	

CCCN Heading	Argentina		Brazil		Chile a/		Colombia		Jamaica
Ores and cocentrates									
ex 26.01	free,8		11%		free		20%		
		ex 26.03	free		11%	5%			
Unwrought									
80.01	10%	100%(BO)	20% B,34%		free,15%	10%-10%	20%	25%(BR)	20%
80.04 b/	10%		51-34%	free(BO)	20%	free(AR,BR)	40%-5%		20%
Wrought									
80.02	10%	90%(BO)	46%	free(BO)d/	5%,15	free(BO)	30%	free(BO)	20%
80.03	10%	60%(BR),100%(AR),	46%		5%				
		30%(CH),40%(PA),g/							
80.04	10%		51%		5%		40%-5%		20%
80.05	5%		74%		5%,15%		50%		20%
Chemicals									
ex 28.28	5%		41%		free				
ex 28.30	10%		34%		free,5%				
ex 28.35	10%		41%-51%		free				
ex 28.47	10%		25%-34%		free				
ex 28.48	10%		41%,51%		free				
Finished manufactures									
80.06		5%	100%(BO)	84%	free(BO)	5%-15%			free(BO)

a/ This rate is the applied rate as from 1.1.1988. All tariff rates on tin are bound at the ceiling rate of 35% (Schedule VII).
b/ Powders and flakes
c/ Brazil grants a ceiling of 1000 tons
d/ A ceiling of US$75000 per year is granted to Bolivia, free of tariff duty.
e/ Preference rate granted to CCCN heading 80.02
f/ Preference rate granted to CCCN heading 80.01
g/ Preference rate granted to CCCN heading 80.03
P. Preferential rate granted in per cent of Advalorem Tariff rate legal regime to AR- Argentina, BR- Brazil, BO-Bolivia, CH, Chile, PA(Paraguay), UR- Urguay, ME- Mexico
Sources UNCTAD secretariat, GATT "Non Ferrous Metals and Minerals MIN.GNG/NG3/W118/Add.1 and Add.2 April 1989

287. In the case of exports to other developing countries, Latin American tin exports encounter higher levels of tariffs, and nominal rates of duty on tin increase with a higher degree of processing. However, a number of trade agreements exist which tend to reduce the level of tariffs imposed especially within the Latin-America and Caribbean region itself.

288. As regards transportation, since tin is mostly refined or concentrated before shipment from Latin American exporting countries, the need for transportation is greatly reduced. Most of the volume is consigned by ship freight in relatively small consignments.The proximity of the North American market, the largest consuming area for Latin-American tin, is another advantage. However, in the case of Bolivia, a land locked country, transportation costs are higher as the metal has to be shipped by truck before reaching the point of shipment. The location of the Oruro refinery at 3,500 metres above sea level, means high land transport costs for carrying its products to their point of shipment.

289. The main tin exporting countries in Latin America do not appear to encounter any serious problems specifically linked to the transportation of their tin exports out of the region. Such problems as may exist are of a general nature which tin shares with other commodity exports. They include inadequate terminal facilities, high shipping and handling charges and low national ownership of shipping tonnages. The development of transport facilities in Latin America and Caribbean would benefit all exports including tin.

290. Greater attention needs to be devoted to marketing. Latin America is far away from the fully vertically integrated tin industries of South East Asia, especially Indonesia, where all activities from exploration, mining and smelting to final marketing are under one management. In Latin America, marketing is often left in the hands of agents and international trading companies. Factors favouring the use of agents are as follows: small turnover which does not justify setting up own sales offices, the difficulty in overcoming personal contacts established beteween a trader and customers, difficulties in securing payments, and stocking and other distribution expenses. In the case of Peru, because of the limited size of its output, it is difficult to set up marketing facilities beyond the national frontiers to handle its sales directly. However, since 1986, local agents in London and New York have been representing Peruvian tin interests and have been responsible for the marketing of the metal smelted in those countries.

Bolivia, which for a long time adopted long term contracts for the sale of its tin, mostly through trading agencies, has finally adopted a new method of marketing. Tin metal sales are increasingly done through bids made by interested buyers which has led to an improvement in the average price.

291. In the case of Brazil, although a trading company has been set up by Paranapanema, international trading companies continue to play a major role as intermediaries in the marketing of Brazilian tin either on a buy and sell basis or as marketing agents. However, in recent years, since tin trading was suspended on the London Metal Exchange (L.M.E), direct sales from producers to consumers have developed. A certain percentage of Brazilian tin is sold directly to final consumers.

292. The lack of a tin exchange market in Latin America which could provide a pricing medium and hedging facilities is a drawback. In South East Asia the Kuala Lumpur Tin market (KLTM) and the recently established Kuala Lumpur commodity Exchange (KLCE) tin futures market in Malaysia allow trading and price setting for the region's producers, although volumes traded are still relatively small. In Brazil the opening of a tin futures market in Sao Paulo has been discussed, but it is still at the project stage. The recent reintroduction of tin trading on the L.M.E last June might provide an opportunity for Latin American tin producers to participate in hedging activities to protect themselves against future price movements; however, the great distances separating most producers from the market, the difficulty of raising the required funds through borrowing without adequate bank guarantees, and the lack of expertise in terminal market operations and familiarity with exchange mechanisms might be obstacles to their participation.

293. There is also a great need to develop facilities for the marketing of Latin American exports of tin end-use products. The market structure in the tin end-use market is dominated by big international companies on both the supply and demand side,especially in can making and packaging. Considering the expected potential growth in exports of tin and tin products from Latin America, marketing is an essential tool for the penetration of new markets, especially in other developing countries where the highest growth of consumption is likely to develop. Some of the advantages of marketing include the control of all marketing facets not only in developing marketing techniques but also in staffing your own marketing organisation and receiving the maximum proceeds by eliminating intermediaries. It goes without saying

that marketing expenses would have to be compared with the intermediary's profit. Another important aspect is that the seller receives useful reports and marketing information which are necessary for the framing of policies and long term planning. Furthermore, marketing outlets constitute a credible information network which can keep the home office abreast of competitors'actions and the development of possible alternative materials, information which is of vital importance in meeting the competition.

294. Therefore, marketing is an important area where Latin American tin and tin products producers need to develop new strategies and policies commensurate with their increasing importance as exporters to the rest of the world. One option is to develop marketing facilities through the establishment of joint-ventures with foreign companies.

B. Production for regional consumption

295. As seen in chapter I, tin output in Latin America and the Caribbean exceeds by far regional demand for tin metal in spite of the significant increase in consumption in recent years. However, tinplate apparent consumption has actually declined and per capita tin consumption is still relatively low compared to other countries, particulary developed countries. Therefore, there is potential for growth as the rates of population growth are high, and there will be a greater need for canned food.

296. However, prospects for growth in consumption in the area will be determined by the future performance of the economies of Latin American/Caribbean countries. The large deficits of certain major public agencies and enterprises, in particular steel and tinplate industries, the readjustment of prices, tariff shedules, interest rates, foreign exchange policies, and the reduction of inflation are all important in this connexion. Obviously, the main problem in most of Latin America is the huge external debt which has in recent years forced a severe contraction of imports and an increase in exports 60/. Another determinant factor is the future level of competitiveness of tin in relation to other materials like glass, paper and aluminium on the Latin American markets. Competition and substitution is already underway in certain markets like Venezuela and the reaction by the tin using industries remains to be seen.

297. However, there exist other barriers which stand in the way of increased consumption in the region. These have been outlined in Chapter I section C.3 on inter-regional trade. They include transportation

difficulties, low purchasing power and limited size of domestic markets, as well as the relatively high tariffs levied particularly on processed tin products in many countries in the region.

298. Table 64 shows tariff rates on tin ore and concentrates, unwrought tin and wrought tin, tin chemicals and finished manufactures in a number of Latin American/Caribbean countries. The level of tariffs imposed is somewhat alleviated by existing trading agreements betwen some Latin American/Caribbean countries which provide concessions and reductions. For example, tin in metallic form, under heading 80.01, is completely free of customs duties in Peru and Venezuela as a result of the special treatment of Bolivia within the Cartagena Agreement. Argentina, Brazil and Chile, by virtue of their programmes of aid to Bolivia, allow free entry of tin metal of Bolivian origin. Within the framework of Aladi, the Asociaci n Latinoamericana de Integraci n, Chile has granted Bolivia a tariff concession of 50 per cent on imports of tin ingots and tin bars with a purity of more than 99 per cent.

299. A number of non-tariff measures are applied by Latin American/Caribbean countries on imports. Some of them are shown in table 63. These measures have the effect of inflating the cost of imports. The great deal of paper work and administrative delays result in further complicating foreign trade. As regards exports, a number of taxes are also imposed, export licences are generally required and differential foreign exchange parities for the dollar are usually the rule. This has the effect of an indirect tax on exports, which often inhibits and discourages trade. While large companies with an established marketing infrastructure may well be equipped to deal with these problems, small Latin American/Caribbean entreprises may find it difficult to cope with them.

V. Conclusions and recommendations

A. Opportunities and obstacles

300. The Latin American region has become a major supplier of tin to the rest of the world and its tin industry is highly competitive, particularly in Brazil, which has the lowest costs of production in the world. In Bolivia, although it is still too early to evaluate the real impact of the newly adopted restructuring measures aiming at reducing costs and improving the level of its competitiveness, signs are pointing to an improvement of the Bolivian tin industry as output has been gradually increased in 1988 and during the first part of 1989.

301. The forecast for the Bolivian mining industry in the short and medium term now seems much brighter than a few years ago. However, the rehabilitation of the Bolivian tin industry depends to a large extent on the level of investments allocated to it. As already mentioned, the government has presented a ten-year mining development plan which includes the reduction of the State's role in the industry and an opening to private investment, including joint ventures. Nevertheless, several actions such as a new mining taxation system must be accomplished.

302. In the case of Peru, output has been expanding and this trend is likely to continue in the future, as rationalization measures to reduce costs and improve production efficiency are being adopted.

303. Tin imports from outside of the Latin American region are negligible and there is little to propose in increasing the complementarities of the region in the trade of tin at the primary stage. However, the higher the stage of processing, the larger is the share of imports into the continent. It is in the semi-manufacturing and manufacturing stages where opportunities exist which could be further developed in the region.

304. As seen in earlier chapters, world tin consumption is expected to show a modest increase and this increase is likely to arise mainly in developing countries as they expand their canning facilities to meet the increasing demand for canned foods and beverages. Solder offers good prospects of growth in the electronics sector despite increasing miniaturization and the growing use of compact integrated circuits and micro-processors. There are

also promising prospects in the chemical sector for both inorganic and organic chemicals such as PVC stabilizers and biocides, especially for agricultural pesticides and anti-fouling paints.

305. Brazil has been a case in point as it has expanded markedly its exports of tin semi-manufactures, especially tinplate, both to the region and elsewhere as well as Venezuela. Mexico, has done the same, particularly in the area of inorganic chemicals. However, the level of tin consumption in Latin America is still relatively small, considering the level of economic development of the continent. There is great potential of growth in consumption although, at least in the short term, the debt and the restrictive monetary and fiscal policies designed to control inflation may hinder a recovery.

306. The relatively high level and incidence of tariff and non-tariff barriers and the lack of adequate transportation infrastructure in the region are also obstacles standing in the way of any expansion in tin trade in the region.

307. When considering new investments, both at the mining stage for new operations and for smelting and down stream processing, the prospects of growth in tin demand in domestic markets, in the region itself and at the world level, as well as the competitiveness of the products produced compared to other producers elsewhere, have to be taken into account. An evaluation of already existing installed capacities and the level of operation is also needed. There is at present excess capacity at the smelting stage in Latin America, although the excess is small compared to other parts of the world. In Brazil, smelting capacity is actually fully used and there is a need for additional capacity as tin concentrate stocks have been expanding due to increasing output. In Mexico, installed capacity is also fully used as an agreement has been struck recently between Minsur S.A of Peru and Metales Potosi S.A of Mexico, to smelt Peruvian concentrates. In Bolivia a large proportion of installed smelting capacity is still idle and there is room for cooperation in this area at the regional level.

308. A special characteristic of the tin industry is that tin by itself has only limited industrial uses. The processing of tin further downstream requires complementary metals such as steel base for making tinplate and various metals like lead, antimony, silver, etc. for tin alloys. Unless the supply of the required metals is available on economic terms, the establishment of processing facilities beyond the stage of smelting in the Latin American tin producing countries would face difficult problems.

309. Some of the required complementary metals are available from domestic sources, for example lead in Bolivia and Brazil and silver in Bolivia, Peru and Mexico. In these cases the setting up of processing capacity for solder alloys is comparatively easy.

310. Imports provide another source of supply. Steel sheets are imported into Peru for the manufacture of tinplate and Argentina, Chile, Colombia and Venezuela import tin metal for the same reason. However, the processing of downstream products on the basis of imported materials tends to raise production costs, rendering the operation uncompetitive compared with the more integrated producers like Brazil. Actually, with the exception of Brazil, this is the case of the majority of Latin American tinplate industries, which encounter serious financial difficulties as they have high production costs the impact of which is further exacerbated by price subsidization policies leading to price distortions.

311. The availability of technology in the region, especially in Brazil and Mexico, which are adequately equipped to undertake processing of tin end-use products, would facilitate the establishment of further processing facilities. However, the main problem for processing is not access to technology but access to markets and good promotion and marketing capabilities. Infrastructural support as well as appropriate fiscal measures, banking services and adequate guidance to provide information and advise on prospects and facilities which are available in the processing sector, are needed.

B. Recommendations

312. Considering the demand forecasts, analysis of the existing capacities, the level of trade in tin and tin products in Latin America and in general the economies of the countries in the region, the following recommendations are put forward to serve as a basis for further discussions:

Transportation

313. Considering the lack of suitable means of transportation, whether coastal, trans-oceanic or inland, any actions which could be taken to improve transportation facilities in the region can only have beneficial effects on intra-regional trade in commodities in general, including tin.

Customs duties

314. Any reduction in the incidence of tariff and non-tariff barriers on tin and tin products as well as a rationalization of customs duties in the region would greatly facilitate trade in this sector.

Promotion and marketing

315. There is a need for greater efforts in the field of marketing and promotion to maintain the attractiveness of tinplate as a packaging material to the canners through, for example, better advertising campaign and an increased awareness of the environmental requirements in the major consuming industries. The development of marketing facilities could be achieved through the establishment of joint ventures with foreign companies in the region itself or elsewhere. These joint ventures can take varied forms, including arrangements for product sharing and buy-back deals. They offer mutual advantages to the participating parties such as cheaper labour and tax exemptions to the foreign companies and technology, equipment and markets to the producing countries.

Processing

316. At the smelting stage, streamlining and rationalization of existing capacity is needed, especially in Bolivia. Complementarities exist for co-operation in tin smelting between Brazil, Peru, Bolivia and Mexico. The initiation of co-operation in this area between Peru and Mexico is a welcome development which could be further strengthened.

317. As regards tinplate, rationalization of existing capacities is necessary through the adoption of appropriate measures to improve efficiency and to reduce production costs. Domestic price controls on tinplate which have the effect of creating shortages and distorting production costs should be revised or eliminated.

318. Opportunities exist to set up processing plants in the area of tin chemicals. Brazil and Mexico are fully equipped to establish and expand industries in this sector and this could be achieved through joint-ventures with firms of other countries which could buy back the fabricated products and provide the required know-how, expertise and technology.

Financial and fiscal policies

319. The formulation of a more adequate foreign exchange policy which does not penalize exports would encourage exports of tin and tin products from the region. Also, appropriate fiscal policies which give incentives for exports would assist in the expansion of exports in general, including tin products.

320. The development of export credits and adequate systems of payments for the promotion of intra-regional trade would facilitate exchanges in the regi and reduce the problems caused by scarcity of foreign exchange.

Research and development activities and training of technical personnel

321. Research efforts in the tin industry will be needed especially in metallurgical processes for the reduction of production costs, for the development of new uses of tin and to slow down the replacement of tin by other materials. The South East Asia Tin Research and Development Center (SEATRAD), first initiated and financed by the United Nations Development Programme, to coordinate and promote research and training in mining, minera processing and smelting of tin, is a good example which could be followed ir the Latin American region.

322. Cooperation could be established between Argentina, Bolivia, Brazil, Peru and Mexico through regular and direct contacts between specialists of t tin industry to exchange information of a technical and commercial nature. sthrengthening of contacts would assist in greater knwowledge of opportunit which exist in other countries and would promote the utilization of complementarities and the establishment of regional joint-ventures.

324. The training of technical personnel to ensure an up to date level of knowledge could also be organized at the regional level with the assistance international institutions such as UNIDO in the area of industrial developm and UNCTAD in the area of trade and marketing.

323. Considering the increasing interest the region has in the development the world tin market, participation in and financing of research and development activities regarding new uses of tin have become a necessity. International Tin Research Institute (I.T.R.I) is undertaking valuable wor this area and recently Brazil has made an ad-hoc contribution to its budge However, a more permanent contribution would assist in strengthening the activities of this body.

Statistical information

324. Statistical data on production and trade in tin are available in Latin America but there are important statistical gaps regarding consumption of processed products. A wider statistical coverage with a view to improving market transparency in the domestic markets would be helpful in determining the level of demand for tin in the region.

325. The terms of reference for the establishment of an International Tin Study Group (I.T.S.G) adopted in December 1988, aim principally at enhancing market transparency in the world tin market. The signature or ratification of these terms of reference and the active participation of the Latin American tin producers would be a good step forward in this direction.

Environmental Considerations

326. The establisment of environmental protection provisions according to internationally acceptable norms to be adopted by the large companies operating in the tin using industries would help to promote Latin American tin products and allow the tin industry to be in the forefront of developments compatible with new regulations enacted in Europe and North America with regard to levels of lead content especially in soldering.

Footnotes:

1/ See, Crowson, P. "Tin: The implications of present prices for mines and smelters", in Tin International, February 1987.

2/ Ibid.

3/ This is possible because of the smaller amount of ore that has to be mined for the same amount of metal contained.

4/ "Guidelines for can manufacturers and food canners", FAO Food and Nutrition Paper 36, 82, Food and Agriculture Organization of the United Nations, Rome, 1986.

5/ The concern about lead leaching has resulted in the use of lead-free solders which are typically high tin alloys with either antimony or silver. This trend is expected to continue, thereby increasing tin consumption. In June 1988, new United States federal legislation came into effect, restricting the use of lead solders in drinking water systems. In the Federal Republic of Germany, the use of leaded solders stopped for a number of years ago. See conference paper presented by Karl Mount, President, Alpha Metals, Inc., at the Second Metals Week Tin Conference , May 12, 1988.

6/ See "Changing Tinplate Markets and their implications for tin consumption", Paper No. 2 by F. Williamson, formerly with ITC, London, UK. The ITRI 4th World Tin Conference, Oct. 1988.

7/ See section on Bolivia in Chapter I.

8/ idem

9/ The United States is the world's largest producer of secondary tin. Secondary tin from recycled fabricated parts is an important source of material for the solder and the brass and bronze industries. The Steel Can Association in Pittsburgh, funded and operated by five domestic tinplate producers, promotes the collection, preparation and transportation of can scrap to be recycled.

10/ See "The Great Tin Crash, Bolivia and the World Tin Market", by Latin American Bureau, London, April 1987.

11/ See "The Mineral Industry of Argentina", US Bureau of Mines Minerals Yearbook, 1986.

12/ See US Bureau of Mines, Industrial Minerals, Argentina, November, 1986.

13/ "Tin International", November, 1986.

14/ This includes the mines of Siglo XX, Colavi, Japo, Morococala and Colquechaca. See Sinopsis Minera, op cit. Centro de Documentacion Informaciones, Ministerio de Mineria y Metalurgia, n: 1, January 1988.

15/ The decrees which set up ENAF forbade the construction of new private smelters, but allowed the operations of those already established.

16/ See "Bolivia's Experience and Strategy in Restructuring the State's Mining Sector, Promotion of Private Investments, Legal Instruments and Projections to the Year 2000" by Minister of Mines J. Villalobos, paper presented at the UNDTCD Seminar on "Mining Prospects to the Year 2000", New York, January, 1989.

17/ See, Sinopsis Minera,

18/ There is also a lead-silver smelter in Karachipampa-Potosi which was also transferred to COMIBOL's administration.

19/ Berzelius MetallhAtten-Gesellschaft, a West-German firm based in the Federal Republic of Germany, is completing a study of Vinto's rehabilitation programme, which will include conversion to the use of natural gas instead of fuel oil, recovery of by-products and the reconditioning of the electro-filters.

20/ Of which 3,600 tons from the Huanini mine, considered one of the richest primary tin deposits in the world.

21/ In April 1970, The Federal Government issued Bill 195 which prohibited manual mining of cassiterite in the Rondonia tin province, aiming at creating conditions for the consolidation of the Brazilian tin industry and encouraging proper settlement of the region. Bill 195 is considered as the milestone not only for the Brazilian tin industry, but also for mining in the Amazon region which up to 1970 was restricted to manganese production in the

Serra Do Navio region, in the state of Amazonas. Bill 195 has encouraged the business community to invest in the region and undertake mechanized mining operations and exploration activity. For further details, see the paper presented by Samuel A. Hanan, "The Brazilian Tin Industry", at Metals Week Tin Symposium, May 12, 1988.

22/ As concluded by B.C. Engel in "Report on visit to Brazil", The International Tin Council, ITC 761, 20/2/1980, (mimeo).

23/ See Sumario Mineral 1988, Ministerio das Minas E Energia Departemento Nacional de Producao Mineral (D.N.P.M), Republica Federativa do Brazil - page 52.

24/ See paper by Ann-Marie Moreno on "The Tin Industry in Brazil", presented at the First International Tin Symposium, Tin International, London, 17December 1985.

25/ One smelter of the Best group with a capacity to treat 3,600 tons/year is located in Manaus, Amazon State

26/ See Metal Bulletin (MBM), February 1988, page 32.

27/ Reynolds International do Brazil intends to set up Brazil's first aluminium can factory in the State of Minas Gerais. The plant will have a capacity of 700 million two piece aluminium cans per year and is expected to come on stream in the course of 1989. Brazil's 17 or so tinplate can manufacturers are worried by the emergence of a local manufacturer of aluminium cans and major can makers Rheem Metalurgica and the Matarazzo group have made considerable efforts to campaign against the US$ 55 million Reynolds factory. For further details see Metal Bulletin Monthly, February 1988 (MBM) pages 32-33.

28/ In December 1987, a new policy,"El Pacto de Solidaridad Economica" was adopted, including a freeze of salaries and prices in order to control the rate of inflation in Mexico.

29/ Projection by Secretaria de Energia Minas e Industria Paraestatal, Direccion General de Minero Metalurgica - January 1989.

30/ idem.

31/ Forecast by Direccion General de Siderurgia y fertilizantes based on CANACER regression model, January 1989.

32/ Minsur S.A., Memor a y Balance, 31 December 1987.

33/ Smelters in Brazil treat only high grade alluvial concentrates. Tin smelters in Mayalsia have a cheaper tolling cost, but transportation costs are high and fright schedules to Asia are irregular. In addition, these smelters treat only high grade concentrates with 60 per cent tin content or more while Peruvian tin concentrates are lower grade and contain some impurities such as copper and arsenic.

34/ See paper "Minsur, Portrait of a producer" by Anthony J.Y.Turner, Wildshaw Ltd., presented at Metals Week Tin Conference, New York, 12 May, 1988.

35/ In 1988, Sidor received orders for tinplate from 27 companies from the packaging sector, but 75 per cent of Sidor's deliveries were actually sent to 6 big companies which illustrate the high concentration of the packaging sector in Venezuela in the hands of a few enterprises. This concentration has been further consolidated as the Dominguez Group purchased Empresa Envases Herem ticos Lockpack; Ilapeca Group bought Empresa Envases Zulia (Enzuca) and the Polar Group acquired the packaging companies of Industrias Yukery part of Superenvases Envalic.

36/ Bleiwas, D. etal. Tin - Availability - Market Economy Countries, Bureau of Mines Information, Circular No. 9086, 1986. And "World Mining Update" in Tin International, July. 1988.

37/ Bleiwas, D. op. cit.

38/ Bleiwas, D. et. al. op. cit.

39/ Mineral Facts and Problems - 1985 edition.

40/ Bleiwas, D. op. cit.

41/ Mineral Facts and Problems, op. cit.

42/ Ibid.

43/ Ibid.

44/ In the case of Paranapanema byproducts would include zircon, niobium, tantalum pentoxide and rare earths.

45/ Bleiwas, D. et. al. op. cit.

46/ Crowson, P. op. cit.

47/ According to interviews with the industry.

48/ See Dr B.T.K. Barry "Tin consuption, an overview", Proceedings of the First International Tin Symposium, Tin International, London 17 December 1985.

49/ See paper on "changing tinplate markets and their implications for tin consumption" by T.Williamson. Fourth International Tinplate Conference, ITR.. London, United Kingdom October 1988

50/ See article "Tin supply deficit forecast" in Mining Journal, London 5 May 1989.

51/ See footnote 49.

52/ In many developed market economy countries, new legislation has been enacted to control litter and reduce waste by promoting the recycling of beverage containers. In the EEC, the commission has adopted a Directive in Containers of Liquids and Human Consumption (85/339/EEC) which was modified by

Member States in July 1985 with the objective of reducing the impact of used containers in the environment and decreasing the consumption of energy and raw materials in the manufacture of beverage cans. Programmes to comply with the Directive have been drawn up by EEC member States. For further details see article "Resource Management and recycling Activities" in Can making and Canning International, June 1988.

53/ In 1985, Bethlehem, LTV, USS, Weirton and Wheeling, Pittsburgh Steel Companies, and Vulcan Materials Corporation, a detinner, formed the Steel Can Recycling Association with the aim of promoting recycling of food and beverage cans, act as an information resource on steel can recycling to the public, industry and government, and help in research and development of new processes for recycling can scrap. Funding for this organisation is set at US$ 15 million over the period 1988 to 1993. Nineteen United States mills are publicity committed to using steel cans in their melting operations, creating a potential market of several hundred thousand tons. Stelco and Dofarco founded a similar organisation in Canada in 1983; the Canadian Tinplate Recycling Council.

54/ see paper N.3 "Developing the market for tinplate" by M. Warwick, ITRI London, Fourth International Tinplate Conference, October 1988.

55/ See paper N. 5 "Developments in Tinplate Recycling" by P.A Neeman, AMG Resources Ltd, Birmingham, United Kingdom, Proceedings of the ITRI Fourth International Tinplate Conference, Oct 1988.

56/ See paper N.2 "Changing tinplate Markets and their Implications for Tin Consumption" by T. Williamson, London, United Kingdom Oct 1988

57/ See paper N.4 "The New, Competitive U.S. Tinplate Industry" by C.G. Carson, USS division of US Corporation, Tin mill Products, Fourth ITRI International Tinplate Conference London, Oct. 1988.

58/ See article "Tinplate prices rise amid slowing growth" Metal Bulletin, 18 may 1989.

59/ See footnote 5 in chapter I section 2.

60/ For example, per capita tinplate consumption actually declined in Brazil from around 5 kg in 1978 to around 3 Kg in 1987.

S T A T I S T I C A L A N N E X

TABLE A1: PRODUCTION OF TIN-IN-CONCENTRATES (1978-1987)

(Thousand tons)

	1978	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*986*	*1987*
WORLD.....	236.0	238.8	235.9	239.3	224.9	211.5	206.9	199.5	186.7	184.9
DEVELOPED MARKET ECONOMY COUNTRIES...	19.8	19.8	19.3	21.4	21.4	18.0	16.7	15.3	18.5	16.9
AMERICA.....	0.4	0.4	0.3	0.3	0.2	0.2	0.3	0.3	2.5	3.5
Canada.....	0.3	0.3	0.2	0.2	0.1	0.1	0.2	0.2	2.4	3.4
United States.....	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
EUROPE.....	4.2	3.4	4.0	4.8	5.1	4.9	5.7	5.9	4.8	4.2
EEC.....	*4.2*	*3.4*	*4.0*	*4.8*	*5.1*	*4.9*	*5.7*	*5.9*	*4.8*	*4.2*
Portugal.....	0.3	0.2	0.3	0.5	0.4	0.4	0.3	0.2	0.2	0.1
Spain.....	0.8	0.5	0.4	0.6	0.5	0.4	0.4	0.5	0.3	0.1
United Kingdom...	3.1	2.7	3.3	3.7	4.2	4.1	5.0	5.2	4.3	4.0
SOUTH AFRICA.....	2.9	2.7	2.9	2.8	3.0	2.7	2.3	2.2	2.2	1.4
ASIA.....	0.6	0.7	0.5	0.6	0.5	0.6	0.5	0.5	0.5	0.1
Japan.....	0.6	0.7	0.5	0.6	0.5	0.6	0.5	0.5	0.5	0.1
OCEANIA.....	11.7	12.6	11.6	12.9	12.6	9.6	7.9	6.4	8.5	7.7
Australia.....	11.7	12.6	11.6	12.9	12.6	9.6	7.9	6.4	8.5	7.7
DEVELOPING COUNTRIES AND TERRITORIES.....	178.0	182.0	182.2	183.6	169.0	155.8	151.5	143.7	122.7	119.7
AMERICA.....	39.0	36.2	36.2	40.4	37.2	42.2	43.5	48.0	44.0	42.5
Argentina.....	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.5	0.4	0.2
Bolivia.....	30.9	27.8	27.3	29.8	26.7	25.3	19.9	16.1	10.5	8.1
Brazil.....	6.5	6.6	6.9	8.3	8.2	13.3	20.0	26.5	27.7	28.5
Mexico.....	0.3	0.0	0.1	0.0	0.0	0.3	0.4	0.4	0.6	0.4
Peru.....	0.8	0.9	1.1	1.5	1.7	2.4	2.2	3.8	4.8	5.3
AFRICA.....	10.2	9.9	9.7	8.5	7.4	6.9	8.0	7.1	3.9	4.5
Burundi.....	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Namibia.....	1.0	1.0	1.0	0.8	0.8	0.8	0.9	1.0	0.7	1.1
Niger.....	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.1	0.1	0.1
Nigeria.....	3.0	2.9	2.7	2.4	1.8	1.6	1.3	0.8	0.1	0.2
Rwanda.....	1.4	1.4	1.6	1.3	1.2	1.0	1.1	0.8	0.0	0.0
Zaire.....	3.5	3.3	3.2	2.5	2.2	2.1	2.9	3.1	1.9	2.1
Zimbabwe.....	0.9	0.9	0.9	1.2	1.2	1.2	1.2	1.2	1.0	1.0
ASIA.....	128.8	135.9	136.3	134.7	124.4	106.7	100.0	88.6	74.8	72.7
South and South-East Asia.	128.8	135.9	136.3	134.7	124.4	106.7	100.0	88.6	74.8	72.7
Burma.....	0.8	1.2	1.1	1.4	1.6	1.6	1.9	1.7	1.4	0.9
Indonesia.....	27.4	29.4	32.5	35.3	33.8	26.6	23.2	21.8	24.6	26.2
Lao People's Democratic Republic...	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.4	0.4

TABLE A1: PRODUCTION OF TIN-IN-CONCENTRATES (1978-1987)

(Thousand tons)

	1978	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*
Malaysia.....	62.7	63.0	61.4	59.9	52.3	41.4	41.3	36.9	29.1	30.4
Republic of Korea.	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thailand.....	30.2	34.0	33.7	31.5	26.2	19.9	21.6	16.6	16.8	14.8
SOCIALIST COUNTRIES OF EASTERN EUROPE...	**19.8**	**19.8**	**18.0**	**17.9**	**18.0**	**19.2**	**19.7**	**19.0**	**19.0**	**18.5**
Czechoslovakia....	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.5
German Democratic Republic.....	1.6	1.6	1.8	1.6	1.8	2.0	2.5	2.8	2.8	3.0
USSR.....	18.0	18.0	16.0	16.0	16.0	17.0	17.0	16.0	16.0	15.0
SOCIALIST COUNTRIES OF ASIA.....	**18.4**	**17.2**	**16.4**	**16.4**	**16.5**	**18.5**	**19.0**	**21.5**	**26.5**	**29.8**
China.....	18.0	17.0	16.0	16.0	16.0	17.0	17.5	20.0	25.0	28.0
Mongolia.....	0.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.2
Viet Nam.....	0.4	0.2	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6

Source: Metallgesellschaft, ITC.

TABLE X PRODUCTION OF PRIMARY TIN METAL (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
WORLD	231.7	238.7	232.5	232.1	217.8	199.0	201.8	201.2	193.9	196.1
DEVELOPED MARKET ECONOMY COUNTRIES	34.4	31.9	25.7	24.8	25.3	25.4	27.7	26.8	24.9	25.4
AMERICA	5.9	4.6	3.0	2.1	3.5	2.5	4.0	3.0	3.2	3.9
United States	5.9	4.6	3.0	2.1	3.5	2.5	4.0	3.0	3.2	3.9
EUROPE	20.8	19.0	14.4	14.3	13.9	15.6	17.2	17.3	16.3	17.6
EEC	*20.8*	*19.0*	*14.4*	*14.3*	*13.9*	*15.6*	*17.2*	*17.3*	*16.3*	*17.6*
Belgium-Lux	3.3	2.2	2.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Germany,Federal Republic of	3.3	2.5	0.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands	1.4	1.5	0.9	3.3	2.6	5.2	6.2	6.0	5.1	3.8
Portugal	0.5	0.4	0.4	0.4	0.4	0.5	0.4	0.5	0.2	0.1
Spain	4.6	4.4	3.7	3.1	2.7	3.5	3.4	3.3	1.8	1.5
United Kingdom	7.7	8.0	5.9	6.8	8.2	6.4	7.2	7.5	9.2	12.2
SOUTH AFRICA	1.5	1.6	2.2	2.9	3.5	3.1	2.2	2.4	2.7	2.4
ASIA	1.1	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.3	0.9
Japan	1.1	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.3	0.9
OCEANIA	5.1	5.4	4.8	4.2	3.1	2.9	2.9	2.7	1.4	0.6
Australia	5.1	5.4	4.8	4.2	3.1	2.9	2.9	2.7	1.4	0.6
DEVELOPING COUNTRIES AND TERRITORIES	159.8	170.1	172.8	172.5	156.0	135.2	134.7	132.6	127.0	124.6
AMERICA	26.6	27.2	27.8	28.7	29.2	28.5	36.5	39.4	37.4	35.2
Argentina	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Bolivia	16.2	15.7	17.5	19.9	18.9	14.1	15.8	12.9	7.7	2.7
Brazil	9.3	10.1	8.8	7.8	9.3	13.0	18.9	24.7	27.5	29.1
Mexico	1.0	1.3	1.4	0.9	0.9	1.2	1.6	1.6	2.0	3.2
AFRICA	4.5	4.3	4.1	4.2	4.2	3.8	3.7	3.2	1.2	1.6
Nigeria	2.7	2.9	2.7	2.5	1.7	1.4	1.3	1.1	0.1	0.6
Rwanda	0.0	0.0	0.0	0.0	0.9	1.1	1.0	0.9	0.0	0.0
Zaire	0.9	0.5	0.5	0.5	0.4	0.1	0.2	0.1	0.0	0.0
Zimbabwe	0.9	0.9	0.9	1.2	1.2	1.2	1.2	1.1	1.1	1.0
ASIA	128.7	138.6	140.9	139.6	122.6	102.9	94.5	90.0	88.4	87.8
South and South-East Asia	128.7	138.6	140.9	139.6	122.6	102.9	94.5	90.0	88.4	87.8
Burma	0.0	0.0	0.0	0.0	0.5	0.5	0.7	0.5	1.0	1.0
Indonesia	25.8	27.8	30.5	32.5	29.8	28.4	22.5	20.4	22.1	24.2
Malaysia	71.9	73.1	71.3	70.3	62.8	53.3	46.9	45.5	43.8	44.4
Republic of Korea	0.5	0.5	0.4	0.2	0.0	0.4	1.2	1.6	1.3	1.8

TABLE A2: PRODUCTION OF PRIMARY TIN METAL (1978-1987)

(Thousand tons)

	1978	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*
Singapore.....	1.5	4.0	4.0	4.0	4.0	1.8	3.5	4.0	0.5	1.0
Thailand.....	29.0	33.2	34.7	32.6	25.5	18.5	19.7	18.0	19.7	15.4
SOCIALIST COUNTRIES OF EASTERN EUROPE...	**19.5**	**19.7**	**19.0**	**18.3**	**19.5**	**21.4**	**21.9**	**22.3**	**21.5**	**20.6**
Czechoslovakia....	0.1	0.1	0.2	0.3	0.3	0.3	0.4	0.5	0.2	0.2
German Democratic Republic.....	1.4	1.6	1.8	2.0	2.2	2.6	3.0	3.3	3.3	3.4
USSR.....	18.0	18.0	17.0	16.0	17.0	18.5	18.5	18.5	18.0	17.0
SOCIALIST COUNTRIES OF ASIA.....	**18.0**	**17.0**	**15.0**	**16.5**	**17.0**	**17.0**	**17.5**	**19.5**	**20.5**	**25.5**
China.....	18.0	17.0	15.0	16.5	16.5	16.5	17.0	19.0	20.0	25.0
Viet Nam.....	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5	0.5	0.5

Source: Metallgesellschaft and national statistics for Argentina.

TABLE A3: PRODUCTION OF SECONDARY TIN METAL (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
WORLD.....	9.1	10.2	11.8	12.2	10.4	11.0	11.8	12.3	9.4	8.8
DEVELOPED MARKET ECONOMY COUNTRIES...	8.5	9.6	11.2	11.4	9.6	10.1	10.8	11.3	8.8	8.1
AMERICA.....	1.8	2.0	1.9	1.8	1.3	1.4	1.3	1.5	1.3	1.7
Canada.....	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
United States.....	1.6	1.8	1.7	1.6	1.1	1.2	1.1	1.3	1.1	1.5
EUROPE.....	6.4	7.2	8.8	9.2	7.8	8.3	8.9	9.3	7.1	6.0
EEC.....	*6.3*	*7.1*	*8.7*	*9.1*	*7.7*	*8.2*	*8.8*	*9.2*	*7.0*	*5.9*
Belgium-Lux.....	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Denmark.....	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Germany,Federal Republic of.....	1.5	1.6	1.6	1.2	0.6	0.4	0.4	1.0	0.4	0.2
Greece.....	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.2	0.2
Netherlands.....	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Spain.....	1.6	1.6	1.1	1.3	1.0	0.2	1.0	0.2	0.2	0.2
United Kingdom...	2.7	3.4	5.5	6.1	5.4	6.9	6.7	7.3	5.7	4.8
EFTA.....	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
Norway.....	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SOUTH AFRICA.....	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
OCEANIA.....	0.3	0.4	0.5	0.4	0.5	0.4	0.5	0.4	0.3	0.3
Australia.....	0.3	0.4	0.5	0.4	0.5	0.4	0.5	0.4	0.3	0.3
DEVELOPING COUNTRIES AND TERRITORIES.....	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.5	0.4	0.5
AMERICA.....	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4
Argentina.....	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Brazil.....	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
ASIA.....	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.1	0.1
South and South-East Asia.	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.1	0.1
India.....	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Thailand.....	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.0	0.0
SOCIALIST COUNTRIES OF EASTERN EUROPE...	0.1	0.1	0.1	0.3	0.3	0.3	0.4	0.5	0.2	0.2
Czechoslovakia....	0.1	0.1	0.1	0.3	0.3	0.3	0.4	0.5	0.2	0.2

Source: Metallgesellschaft, ITC and national statistics.

TABLE A-3: CONSUMPTION OF PRIMARY TIN METAL

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
WORLD	222.7	223.7	212.2	201.6	195.0	196.1	207.5	208.0	215.4	220.1
DEVELOPED MARKET ECONOMY COUNTRIES	146.7	147.9	137.6	129.2	117.1	117.3	126.7	123.0	120.5	126.2
AMERICA	53.7	54.3	48.8	44.0	36.5	37.7	41.9	41.2	36.2	39.6
Canada	5.3	4.8	4.5	3.8	3.5	3.4	4.1	4.0	3.7	4.0
United States	48.4	49.5	44.3	40.2	33.0	34.3	37.8	37.2	32.5	35.6
EUROPE	57.6	56.6	52.4	48.8	47.0	44.8	47.0	45.4	48.2	49.3
EEC	*55.4*	*54.2*	*49.6*	*46.7*	*45.3*	*43.0*	*45.1*	*43.2*	*45.4*	*47.0*
Belgium-Lux	3.1	2.4	2.6	2.2	1.9	1.8	1.7	0.9	1.1	1.4
Denmark	0.3	0.3	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.0
France	9.9	9.7	10.1	9.1	8.2	7.6	7.8	6.9	7.5	7.4
Germany, Federal Republic of	13.5	13.7	14.3	13.2	13.2	13.8	15.6	15.7	16.9	17.3
Greece	0.4	0.8	0.5	0.5	0.3	0.4	0.3	0.4	0.6	0.6
Ireland	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Italy	5.8	6.0	5.8	4.3	4.2	4.5	4.5	5.0	5.6	6.0
Netherlands	4.8	4.8	4.8	5.1	5.1	4.7	4.8	4.3	4.0	4.6
Portugal	1.0	0.9	0.4	0.4	0.8	0.6	0.6	0.7	0.9	0.8
Spain	4.3	4.4	4.6	4.7	4.7	3.7	3.9	3.1	2.6	2.6
United Kingdom	12.2	11.1	6.4	7.1	6.8	5.9	5.8	6.0	6.0	6.2
EFTA	*2.2*	*2.4*	*2.8*	*2.1*	*1.7*	*1.8*	*1.9*	*2.2*	*2.8*	*2.3*
Austria	0.4	0.5	0.6	0.4	0.4	0.4	0.5	0.5	0.5	0.5
Finland	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.1
Norway	0.5	0.5	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4
Sweden	0.3	0.5	0.8	0.3	0.2	0.2	0.3	0.4	0.5	0.4
Switzerland	0.8	0.7	0.8	0.8	0.6	0.7	0.6	0.8	1.2	0.9
SOUTH AFRICA	1.9	2.0	2.0	2.4	1.9	1.6	1.7	1.9	1.9	2.0
ASIA	29.7	31.3	31.0	30.6	28.8	30.5	33.4	31.7	31.6	32.7
Israel	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Japan	29.6	31.2	30.9	30.5	28.7	30.4	33.3	31.6	31.5	32.6
OCEANIA	3.8	3.7	3.4	3.4	2.9	2.7	2.7	2.8	2.6	2.6
Australia	3.6	3.4	3.1	3.2	2.7	2.5	2.6	2.7	2.5	2.4
New Zealand	0.2	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.2
DEVELOPING COUNTRIES AND TERRITORIES	25.3	26.3	23.4	22.5	24.5	25.1	28.2	27.8	35.1	37.4
AMERICA	10.2	10.6	11.0	9.0	11.5	11.2	11.1	12.0	13.8	15.4
Argentina	1.0	1.4	1.1	1.1	1.3	1.2	1.2	0.8	1.7	1.0
Bolivia	0.6	1.0	1.0	1.0	1.5	2.4	1.8	1.9	1.1	1.1
Brazil	5.2	5.4	5.0	2.9	5.1	4.0	4.2	4.3	6.0	7.8
Chile	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1.0	1.2

TABLE A4: CONSUMPTION OF PRIMARY TIN METAL

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Venezuela	0.2	0.1	0.1	0.2	0.2	0.3	0.6	1.0	0.8	0.8
AFRICA	**2.1**	**2.0**	**1.6**	**1.4**	**1.5**	**1.4**	**2.1**	**1.5**	**1.6**	**1.6**
Egypt	0.4	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Morocco	0.2	0.2	0.2	0.2	0.2	0.1	0.4	0.1	0.2	0.2
Nigeria	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.2	0.2
Zaire	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
ASIA	**11.2**	**12.4**	**9.8**	**11.2**	**10.3**	**11.4**	**13.9**	**12.9**	**18.2**	**18.9**
West Asia	**1.9**	**3.5**	**1.1**	**1.3**	**1.3**	**1.6**	**1.4**	**1.5**	**1.7**	**1.7**
Iran (Islamic Republic of)	0.6	0.5	0.5	0.5	0.5	0.5	0.4	0.5	0.5	0.5
Syrian Arab Republic	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Turkey	1.2	2.9	0.5	0.7	0.7	1.0	0.9	0.9	1.1	1.1
South and South-East Asia	**9.3**	**8.9**	**8.7**	**9.9**	**9.0**	**9.8**	**12.5**	**11.4**	**16.5**	**17.2**
Hong Kong	1.1	1.2	1.2	0.8	0.4	0.6	1.1	1.5	1.8	2.5
India	2.6	2.5	2.3	2.8	2.1	2.3	2.4	2.2	2.8	2.6
Indonesia	0.4	0.4	0.3	0.4	0.6	0.6	0.9	1.0	1.1	0.9
Malaysia	0.3	0.4	0.4	0.4	0.4	0.8	1.5	1.6	1.9	2.0
Pakistan	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.3	0.5	0.5
Philippines	0.8	0.4	0.4	1.1	1.0	0.7	0.7	0.4	0.5	0.7
Republic of Korea	2.1	1.8	1.8	2.2	2.1	2.6	3.6	2.6	4.3	4.0
Thailand	0.4	0.6	0.7	0.8	0.7	0.7	0.6	0.5	1.5	1.9
Taiwan	1.3	1.3	1.3	1.1	1.4	1.2	1.6	1.2	1.5	1.5
EUROPE	**1.8**	**1.3**	**1.0**	**0.9**	**1.2**	**1.1**	**1.1**	**1.4**	**1.5**	**1.5**
Yugoslavia	1.8	1.3	1.0	0.9	1.2	1.1	1.1	1.4	1.5	1.5
SOCIALIST COUNTRIES OF EASTERN EUROPE	**40.7**	**39.5**	**41.2**	**39.9**	**43.4**	**42.7**	**41.6**	**45.2**	**46.8**	**43.0**
Bulgaria	1.0	1.0	0.9	0.6	0.8	0.8	1.0	1.0	0.8	2.0
Czechoslovakia	3.2	3.2	4.3	3.9	3.5	3.2	3.3	3.1	3.7	3.1
German Democratic Republic	3.0	3.0	3.1	3.0	3.2	2.8	3.0	3.3	3.3	3.4
Hungary	1.7	1.4	1.6	1.4	1.8	2.0	1.7	1.3	1.4	1.3
Poland	4.6	3.9	3.3	2.2	4.6	4.5	3.6	3.0	3.6	2.7
Romania	3.2	3.0	3.0	2.8	2.5	2.4	2.0	2.0	2.0	1.5
USSR	24.0	24.0	25.0	26.0	27.0	27.0	27.0	31.5	32.0	29.0
SOCIALIST COUNTRIES OF ASIA	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**11.0**	**11.0**	**12.0**	**13.0**	**13.5**
China	10.0	10.0	10.0	10.0	10.0	11.0	11.0	12.0	13.0	13.5

Source: UNCTAD secretariat.

TABLE A5: CONSUMPTION OF SECONDARY TIN METAL (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
WORLD	7.4	7.6	8.8	8.5	7.0	7.8	8.0	7.5	7.3	7.2
DEVELOPED MARKET ECONOMY COUNTRIES	7.0	7.2	8.4	8.1	6.6	7.4	7.6	7.1	7.0	6.9
AMERICA	2.4	2.0	1.9	1.8	1.3	1.4	1.3	1.5	1.3	1.3
Canada	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
United States	2.2	1.8	1.7	1.6	1.1	1.2	1.1	1.3	1.1	1.1
EUROPE	4.3	4.7	6.0	5.8	4.8	5.5	5.8	5.2	5.4	5.3
EEC	*4.1*	*4.5*	*5.9*	*5.8*	*4.8*	*5.4*	*5.7*	*5.1*	*5.3*	*5.2*
Belgium-Lux	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Denmark	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Germany, Federal Republic of	1.5	1.6	1.6	1.2	0.6	0.4	0.4	0.9	0.5	0.5
Netherlands	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Spain	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.6	0.6
United Kingdom	1.8	2.1	3.5	3.8	3.4	4.2	4.5	3.4	3.7	3.6
EFTA	*0.2*	*0.2*	*0.1*	*0.0*	*0.0*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
Austria	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Norway	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OCEANIA	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.3	0.3
Australia	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.3	0.3
DEVELOPING COUNTRIES AND TERRITORIES	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3
AMERICA	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Brazil	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
ASIA	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1
South and South-East Asia	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1
India	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Thailand	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0

Source: UNCTAD secretariat.

TABLE A6: APPARENT CONSUMPTION OF TIN PLATE (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
WORLD.....	13030.9	13518.6	12919.2	12094.2	11638.0	11370.8	11715.1	11237.9	10811.1	11530.4
DEVELOPED MARKET ECONOMY COUNTRIES...	9618.8	9956.0	9121.8	8583.3	8175.9	8010.3	8492.1	7861.6	7201.8	7627.0
AMERICA.....	4509.6	4536.6	3845.4	3575.8	3106.0	3105.6	3201.1	2861.0	2605.5	2829.1
Canada.....	462.2	446.2	493.7	368.8	389.5	395.9	477.5	388.0	364.5	363.0
United States.....	4047.4	4090.4	3351.7	3207.0	2716.5	2709.7	2723.6	2473.0	2241.0	2466.1
EUROPE.....	3589.6	3762.5	3704.9	3519.6	3551.3	3448.9	3809.8	3598.3	3134.9	3252.5
EEC.....	*3455.4*	*3621.4*	*3557.3*	*3396.4*	*3449.6*	*3348.2*	*3696.8*	*3498.1*	*3029.8*	*3146.1*
Belgium-Lux.....	154.8	142.3	152.7	174.4	179.1	202.3	195.0	189.5	185.1	183.6
Denmark.....	89.5	92.4	96.1	94.2	99.2	100.2	122.8	113.8	110.5	102.6
France.....	499.6	542.0	491.8	471.0	508.8	440.5	451.7	465.0	432.7	443.8
Germany,Federal Republic of.....	508.5	595.3	595.3	598.4	628.3	529.4	696.1	609.8	606.1	626.0
Greece.....	49.6	77.3	46.2	110.2	72.9	96.3	92.2	100.9	91.8	92.3
Ireland.....	3.6	9.0	6.4	7.6	7.2	7.0	7.7	8.0	6.9	7.7
Italy.....	480.0	620.6	688.2	431.4	486.7	584.3	612.1	528.2	431.0	514.2
Netherlands.....	256.8	246.0	279.5	309.3	267.7	257.3	266.3	255.3	196.4	195.9
Portugal.....	67.4	48.0	68.3	62.3	59.8	52.6	38.5	29.8	46.2	34.0
Spain.....	333.9	255.8	394.3	326.5	317.0	296.6	389.0	385.9	279.7	310.5
United Kingdom...	1011.7	992.7	738.5	811.1	822.9	781.7	825.4	811.9	643.4	635.5
EFTA.....	*134.2*	*141.1*	*147.6*	*123.2*	*101.7*	*100.7*	*113.0*	*100.2*	*105.1*	*106.4*
Austria.....	23.3	22.8	22.8	23.1	21.4	24.3	20.3	22.0	22.0	20.3
Finland.....	15.1	16.1	18.7	17.4	13.7	13.5	12.4	9.5	12.6	16.0
Iceland.....	1.2	0.9	1.0	0.7	0.7	0.7	0.9	0.6	0.6	0.6
Norway.....	6.5	13.8	10.8	17.1	5.7	5.7	18.2	13.7	13.0	8.4
Sweden.....	59.5	54.1	60.6	37.6	35.3	31.1	34.9	29.8	33.0	29.8
Switzerland.....	28.6	33.4	33.7	27.3	24.9	25.4	26.3	24.6	23.9	31.3
SOUTH AFRICA.....	244.4	276.3	292.6	271.3	251.4	284.2	266.0	254.2	288.3	302.9
ASIA.....	995.8	1052.2	979.3	953.7	1011.5	917.8	938.9	827.8	881.8	911.4
Israel.....	0.7	0.3	0.5	51.9	74.8	77.4	80.2	62.2	74.7	77.6
Japan.....	995.1	1051.9	978.8	901.8	936.7	840.4	858.7	765.6	807.1	833.8
OCEANIA.....	279.4	328.4	299.6	262.9	255.7	253.8	276.3	320.3	291.3	331.1
Australia.....	243.5	288.4	264.6	224.7	219.8	222.1	224.8	274.8	244.3	300.4
New Zealand.....	35.9	40.0	35.0	38.2	35.9	31.7	51.5	45.5	47.0	30.7
DEVELOPING COUNTRIES AND TERRITORIES.....	2845.0	3060.8	3235.9	3121.9	2994.3	2821.4	2749.9	2865.8	3062.4	3113.0
AMERICA.....	1314.9	1400.5	1504.7	1189.0	1193.0	929.5	1021.5	978.0	1102.9	1124.7
Antigua and Barbuda.....	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Argentina.....	74.4	120.4	94.3	80.5	119.8	134.6	101.5	97.2	124.8	118.6
Barbados.....	8.9	0.4	0.2	0.1	0.0	0.1	0.1	0.1	0.3	0.3
Bolivia.....	4.2	4.1	2.8	8.5	3.5	2.3	1.9	1.9	1.5	1.5

TABLE A6: APPARENT CONSUMPTION OF TIN PLATE (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Brazil	552.3	559.6	633.1	429.1	452.0	290.8	366.8	330.1	384.0	415.8
Chile	41.9	53.9	52.4	37.2	28.0	41.9	35.1	27.0	44.5	51.0
Colombia	61.5	65.5	70.2	50.0	57.0	53.3	54.6	58.3	50.8	60.9
Costa Rica	13.1	13.0	10.4	7.7	4.9	7.8	10.7	10.0	10.0	10.0
Cuba	54.8	47.4	55.8	63.6	46.2	57.5	59.7	69.3	55.3	55.0
Dominica	0.2	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ecuador	11.9	9.5	8.6	5.1	6.1	4.7	16.3	10.0	10.0	10.0
El Salvador	5.3	3.1	3.3	2.1	2.2	2.5	3.1	3.0	3.0	3.0
Guatemala	6.0	14.4	7.4	4.6	3.4	3.8	3.7	4.5	5.0	5.0
Guyana	0.0	1.2	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Honduras	9.4	9.7	7.1	4.5	4.5	7.8	3.1	2.9	3.0	3.0
Jamaica	0.4	0.5	0.4	0.4	0.1	0.5	0.5	1.0	1.0	1.0
Mexico	297.2	310.0	370.5	305.6	286.3	194.5	223.4	217.8	239.0	202.7
Nicaragua	4.3	1.1	2.8	3.4	4.0	4.5	5.2	4.5	4.5	4.5
Paraguay	2.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Peru	32.7	50.0	66.6	62.6	54.2	49.5	47.4	40.0	52.4	68.0
Uruguay	6.0	7.0	6.0	7.4	3.6	2.9	3.8	3.6	6.1	6.9
Venezuela	126.8	128.4	110.7	115.1	115.7	69.0	83.1	95.3	105.9	106.0
AFRICA	223.8	211.3	273.4	272.0	276.0	254.5	225.5	270.0	223.5	202.7
Algeria	40.8	56.4	54.0	65.1	83.4	64.0	53.1	55.7	60.7	41.0
Cote d'Ivoire	16.7	25.8	25.8	20.7	22.1	24.9	23.0	21.4	20.0	20.0
Egypt	52.8	33.2	43.1	36.4	31.3	55.8	39.9	67.6	43.6	47.3
Ethiopia	3.5	1.5	7.2	3.3	4.7	6.0	8.2	5.3	5.0	5.0
Ghana	2.9	2.2	2.0	3.1	2.0	2.0	1.0	1.0	1.0	1.0
Kenya	23.4	19.2	24.2	48.0	23.2	18.8	18.0	18.0	18.1	19.9
Liberia	0.8	0.4	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Madagascar	3.0	3.5	1.9	0.9	0.8	0.3	2.0	1.1	0.9	1.0
Malawi	0.2	0.4	0.5	0.1	0.3	0.5	0.4	0.3	0.3	0.3
Mali	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mauritius	1.1	1.1	1.3	1.2	1.2	1.4	1.3	1.3	1.3	1.3
Morocco	23.2	23.2	29.8	28.3	32.0	26.3	32.4	36.6	32.4	20.0
Nigeria	32.8	23.1	53.1	30.3	38.1	26.0	17.2	30.2	10.8	17.5
Senegal	6.2	0.7	1.1	8.2	5.0	5.0	4.0	4.0	4.0	4.0
Sudan	3.0	2.6	4.2	4.0	3.0	3.0	3.0	3.0	3.0	3.0
Tunisia	5.0	10.0	16.6	13.7	22.9	14.5	16.0	18.5	16.4	15.4
United Republic of Tanzania	5.7	5.8	6.2	5.6	5.0	5.0	5.0	5.0	5.0	5.0
~~Zaire~~	~~0.4~~	~~0.0~~	~~0.0~~	0.0	~~0.0~~	~~0.0~~	~~0.0~~	0.0	~~0.0~~	~~0.0~~
Zambia	2.1	2.2	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
ASIA	1221.7	1371.9	1364.8	1584.7	1463.7	1565.0	1427.7	1567.5	1683.5	1730.0
West Asia	217.1	182.2	177.6	190.4	227.3	237.2	261.1	260.4	230.6	233.4
Cyprus	5.0	4.7	4.8	3.8	5.2	5.6	3.6	5.2	4.7	4.9
Iran (Islamic Republic of)	88.9	50.3	39.1	60.8	34.9	68.5	89.5	65.9	52.0	34.4
Iraq	10.0	10.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Jordan	1.4	2.0	2.9	3.5	3.5	3.5	4.0	4.0	4.0	4.0
Kuwait	14.6	28.6	14.7	31.9	45.5	15.9	34.3	36.0	36.0	36.0
Syrian Arab Republic	7.7	11.6	9.0	7.9	10.4	16.7	10.5	11.0	11.0	11.0

TABLE A6: APPARENT CONSUMPTION OF TIN PLATE (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Turkey.....	89.5	75.0	92.1	67.5	112.8	112.0	104.2	123.3	107.9	128.1
South and South-East Asia.	1004.6	1189.7	1187.2	1394.3	1236.4	1327.8	1166.6	1307.1	1452.9	1496.6
Hong Kong.....	55.5	47.7	42.3	47.6	39.3	45.4	42.9	44.9	153.7	153.7
India.....	191.1	224.3	245.0	430.5	410.0	442.3	263.0	349.0	285.5	280.0
Indonesia.....	89.7	116.2	146.8	110.9	114.7	119.1	114.6	157.4	134.2	112.4
Malaysia.....	69.3	81.3	90.0	58.0	67.6	55.6	60.5	75.8	82.7	89.4
Pakistan.....	44.8	75.2	55.0	60.9	64.5	60.2	70.7	82.0	90.5	95.0
Philippines.....	127.5	148.7	152.5	105.1	183.1	179.1	124.9	105.5	133.5	164.0
Republic of Korea.	93.8	135.3	141.7	155.1	83.6	98.0	137.6	144.1	166.2	186.0
Singapore.....	56.5	71.0	66.4	90.5	55.6	62.9	49.8	47.7	72.8	65.2
Sri Lanka.....	4.6	5.4	5.2	4.6	6.0	5.3	3.5	6.3	4.8	5.0
Thailand.....	87.8	130.5	97.0	195.0	103.4	134.2	153.8	134.4	167.6	192.0
Taiwan.....	184.0	154.1	145.3	136.1	108.6	125.7	145.3	160.0	161.4	153.9
EUROPE.....	77.8	74.7	90.2	71.0	58.8	69.4	72.3	47.3	49.5	52.6
Yugoslavia.....	77.8	74.7	90.2	71.0	58.8	69.4	72.3	47.3	49.5	52.6
OCEANIA.....	6.8	2.4	2.8	5.2	2.8	3.0	2.9	3.0	3.0	3.0
Fiji.....	6.8	2.4	2.8	4.7	1.9	3.0	2.9	3.0	3.0	3.0
Papua New Guinea..	0.0	0.0	0.0	0.5	0.9	0.0	0.0	0.0	0.0	0.0
SOCIALIST COUNTRIES OF EASTERN EUROPE...	434.3	340.8	352.7	219.3	216.2	264.7	273.8	276.3	275.5	295.7
Bulgaria.....	-11.0	-9.0	-15.0	-13.5	-13.0	-9.6	-8.0	-6.9	-11.8	-7.0
Czechoslovakia....	96.5	104.0	99.0	92.0	94.0	97.6	102.0	103.0	106.0	111.0
German Democratic Republic.....	43.0	42.0	44.0	42.0	41.0	43.0	48.0	46.0	48.0	51.0
Hungary.....	58.0	53.0	55.0	50.0	46.0	54.0	53.0	59.0	55.0	60.0
Poland.....	137.0	135.0	146.3	87.8	72.2	97.2	104.8	101.2	105.3	107.7
Romania.....	66.0	11.0	17.0	-22.0	-4.0	4.0	9.0	4.0	3.0	3.0
USSR.....	44.8	4.8	6.4	-17.0	-20.0	-21.5	-35.0	-30.0	-30.0	-30.0
SOCIALIST COUNTRIES OF ASIA.....	132.8	161.0	208.8	169.7	251.6	274.4	199.3	234.2	271.4	494.7
China.....	132.8	161.0	208.8	169.7	251.6	274.4	199.3	234.2	271.4	494.7

Source: UNCTAD secretariat.

TABLE A8: QUANTITY OF EXPORTS OF TIN-IN-CONCENTRATES (1978-1987)

(Thousand tons, etimated SN content)

	1978	1979	1980	1981	1982	1983	1984	1985	19 6	1987
WORLD.....	40.8	35.4	33.0	27.3	24.9	30.1	32.8	32.2	43.1	43.3
DEVELOPED MARKET ECONOMY COUNTRIES...	12.6	11.4	9.8	11.1	10.1	9.2	9.4	8.3	13.5	12.7
AMERICA.....	0.9	0.7	0.2	0.2	0.2	0.1	0.2	0.2	2.1	2.8
Canada.....	0.9	0.7	0.2	0.2	0.2	0.1	0.2	0.2	2.1	2.8
EUROPE.....	2.5	2.8	1.4	2.2	1.1	1.0	1.5	1.6	3.0	2.7
EEC.....	*2.5*	*2.8*	*1.4*	*2.2*	*1.1*	*1.0*	*1.5*	*1.6*	*3.0*	*2.7*
Portugal.....	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
United Kingdom...	2.5	2.8	1.4	1.8	1.1	1.0	1.5	1.6	3.0	2.7
SOUTH AFRICA.....	2.2	1.5	0.8	1.3	1.7	1.9	1.5	1.2	1.2	1.0
OCEANIA.....	7.0	6.4	7.4	7.4	7.1	6.2	6.2	5.3	7.2	6.2
Australia.....	7.0	6.4	7.4	7.4	7.1	6.2	6.2	5.3	7.2	6.2
DEVELOPING COUNTRIES AND TERRITORIES.....	28.2	24.0	23.2	1[illegible].2	14.8	20.8	23.4	21.4	25.1	25.0
AMERICA.....	15.0	12.1	9.1	6.8	5.4	5.7	8.0	6.9	13.2	12.7
Argentina.....	0.3	0.2	0.3	0.4	0.1	0.1	0.1	0.1	0.0	0.0
Bolivia.....	13.8	11.4	8.1	5.5	3.2	2.5	4.7	4.4	8.6	8.3
Peru.....	0.9	0.5	0.7	0.9	2.1	3.1	3.2	2.4	4.6	4.4
AFRICA.....	5.2	4.0	4.5	4.5	2.9	3.3	3.5	3.3	4.0	2.9
Namibia.....	1.0	1.0	1.0	0.9	0.8	0.8	0.8	0.8	0.7	1.0
Niger.....	0.0	0.0	0.0	0.2	0.0	0.1	0.1	0.0	0.0	0.0
Rwanda.....	1.4	1.4	1.5	1.5	0.3	0.0	0.0	0.0	0.0	0.0
United Republic of Tanzania.....	0.0	0.0	0.0	0.3	0.1	0.5	0.0	0.0	0.0	0.0
Zaire.....	2.8	1.6	2.0	1.6	1.7	1.9	2.6	2.5	3.3	1.9
ASIA.....	8.0	7.9	9.6	4.9	6.5	11.8	11.9	11.2	7.9	9.4
South and South-East Asia.	8.0	7.9	9.6	4.9	6.5	11.8	11.9	11.2	7.9	9.4
Burma.....	1.1	2.1	2.1	1.7	1.8	1.7	1.6	1.7	1.1	1.0
Indonesia.....	0.7	1.1	3.4	0.7	1.1	0.9	2.0	2.3	3.2	1.1
Lao People's Democratic Republic...	0.1	0.0	0.1	0.0	0.6	1.3	0.0	0.0	0.0	0.0
Singapore.....	6.1	4.7	4.0	2.5	3.0	7.9	8.3	7.2	3.6	7.3
SOCIALIST COUNTRIES OF ASIA.....	0.0	0.0	0.0	0.0	0.0	0.1	0.0	2.5	4.5	5.6
China.....	0.0	0.0	0.0	0.0	0.0	0.1	0.0	2.5	4.5	5.6

Source: UNCTAD secretariat.

TABLE A9: QUANTITY OF IMPORTS OF TIN-IN-CONCENTRATES (1978-1987)

(Thousand tons, estimated SN content)

	1978	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*
WORLD	40.5	40.9	33.5	29.3	29.0	35.6	40.7	37.0	43.9	49.9
DEVELOPED MARKET ECONOMY COUNTRIES	23.1	20.9	17.3	14.4	11.8	15.4	20.8	16.7	22.0	16.0
AMERICA	3.9	4.5	0.8	0.2	2.0	1.0	3.5	1.6	4.0	3.0
United States	3.9	4.5	0.8	0.2	2.0	1.0	3.5	1.6	4.0	3.0
EUROPE	19.2	16.4	16.5	14.2	9.8	14.3	17.1	15.0	18.0	13.0
EEC	*19.2*	*16.4*	*16.5*	*14.2*	*9.8*	*14.3*	*17.1*	*15.0*	*18.0*	*13.0*
Belgium-Lux	3.3	2.0	2.3	0.1	0.0	0.6	0.5	0.1	0.1	0.0
Germany,Federal Republic of	4.2	3.6	1.5	1.3	0.4	0.5	0.5	0.8	0.2	0.1
Netherlands	1.5	1.6	1.5	3.9	3.0	5.6	8.2	6.3	6.4	3.8
Portugal	0.0	0.0	0.2	0.1	0.0	0.1	0.1	0.1	0.0	0.0
Spain	3.1	2.1	2.8	2.6	2.0	2.4	2.9	3.0	2.1	1.1
United Kingdom	7.1	7.1	8.2	6.2	4.4	5.1	4.9	4.7	9.2	8.0
OCEANIA	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0
Australia	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0
DEVELOPING COUNTRIES AND TERRITORIES	15.7	18.4	14.8	13.9	15.5	18.7	18.7	18.7	21.3	32.6
AMERICA	3.5	4.8	3.9	1.7	0.8	1.3	2.5	3.8	4.5	5.1
Argentina	0.1	0.2	0.6	0.0	0.3	0.0	0.0	0.0	0.1	0.2
Brazil	2.3	4.2	1.9	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Mexico	1.1	0.4	1.4	1.5	0.5	1.3	2.5	3.8	4.4	4.9
ASIA	12.2	13.6	10.9	12.2	14.7	17.4	16.2	14.9	16.8	27.5
West Asia	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0
Turkey	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0
South and South-East Asia	12.2	13.6	10.9	12.2	14.7	17.4	14.6	14.9	16.8	27.5
Malaysia	9.4	10.2	8.4	10.7	12.5	14.3	8.9	7.8	12.5	17.4
Republic of Korea	0.5	0.4	0.2	0.1	0.0	0.4	1.2	1.9	1.1	2.6
Singapore	2.3	3.0	2.3	1.4	2.2	2.7	4.5	5.2	3.2	7.5
SOCIALIST COUNTRIES OF EASTERN EUROPE	1.7	1.6	1.4	1.0	1.7	1.5	1.2	1.6	0.6	1.3
USSR	1.7	1.6	1.4	1.0	1.7	1.5	1.2	1.6	0.6	1.3

Source: UNCTAD secretariat.

TABLE A10: QUANTITY OF EXPORTS OF TIN METAL (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
WORLD.....	171.7	176.3	178.5	187.3	155.9	146.2	145.8	169.8	151.2	158.9
DEVELOPED MARKET ECONOMY COUNTRIES...	21.3	21.1	20.5	21.8	20.8	15.2	28.0	21.8	30.6	27.3
AMERICA.....	0.5	0.6	0.6	2.4	5.8	1.3	1.4	1.5	1.5	1.3
United States.....	0.5	0.6	0.6	2.4	5.8	1.3	1.4	1.5	1.5	1.3
EUROPE.....	18.6	18.8	18.2	18.0	14.2	13.2	26.0	19.8	28.8	25.7
EEC.....	*18.4*	*18.5*	*17.9*	*17.6*	*13.9*	*12.9*	*25.7*	*19.4*	*28.5*	*25.4*
Belgium-Lux.....	2.4	2.3	3.0	0.8	0.4	1.2	1.6	2.5	3.2	3.1
Denmark.....	0.7	0.8	0.5	0.4	0.7	1.2	1.8	1.3	1.4	0.1
France.....	0.7	0.6	0.6	0.8	0.4	0.3	0.3	0.4	0.2	0.1
Germany,Federal Republic of.....	4.4	5.3	3.1	4.7	3.9	4.3	4.2	3.8	3.5	1.9
Italy.....	0.2	0.1	0.3	0.1	0.3	0.5	0.1	0.2	0.2	0.1
Netherlands.....	1.2	1.3	2.0	2.9	1.5	3.4	4.2	2.1	3.2	2.5
Spain.....	0.3	0.6	0.2	0.2	0.1	0.1	0.4	0.2	0.2	0.0
United Kingdom...	8.5	7.5	8.2	7.7	6.6	1.9	13.1	8.9	16.6	17.6
EFTA.....	*0.2*	*0.3*	*0.3*	*0.4*	*0.3*	*0.3*	*0.3*	*0.4*	*0.3*	*0.3*
Norway.....	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sweden.....	0.0	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.2
Switzerland.....	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1
ASIA.....	0.1	0.1	0.1	0.0	0.1	0.2	0.1	0.1	0.1	0.1
Japan.....	0.1	0.1	0.1	0.0	0.1	0.2	0.1	0.1	0.1	0.1
OCEANIA.....	2.1	1.6	1.6	1.4	0.7	0.5	0.5	0.4	0.2	0.2
Australia.....	2.1	1.6	1.6	1.4	0.7	0.5	0.5	0.4	0.2	0.2
DEVELOPING COUNTRIES AND TERRITORIES.....	145.0	153.2	153.8	159.9	130.8	127.4	114.8	134.3	112.9	114.0
AMERICA.....	17.2	15.9	16.5	22.9	21.3	20.3	28.2	29.7	26.2	22.9
Bolivia.....	15.5	14.4	13.7	18.0	17.1	11.6	13.6	9.6	7.0	1.8
Brazil.....	1.7	1.5	2.8	4.9	4.2	8.7	14.6	20.1	19.2	21.1
AFRICA.....	5.0	4.1	4.0	3.6	3.8	2.7	2.6	3.0	1.8	2.0
Niger.....	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria.....	3.1	2.6	2.7	2.4	1.9	1.1	1.3	0.9	0.2	0.6
Rwanda.....	0.0	0.0	0.0	0.0	0.7	1.0	0.9	0.9	0.3	0.2
Zaire.....	1.1	0.5	0.4	0.2	0.2	0.2	0.2	0.0	0.0	0.0
Zimbabwe.....	0.7	0.9	0.9	1.0	1.0	0.4	0.2	1.2	1.3	1.2
ASIA.....	122.8	133.2	133.2	133.3	105.7	104.4	84.0	101.6	84.9	89.1

South and
South East Asia

TABLE A10: QUANTITY OF EXPORTS OF TIN METAL (1978-1987)

(Thousand tons)

	1978	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*
Malaysia.....	70.1	72.1	69.4	66.5	49.0	57.1	39.6	57.4	40.5	49.6
Singapore.....	0.9	3.5	3.6	2.7	2.5	3.5	2.2	5.7	2.0	1.5
Thailand.....	28.9	31.3	34.0	32.0	25.5	18.9	19.5	17.4	18.6	13.7
EUROPE.....	**0.0**	**0.0**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	0.0	0.0	**0.0**
Yugoslavia.....	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
SOCIALIST COUNTRIES OF ASIA.....	5.4	2.0	4.2	5.6	4.3	3.6	3.0	13.7	7.7	**17.6**
China.....	5.4	2.0	4.2	5.6	4.3	3.6	3.0	13.7	7.7	17.6

Source: UNCTAD secretariat.

TABLE A11: QUANTITY OF IMPORTS OF TIN METAL (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
WORLD.....	171.6	174.2	179.7	173.5	147.4	157.2	170.7	163.0	190.9	186.7
DEVELOPED MARKET ECONOMY COUNTRIES...	131.1	136.3	139.1	132.8	107.7	116.2	128.7	121.8	129.2	130.6
AMERICA.....	51.6	53.1	51.3	50.4	32.4	39.7	47.8	40.9	40.7	46.5
Canada.....	4.8	4.7	4.5	3.8	3.2	3.6	4.1	3.8	3.9	3.8
United States.....	46.8	48.4	46.8	46.6	29.2	36.1	43.7	37.1	36.8	42.7
EUROPE.....	50.2	52.0	56.0	51.4	48.7	46.5	48.5	50.2	55.6	50.0
EEC.....	*47.8*	*49.4*	*53.0*	*49.0*	*46.3*	*44.3*	*46.2*	*47.5*	*52.2*	*47.4*
Belgium-Lux.....	2.2	2.6	3.0	2.7	2.4	2.3	2.3	3.9	3.5	2.1
Denmark.....	0.3	0.3	0.2	0.1	0.3	0.5	0.8	0.4	2.0	0.2
France.....	10.7	10.3	10.5	8.9	8.6	8.0	8.2	7.1	8.3	7.6
Germany,Federal Republic of.....	14.7	15.8	18.3	17.1	16.3	16.6	18.7	19.1	18.8	19.3
Greece.....	0.3	0.0	0.5	0.4	0.3	0.4	0.3	0.4	0.5	0.4
Ireland.....	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1
Italy.....	5.9	6.7	6.9	4.8	5.1	5.8	6.0	5.6	6.3	6.6
Netherlands.....	5.4	5.5	5.8	6.4	5.0	2.8	2.3	3.2	2.7	3.2
Portugal.....	0.5	0.4	0.6	0.4	0.4	0.4	0.4	0.2	0.7	0.8
Spain.....	0.0	0.1	0.1	0.0	0.3	0.1	0.1	0.3	1.6	1.8
United Kingdom...	7.8	7.7	7.1	8.2	7.6	7.4	7.0	7.3	7.7	5.3
EFTA.....	*2.4*	*2.6*	*3.0*	*2.4*	*2.4*	*2.2*	*2.3*	*2.7*	*3.4*	*2.6*
Austria.....	0.5	0.5	0.6	0.4	0.5	0.4	0.5	0.5	0.5	0.5
Finland.....	0.2	0.2	0.3	0.2	0.2	0.1	0.1	0.1	0.2	0.1
Norway.....	0.5	0.5	0.6	0.6	0.5	0.4	0.5	0.5	0.6	0.5
Sweden.....	0.3	0.5	0.5	0.3	0.3	0.4	0.4	0.6	0.7	0.5
Switzerland.....	0.9	0.9	1.0	0.9	0.9	0.9	0.8	1.0	1.4	1.0
SOUTH AFRICA.....	0.4	0.4	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0
ASIA.....	28.6	30.5	31.2	30.4	26.3	29.8	31.9	30.3	32.4	33.6
Israel.....	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.0
Japan.....	28.6	30.5	31.1	30.3	26.2	29.8	31.9	30.3	32.3	33.6
OCEANIA.....	0.3	0.3	0.4	0.3	0.3	0.2	0.5	0.4	0.5	0.5
Australia.....	0.0	0.0	0.2	0.1	0.1	0.1	0.3	0.3	0.4	0.3
New Zealand.....	0.3	0.3	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.2
DEVELOPING COUNTRIES AND TERRITORIES.....	12.6	12.9	13.3	15.4	14.7	16.3	17.8	18.4	36.8	34.2
AMERICA.....	1.9	2.5	2.5	2.5	2.4	2.5	3.0	3.4	4.2	3.1
Argentina.....	0.7	1.0	0.7	0.6	1.0	0.9	0.9	0.5	1.3	0.7
Chile.....	0.3	0.3	0.4	0.3	0.2	0.2	0.5	0.6	1.1	1.0
Colombia.....	0.2	0.4	0.4	0.4	0.4	0.2	0.3	0.4	0.3	0.2
Mexico.....	0.3	0.4	0.2	0.5	0.4	0.5	0.4	0.3	0.3	0.3
Peru	0.1	0.1	0.4	0.4	0.2	0.4	0.3	0.6	0.4	

TABLE A11: QUANTITY OF IMPORTS OF TIN METAL (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
AFRICA.....	0.7	0.7	0.5	0.5	0.6	0.7	0.7	1.0	0.7	0.7
Algeria.....	0.2	0.2	0.2	0.2	0.2	0.2	0.6	0.4	0.2	0.3
Egypt.....	0.2	0.2	0.0	0.1	0.2	0.4	0.0	0.4	0.3	0.2
Morocco.....	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.2
Tunisia.....	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ASIA.....	8.2	8.4	9.3	11.4	10.5	12.0	13.0	12.6	30.3	29.3
West Asia.....	1.1	0.7	0.8	1.1	1.1	1.3	1.0	1.1	1.2	1.2
Iran (Islamic Republic of).....	0.4	0.4	0.4	0.4	0.4	0.2	0.0	0.0	0.0	0.0
Saudi Arabia.....	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Turkey.....	0.7	0.3	0.3	0.7	0.7	1.0	0.9	1.0	1.1	1.1
South and South-East Asia.	7.1	7.7	8.5	10.3	9.4	10.7	12.0	11.5	29.1	28.1
Hong Kong.....	1.4	2.0	1.7	1.8	1.5	1.7	1.9	4.0	3.6	4.7
India.....	1.2	1.2	1.5	2.4	1.9	2.1	2.3	2.3	3.1	2.7
Malaysia.....	0.4	0.3	0.3	0.6	1.0	1.1	0.9	0.8	0.6	0.3
Pakistan.....	0.1	0.4	0.2	0.2	0.0	0.0	0.0	0.1	0.6	0.6
Philippines.....	0.8	0.8	0.4	0.4	0.4	0.7	0.7	0.4	0.5	0.5
Republic of Korea.	1.5	1.4	1.2	2.1	2.1	2.2	2.4	1.6	3.8	4.3
Singapore.....	1.7	1.6	2.6	1.7	1.5	1.5	2.3	1.1	12.7	11.0
Taiwan.....	0.0	0.0	0.6	1.1	1.0	1.4	1.5	1.2	4.2	4.0
EUROPE.....	1.8	1.3	1.0	1.0	1.2	1.1	1.1	1.4	1.6	1.1
Yugoslavia.....	1.8	1.3	1.0	1.0	1.2	1.1	1.1	1.4	1.6	1.1
SOCIALIST COUNTRIES OF EASTERN EUROPE...	27.9	25.0	27.3	25.3	25.0	24.7	24.2	22.8	24.9	21.9
Bulgaria.....	0.5	0.6	0.9	1.0	1.0	0.5	0.9	1.0	1.0	1.0
Czechoslovakia....	3.9	2.0	4.1	3.6	3.1	2.9	2.9	3.1	3.2	2.8
Hungary.....	1.7	1.7	1.7	1.4	1.8	2.1	1.7	1.3	1.4	1.7
Poland.....	4.6	3.9	3.3	2.2	4.6	4.4	3.6	3.0	3.6	2.7
Romania.....	3.1	3.1	3.1	2.8	2.5	2.0	2.0	2.0	1.9	1.9
USSR.....	14.1	13.7	14.2	14.3	12.0	12.8	13.1	12.4	13.8	11.8

Source: UNCTAD secretariat.

TABLE A12: QUANTITY OF EXPORTS OF TIN WASTE AND SCRAP (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	986	,987
WORLD.....	9.4	11.5	10.7	7.2	8.3	7.8	7.8	9.2	8.1	9.6
DEVELOPED MARKET ECONOMY COUNTRIES...	9.2	10.0	9.9	6.6	7.6	5.8	6.7	8.5	7.8	9.2
AMERICA.....	6.3	6.0	7.5	3.8	4.8	3.0	3.3	5.1	2.9	4.5
United States.....	6.3	6.0	7.5	3.8	4.8	3.0	3.3	5.1	2.9	4.5
EUROPE.....	1.8	2.5	2.2	1.9	2.1	2.4	3.3	3.3	3.4	4.2
EEC.....	*1.5*	*2.3*	*2.0*	*1.7*	*1.9*	*2.2*	*3.3*	*3.2*	*3.4*	*4.1*
Belgium-Lux.....	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Denmark.....	0.0	0.5	0.2	0.0	0.0	0.0	0.1	0.2	0.3	0.2
France.....	0.7	0.9	0.9	0.7	0.5	0.3	0.3	0.4	0.3	0.3
Germany,Federal Republic of.....	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.3
Ireland.....	0.0	0.0	0.0	0.2	0.2	0.8	1.4	1.4	1.4	2.1
Italy.....	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.1
Netherlands.....	0.5	0.5	0.4	0.3	0.4	0.2	0.2	0.2	0.2	0.2
Portugal.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Spain.....	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.3
United Kingdom...	0.1	0.0	0.1	^.1	0.4	0.4	0.9	0.5	0.7	0.5
EFTA.....	*0.3*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.0*	*0.1*	*0.0*	*0.1*
Austria.....	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finland.....	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Norway.....	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Switzerland.....	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0
SOUTH AFRICA.....	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
ASIA.....	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Japan.....	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OCEANIA.....	1.1	1.4	0.2	0.8	0.7	0.4	0.1	0.1	1.5	0.5
Australia.....	1.0	1.4	0.2	0.8	0.7	0.4	0.1	0.0	1.4	0.3
New Zealand.....	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2
DEVELOPING COUNTRIES AND TERRITORIES.....	0.2	1.5	0.8	0.6	0.7	2.0	1.1	0.7	0.3	0.4
ASIA.....	0.2	1.5	0.8	0.6	0.7	2.0	1.1	0.7	0.3	0.4
South and South-East Asia.	0.2	1.5	0.8	0.6	0.7	2.0	1.1	0.7	0.3	0.4
Hong Kong.....	0.0	0.0	0.5	0.2	0.1	0.1	0.1	0.1	0.0	0.1
Indonesia.....	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Malaysia.....	0.1	1.0	0.2	0.0	0.4	1.2	0.4	0.5	0.2	0.2
Philippines.....	0.0	0.4	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Singapore.....	0.1	0.1	0.1	0.4	0.2	0.6	0.5	0.1	0.1	0.1

Source: UNCTAD secretariat

TABLE A13: QUANTITY OF IMPORTS OF TIN WASTE AND SCRAP (978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
WORLD.....	4.0	3.7	7.9	9.4	7.3	8.4	5.2	3.2	3.9	4.0
DEVELOPED MARKET ECONOMY COUNTRIES...	4.0	3.3	6.7	7.5	4.8	5.4	4.3	2.6	3.4	3.3
AMERICA.....	0.5	0.6	0.9	2.4	2.8	1.2	1.2	0.7	0.9	1.5
United States.....	0.5	0.6	0.9	2.4	2.8	1.2	1.2	0.7	0.9	1.5
EUROPE.....	3.5	2.7	2.2	1.9	1.9	4.1	2.9	1.8	2.3	1.7
EEC.....	*3.4*	*2.7*	*2.2*	*1.8*	*1.9*	*3.7*	*2.4*	*1.7*	*1.8*	*1.4*
Belgium-Lux.....	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.4	0.3	0.2
Denmark.....	0.2	0.3	0.2	0.1	0.1	0.4	0.1	0.0	0.5	0.0
France.....	0.1	0.1	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Germany,Federal Republic of.....	0.6	0.3	0.3	0.3	0.0	0.0	0.0	0.2	0.3	0.4
Netherlands.....	1.0	0.5	0.4	0.2	0.2	0.2	0.4	0.5	0.4	0.4
United Kingdom...	1.4	1.3	0.9	1.0	1.5	2.9	1.7	0.6	0.3	0.4
EFTA.....	*0.1*	*0.0*	*0.0*	*0.1*	*0.0*	*0.4*	*0.5*	*0.1*	*0.5*	*0.3*
Sweden.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Switzerland.....	0.1	0.0	0.0	0.1	0.0	0.4	0.5	0.0	0.4	0.2
ASIA.....	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.2	0.1
Israel.....	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.2	0.1
OCEANIA.....	0.0	0.0	3.6	3.2	0.1	0.0	0.0	0.0	0.0	0.0
Australia.....	0.0	0.0	3.6	3.2	0.1	0.0	0.0	0.0	0.0	0.0
DEVELOPING COUNTRIES AND TERRITORIES.....	0.0	0.4	1.2	1.9	2.5	3.0	0.9	0.6	0.5	0.7
AMERICA.....	0.0	0.0	0.0	0.2	0.4	0.3	0.5	0.2	0.2	0.2
Mexico.....	0.0	0.0	0.0	0.2	0.4	0.3	0.5	0.2	0.2	0.2
AFRICA.....	0.0	0.1	0.1	0.1	0.2	0.1	0.0	0.0	0.0	0.0
Algeria.....	0.0	0.1	0.1	0.1	0.2	0.1	0.0	0.0	0.0	0.0
ASIA.....	0.0	0.3	1.1	1.6	1.9	2.6	0.4	0.4	0.3	0.5
West Asia.....	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Saudi Arabia.....	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
South and South-East Asia.	0.0	0.3	1.1	1.6	1.8	2.6	0.4	0.4	0.3	0.5
Hong Kong.....	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Malaysia.....	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Singapore.....	0.0	0.2	1.0	1.5	0.6	2.6	0.4	0.3	0.3	0.5
Taiwan.....	0.0	0.0	0.0	0.1	1.1	0.0	0.0	0.0	0.0	0.0

Source: UNCTAD secretariat.

TABLE A14: PRODUCTION OF TIN PLATE (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
WORLD.....	13072.0	13633.9	12996.4	11821.1	11297.9	11064.5	11642.6	10920.5	10762.9	11584.8
DEVELOPED MARKET ECONOMY COUNTRIES...	11360.0	11765.7	11051.2	10226.9	9719.0	9450.8	9850.9	9121.0	8623.8	9229.6
AMERICA.....	4483.3	4681.3	4191.7	3638.7	3097.8	2980.5	2976.2	2602.5	2431.0	2636.7
Canada.....	460.8	444.7	491.8	365.1	385.1	393.7	475.3	387.5	360.0	360.0
United States.....	4022.5	4236.6	3699.9	3273.6	2712.7	2586.8	2500.9	2215.0	2071.0	2276.7
EUROPE.....	4493.5	4562.8	4338.1	4308.2	4380.7	4264.4	4593.4	4319.8	4022.6	4217.2
EEC.....	*4420.5*	*4483.8*	*4258.1*	*4233.2*	*4316.7*	*4194.4*	*4502.4*	*4228.8*	*3932.6*	*4122.2*
Belgium-Lux.....	297.8	331.6	333.5	325.4	276.2	303.3	335.8	302.1	305.1	319.7
France.....	901.8	865.8	914.2	782.0	847.2	771.3	766.5	756.8	796.6	769.5
Germany,Federal Republic of.....	812.6	857.6	962.5	843.1	818.6	722.3	797.5	751.1	773.4	810.4
Greece.....	49.8	39.7	49.2	49.9	40.1	43.7	46.7	42.2	42.9	52.7
Italy.....	387.3	420.9	436.1	374.1	413.2	485.4	485.7	455.9	387.5	449.8
Netherlands.....	472.3	497.6	504.5	513.4	516.6	524.0	565.3	531.6	483.9	496.9
Portugal.....	63.1	60.0	70.0	54.9	65.5	63.3	64.0	45.0	50.0	48.0
Spain.....	309.8	302.5	391.0	414.2	452.0	399.0	519.0	468.0	369.4	400.0
United Kingdom...	1126.0	1108.1	597.1	870.2	887.3	882.1	921.9	876.1	723.8	775.2
EFTA.....	*73.0*	*79.0*	*80.0*	*75.0*	*64.0*	*70.0*	*91.0*	*91.0*	*90.0*	*95.0*
Norway.....	73.0	79.0	80.0	75.0	64.0	70.0	91.0	91.0	90.0	95.0
SOUTH AFRICA.....	244.4	276.3	292.6	271.3	251.4	284.2	266.0	254.2	288.3	302.9
ASIA.....	1810.0	1886.0	1868.8	1665.8	1639.1	1583.7	1654.4	1564.5	1551.9	1722.8
Japan.....	1810.0	1886.0	1868.8	1665.8	1639.1	1583.7	1654.4	1564.5	1551.9	1722.8
OCEANIA.....	328.8	359.3	360.0	342.9	350.0	338.0	360.9	380.0	330.0	350.0
Australia.....	328.8	359.3	360.0	342.9	350.0	338.0	360.9	380.0	330.0	350.0
DEVELOPING COUNTRIES AND TERRITORIES.....	1443.0	1595.2	1678.2	1388.2	1386.9	1391.7	1565.7	1576.5	1910.1	2121.2
AMERICA.....	936.3	1011.6	1026.5	752.4	849.4	711.6	785.5	805.6	979.0	1052.2
Argentina.....	53.0	67.0	40.0	52.0	84.0	100.0	86.0	81.0	84.0	88.0
Brazil.....	501.4	536.8	594.6	403.2	447.9	311.1	378.5	360.9	446.3	499.2
Chile.....	42.8	48.9	45.4	25.8	22.0	37.0	27.0	30.0	36.0	42.0
Colombia.....	56.0	59.0	65.0	50.0	55.0	52.0	54.0	58.0	50.0	60.0
Mexico.....	183.1	177.9	146.5	99.4	124.8	130.0	130.0	147.7	198.3	184.0
Peru.....	30.0	52.0	65.0	52.0	45.7	45.0	40.0	38.0	49.4	64.0
Venezuela.....	70.0	70.0	70.0	70.0	70.0	36.5	70.0	90.0	115.0	115.0
AFRICA.....	24.0	27.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0
Algeria.....	12.0	15.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Egypt.....	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
ASIA.....	482.7	556.6	615.7	599.8	501.5	637.1	709.8	702.3	847.3	951.5

TABLE A14: PRODUCTION OF TIN PLATE (1978-1987)

(Thousand tons)

	1978	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*
West Asia.....	82.2	72.3	74.8	63.1	96.7	98.6	91.9	92.6	95.5	85.6
Turkey.....	82.2	72.3	74.8	63.1	96.7	98.6	91.9	92.6	95.5	85.6
South and South-East Asia.	400.5	484.3	540.9	536.7	404.8	538.5	617.9	609.7	751.8	865.9
India.....	120.0	160.0	200.0	200.0	160.0	160.0	160.0	160.0	160.0	160.0
Indonesia.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	75.0	100.0
Malaysia.....	0.0	0.0	0.0	0.0	11.0	33.8	45.2	64.8	76.7	85.6
Philippines.....	63.6	60.0	59.4	41.4	42.7	103.2	85.4	56.0	90.0	120.0
Republic of Korea.	93.0	134.0	144.0	160.0	97.5	127.7	185.0	185.0	207.0	236.0
Thailand.....	43.9	64.8	69.9	78.8	62.2	73.1	92.0	68.2	104.2	119.3
Taiwan.....	80.0	65.5	67.6	56.5	31.4	40.7	50.3	55.7	38.9	45.0
EUROPE.....	0.0	0.0	0.0	0.0	0.0	7.0	34.4	32.6	47.8	81.5
Yugoslavia.....	0.0	0.0	0.0	0.0	0.0	7.0	34.4	32.6	47.8	81.5
SOCIALIST COUNTRIES OF EASTERN EUROPE...	269.0	273.0	267.0	206.0	192.0	222.0	226.0	223.0	229.0	234.0
Czechoslovakia....	102.0	110.0	105.0	96.0	99.0	102.0	106.0	108.0	111.0	116.0
German Democratic Republic.....	18.0	18.0	18.0	18.0	16.0	18.0	21.0	19.0	21.0	24.0
Hungary.....	10.0	8.0	10.0	10.0	4.0	8.0	7.0	6.0	0.0	0.0
Poland.....	137.0	135.0	132.0	80.0	71.0	92.0	90.0	88.0	95.0	92.0
Romania.....	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

Source: UNCTAD secretariat.

TABLE A15: QUANTITY OF EXPORTS OF TIN PLATE (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
WORLD.....	3251.9	3435.2	3855.0	3330.6	3170.5	3087.6	3163.8	3087.0	3357.9	3648.3
DEVELOPED MARKET ECONOMY COUNTRIES...	3066.2	3223.0	3642.9	3131.0	2965.3	2891.2	2945.2	2857.7	3056.4	3282.1
AMERICA.....	316.5	381.7	627.9	330.2	205.5	154.3	110.2	118.0	187.1	144.2
United States.....	316.5	381.7	627.9	330.2	205.5	154.3	110.2	118.0	187.1	144.2
EUROPE.....	1848.2	1935.6	2029.5	1918.4	1927.0	1876.3	1902.3	1834.5	2026.3	2189.0
EEC.....	*1773.6*	*1860.8*	*1950.9*	*1849.0*	*1856.1*	*1801.5*	*1819.9*	*1742.1*	*1936.3*	*2089.4*
Belgium-Lux.....	204.1	253.6	249.7	232.0	191.3	190.9	228.9	201.9	203.3	232.1
Denmark.....	7.0	7.5	8.7	6.7	5.0	4.0	3.9	3.7	3.6	5.6
France.....	492.7	443.0	516.5	416.6	441.8	419.0	403.2	383.9	454.7	428.5
Germany,Federal Republic of.....	424.7	402.4	502.8	392.6	340.8	348.5	286.6	296.0	332.5	352.5
Greece.....	35.4	12.3	57.3	26.5	37.3	23.2	29.4	17.4	9.7	9.8
Ireland.....	0.4	0.2	0.5	0.0	0.0	0.0	0.1	0.0	0.1	0.2
Italy.....	49.5	35.4	33.8	56.4	60.0	55.8	63.9	88.8	98.8	100.0
Netherlands.....	309.8	356.0	345.4	319.0	333.3	326.7	339.0	336.3	331.2	354.5
Portugal.....	7.2	16.4	13.4	9.6	11.7	22.7	43.8	30.2	27.9	32.1
Spain.....	15.9	89.6	62.6	14[illegible].8	207.8	177.8	188.2	172.1	243.9	261.2
United Kingdom...	226.9	244.4	160.2	247.8	227.1	232.9	232.9	211.8	230.6	312.9
EFTA.....	*74.6*	*74.8*	*78.6*	*69.4*	*70.9*	*74.8*	*82.4*	*92.4*	*90.0*	*99.6*
Austria.....	0.0	1.5	0.2	0.0	0.1	1.1	0.2	0.8	0.2	0.1
Finland.....	0.2	0.1	0.0	0.0	1.9	1.8	0.0	2.2	0.0	0.0
Norway.....	71.4	70.0	74.0	65.8	66.2	70.2	79.8	83.5	83.2	90.5
Sweden.....	2.9	3.1	4.3	3.4	2.6	1.4	2.1	2.0	2.9	3.1
Switzerland.....	0.1	0.1	0.1	0.2	0.1	0.3	0.3	3.9	3.7	5.9
ASIA.....	814.9	834.1	890.0	764.0	702.5	744.2	796.0	799.5	748.2	898.8
Japan.....	814.9	834.1	890.0	764.0	702.5	744.2	796.0	799.5	748.2	898.8
OCEANIA.....	86.6	71.6	95.5	118.4	130.3	116.4	136.7	105.7	94.8	50.1
Australia.....	86.6	71.3	95.4	118.4	130.3	116.4	136.7	105.7	94.8	50.1
New Zealand.....	0.0	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DEVELOPING COUNTRIES AND TERRITORIES.....	42.2	70.2	59.0	48.0	72.2	83.4	105.6	113.0	179.7	249.2
AMERICA.....	10.6	34.5	20.2	9.5	25.9	40.9	37.6	57.1	114.8	121.5
Argentina.....	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.2	0.0
Brazil.....	0.8	17.0	8.5	3.0	22.7	35.3	25.9	44.3	79.9	92.8
Chile.....	3.1	3.0	1.2	1.4	0.0	0.0	0.0	8.8	2.8	3.0
Costa Rica.....	0.9	0.3	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Guatemala.....	0.0	0.0	0.1	0.9	0.2	0.2	0.1	0.0	0.0	0.0
Mexico.....	1.8	6.7	2.3	1.8	1.7	3.4	2.0	0.1	12.2	5.7
Peru.....	0.0	4.6	4.8	0.0	1.3	0.2	0.0	0.0	0.0	0.0
Uruguay.....	0.0	0.0	0.3	0.0	0.0	0.1	0.6	0.1	0.0	0.0
Venezuela	4.0	2.9	2.5	2.3	0.0	1.6	[illegible]	3.7	10.7	[illegible].0

TABLE A15: QUANTITY OF EXPORTS OF TIN PLATE (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
AFRICA.....	0.1	0.3	0.1	0.4	1.1	1.0	4.7	2.6	0.2	3.5
Algeria.....	0.0	0.0	0.0	0.0	0.0	0.0	4.7	0.0	0.1	3.5
Cote d'Ivoire.....	0.1	0.2	0.0	0.1	0.8	0.8	0.0	2.6	0.0	0.0
Kenya.....	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Madagascar.....	0.0	0.1	0.1	0.0	0.2	0.1	0.0	0.0	0.0	0.0
Malawi.....	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Morocco.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Senegal.....	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
ASIA.....	31.4	35.3	38.7	38.1	45.1	41.5	62.5	53.1	60.8	92.9
West Asia.....	2.9	2.4	2.5	4.6	5.7	2.5	1.9	0.3	0.2	0.5
Cyprus.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
Kuwait.....	2.9	2.4	2.5	4.6	5.5	2.5	1.9	0.0	0.0	0.0
Turkey.....	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.2	0.5
South and South-East Asia.	28.5	32.9	36.2	33.5	39.4	39.0	60.6	52.8	60.6	92.4
Hong Kong.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.4
Indonesia.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	10.8
Malaysia.....	0.0	0.4	0.2	0.1	0.6	0.8	0.4	0.8	2.9	3.2
Republic of Korea.	2.6	0.3	3.7	6.4	18.9	31.2	52.4	44.2	46.6	58.2
Singapore.....	25.9	32.1	32.0	26.8	19.8	7.0	7.5	6.3	7.7	14.5
Thailand.....	0.0	0.0	0.0	0.2	0.0	0.0	0.3	1.5	0.1	0.1
Taiwan.....	0.0	0.1	0.3	0.0	0.1	0.0	0.0	0.0	0.0	5.2
EUROPE.....	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.2	3.9	31.3
Yugoslavia.....	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.2	3.9	31.3
OCEANIA.....	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Fiji.....	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
SOCIALIST COUNTRIES OF EASTERN EUROPE...	143.5	142.0	153.1	151.6	133.0	113.0	113.0	116.3	121.8	117.0
Bulgaria.....	16.0	9.0	15.0	13.5	13.0	9.6	8.0	6.9	11.8	7.0
Czechoslovakia....	6.5	6.0	6.0	4.0	5.0	4.4	4.0	5.0	5.0	5.0
Poland.....	0.0	0.0	4.1	0.1	0.0	0.0	0.0	0.4	0.0	0.0
Romania.....	51.0	47.0	38.0	44.0	25.0	9.0	21.0	24.0	25.0	25.0
USSR.....	70.0	80.0	90.0	90.0	90.0	90.0	80.0	80.0	80.0	80.0

Source: UNCTAD secretariat.

TABLE A16: QUANTITY OF IMPORTS OF TIN PLATE (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
WORLD.....	3210.8	3319.9	3777.8	3603.7	3510.6	3393.9	3236.3	3404.4	3406.1	3593.9
DEVELOPED MARKET ECONOMY COUNTRIES...	1325.0	1413.3	1713.5	1487.4	1422.2	1450.7	1586.4	1598.3	1634.4	1679.5
AMERICA.....	342.8	237.0	281.6	267.3	213.7	279.4	335.1	376.5	361.6	336.6
Canada.....	1.4	1.5	1.9	3.7	4.4	2.2	2.2	0.5	4.5	3.0
United States.....	341.4	235.5	279.7	263.6	209.3	277.2	332.9	376.0	357.1	333.6
EUROPE.....	944.3	1135.3	1396.3	1129.8	1097.6	1060.8	1118.7	1113.0	1138.6	1224.3
*EEC.....	*808.5*	*998.4*	*1250.1*	*1012.2*	*989.0*	*955.3*	*1014.3*	*1011.4*	*1033.5*	*1113.3*
Belgium-Lux.....	61.1	64.3	68.9	81.0	94.2	89.9	88.1	89.3	83.3	96.0
Denmark.....	96.5	99.9	104.8	100.9	104.2	104.2	126.7	117.5	114.1	108.2
France.....	90.5	119.2	94.1	105.6	103.4	88.2	88.4	92.1	90.8	102.8
Germany,Federal Republic of.....	120.6	140.1	135.6	147.9	150.5	155.6	185.2	154.7	165.2	168.1
Greece.....	35.2	49.9	54.3	86.8	70.1	75.8	74.9	76.1	58.6	49.4
Ireland.....	4.0	9.2	6.9	7.6	7.2	7.0	7.8	8.0	7.0	7.9
Italy.....	142.2	235.1	285.9	113.7	133.5	154.7	190.3	161.1	142.3	164.4
Netherlands.....	94.3	104.4	120.4	114.9	84.4	60.0	40.0	60.0	43.7	53.5
Portugal.....	11.5	4.4	11.7	17.0	6.0	12.0	18.3	15.0	24.1	18.1
Spain.....	40.0	42.9	65.9	54.1	72.8	75.4	58.2	90.0	154.2	171.7
United Kingdom...	112.6	129.0	301.6	182.7	162.7	132.5	136.4	147.6	150.2	173.2
*EFTA.....	*135.8*	*136.9*	*146.2*	*117.6*	*108.6*	*105.5*	*104.4*	*101.6*	*105.1*	*111.0*
Austria.....	23.3	24.3	23.0	23.1	21.5	25.4	20.5	22.8	22.2	20.4
Finland.....	15.3	16.2	18.7	17.4	15.6	15.3	12.4	11.7	12.6	16.0
Iceland.....	1.2	0.9	1.0	0.7	0.7	0.7	0.9	0.6	0.6	0.6
Norway.....	4.9	4.8	4.8	7.9	7.9	5.9	7.0	6.2	6.2	3.9
Sweden.....	62.4	57.2	64.9	41.0	37.9	32.5	37.0	31.8	35.9	32.9
Switzerland.....	28.7	33.5	33.8	27.5	25.0	25.7	26.6	28.5	27.6	37.2
ASIA.....	0.7	0.3	0.5	51.9	74.9	78.3	80.5	62.8	78.1	87.4
Israel.....	0.7	0.3	0.5	51.9	74.8	77.4	80.2	62.2	74.7	77.6
Japan.....	0.0	0.0	0.0	0.0	0.1	0.9	0.3	0.6	3.4	9.8
OCEANIA.....	37.2	40.7	35.1	38.4	36.0	32.2	52.1	46.0	56.1	31.2
Australia.....	1.3	0.4	0.0	0.2	0.1	0.5	0.6	0.5	9.1	0.5
New Zealand.....	35.9	40.3	35.1	38.2	35.9	31.7	51.5	45.5	47.0	30.7
DEVELOPING COUNTRIES AND TERRITORIES.....	1444.2	1535.8	1616.7	1781.7	1679.6	1513.1	1289.8	1402.3	1332.0	1241.0
AMERICA.....	389.2	423.4	498.4	446.1	369.5	258.8	273.6	229.5	238.7	194.0
Antigua and Barbuda.....	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Argentina.....	21.4	53.4	54.3	28.5	35.8	34.7	15.5	16.3	41.3	30.6
Barbados.....	8.9	0.4	0.2	0.1	0.0	0.1	0.1	0.1	0.3	0.3
Bolivia.....	4.2	4.1	2.8	8.5	3.5	2.3	1.9	1.9	1.5	1.5
Brazil.....	51.7	39.8	47.0	28.9	26.8	15.0	14.2	13.5	17.6	9.4

TABLE A16: QUANTITY OF IMPORTS OF TIN PLATE (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	986	1987
Colombia.....	5.5	6.5	5.2	0.0	2.0	1.3	0.6	0.3	0.8	0.9
Costa Rica.....	14.0	13.3	10.9	7.8	4.9	7.8	10.7	10.0	10.0	10.0
Cuba.....	54.8	47.4	55.8	63.6	46.2	57.5	59.7	69.3	55.3	55.0
Dominica.....	0.2	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ecuador.....	11.9	9.5	8.6	5.1	6.1	4.7	16.3	10.0	10.0	10.0
El Salvador.....	5.3	3.1	3.3	2.1	2.2	2.5	3.1	3.0	3.0	3.0
Guatemala.....	6.0	14.4	7.5	5.5	3.6	4.0	3.8	4.5	5.0	5.0
Guyana.....	0.0	1.2	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Honduras.....	9.4	9.7	7.1	4.5	4.5	7.8	3.1	2.9	3.0	3.0
Jamaica.....	0.4	0.5	0.4	0.4	0.1	0.5	0.5	1.0	1.0	1.0
Mexico.....	115.9	138.8	226.3	208.0	163.2	67.9	95.4	70.2	52.9	24.4
Nicaragua.....	4.3	1.1	2.8	3.4	4.0	4.5	5.2	4.5	4.5	4.5
Paraguay.....	2.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Peru.....	2.7	2.6	6.4	10.6	9.8	4.7	7.4	2.0	3.0	4.0
Uruguay.....	6.0	7.0	6.3	7.4	3.6	3.0	4.4	3.7	6.1	6.9
Venezuela.....	60.8	61.3	43.2	47.4	45.7	34.1	22.1	9.0	10.6	11.0
AFRICA.....	199.9	184.6	237.5	236.4	241.1	219.5	194.2	236.6	187.7	170.2
Algeria.....	28.8	41.4	30.0	41.1	59.4	40.0	33.8	31.7	36.8	20.5
Cote d'Ivoire.....	16.8	26.0	25.8	20.8	22.9	25.7	23.0	24.0	20.0	20.0
Egypt.....	40.8	21.2	31.1	26.4	19.3	43.8	27.9	55.6	31.6	35.3
Ethiopia.....	3.5	1.5	7.2	7.3	4.7	6.0	8.2	5.3	5.0	5.0
Ghana.....	2.9	2.2	2.0	3.1	2.0	2.0	1.0	1.0	1.0	1.0
Kenya.....	23.4	19.2	24.2	48.0	23.3	18.9	18.0	18.0	18.1	19.9
Liberia.....	0.8	0.4	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Madagascar.....	3.0	3.6	2.0	0.9	1.0	0.4	2.0	1.1	0.9	1.0
Malawi.....	0.2	0.4	0.5	0.2	0.3	0.5	0.4	0.3	0.3	0.3
Mali.....	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mauritius.....	1.1	1.1	1.3	1.2	1.2	1.4	1.3	1.3	1.3	1.3
Morocco.....	23.2	23.2	29.8	28.3	32.0	26.3	32.4	36.6	32.5	20.0
Nigeria.....	32.8	23.1	53.1	30.3	38.1	26.0	17.2	30.2	10.8	17.5
Senegal.....	6.2	0.7	1.1	8.4	5.0	5.0	4.0	4.0	4.0	4.0
Sudan.....	3.0	2.6	4.2	4.0	3.0	3.0	3.0	3.0	3.0	3.0
Tunisia.....	5.0	10.0	16.6	13.7	22.9	14.5	16.0	18.5	16.4	15.4
United Republic of Tanzania.....	5.7	5.8	6.2	5.6	5.0	5.0	5.0	5.0	5.0	5.0
Zaire.....	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zambia.....	2.1	2.2	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
ASIA.....	770.4	850.6	787.8	1023.0	1007.3	969.4	780.4	918.3	897.0	871.4
West Asia.....	137.8	112.3	105.3	131.9	136.3	141.1	171.1	168.1	135.3	148.3
Cyprus.....	5.0	4.7	4.8	3.8	5.2	5.6	3.6	5.4	4.7	4.9
Iran (Islamic Republic of).....	88.9	50.3	39.1	60.8	34.9	68.5	89.5	65.9	52.0	34.4
Iraq.....	10.0	10.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Jordan.....	1.4	2.0	2.9	3.5	3.5	3.5	4.0	4.0	4.0	4.0
Kuwait.....	17.5	31.0	17.2	36.5	51.0	18.4	36.2	36.0	36.0	36.0
Syrian Arab Republic.....	7.7	11.6	9.0	7.9	10.4	16.7	10.5	11.0	11.0	11.0
Turkey	7.3	2.7	17.3	4.4	16.3	13.4	12.3	30.8	12.6	43.0

TABLE A16: QUANTITY OF IMPORTS OF TIN PLATE (1978-1987)

(Thousand tons)

	1978	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*
South and South-East Asia.	632.6	738.3	682.5	891.1	871.0	828.3	609.3	750.2	761.7	723.1
Hong Kong.....	55.5	47.7	42.3	47.6	39.3	45.4	42.9	44.9	154.5	154.1
India.....	71.1	64.3	45.0	230.5	250.0	282.3	103.0	189.0	125.5	120.0
Indonesia.....	89.7	116.2	146.8	110.9	114.7	119.1	114.6	137.4	61.7	23.2
Malaysia.....	69.3	81.7	90.2	58.1	57.2	22.6	15.7	11.8	8.9	7.0
Pakistan.....	44.8	75.2	55.0	60.9	64.5	60.2	70.7	82.0	90.5	95.0
Philippines.....	63.9	88.7	93.1	63.7	140.4	75.9	39.5	49.5	43.5	44.0
Republic of Korea.	3.4	1.6	1.4	1.5	5.0	1.5	5.0	3.3	5.8	8.2
Singapore.....	82.4	103.1	98.4	117.3	75.4	69.9	57.3	54.0	80.5	79.7
Sri Lanka.....	4.6	5.4	5.2	4.6	6.0	5.3	3.5	6.3	4.8	5.0
Thailand.....	43.9	65.7	27.1	116.4	41.2	61.1	62.1	67.7	63.5	72.8
Taiwan.....	104.0	88.7	78.0	79.6	77.3	85.0	95.0	104.3	122.5	114.1
EUROPE.....	77.8	74.7	90.2	71.0	58.8	62.4	38.7	14.9	5.6	2.4
Yugoslavia.....	77.8	74.7	90.2	71.0	58.8	62.4	38.7	14.9	5.6	2.4
OCEANIA.....	6.9	2.5	2.8	5.2	2.9	3.0	2.9	3.0	3.0	3.0
Fiji.....	6.9	2.5	2.8	4.7	2.0	3.0	2.9	3.0	3.0	3.0
Papua New Guinea..	0.0	0.0	0.0	0.5	0.9	0.0	0.0	0.0	0.0	0.0
SOCIALIST COUNTRIES OF EASTERN EUROPE...	308.8	209.8	238.8	164.9	157.2	155.7	160.8	169.6	168.3	178.7
Bulgaria.....	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Czechoslovakia....	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
German Democratic Republic.....	25.0	24.0	26.0	24.0	25.0	25.0	27.0	27.0	27.0	27.0
Hungary.....	48.0	45.0	45.0	40.0	42.0	46.0	46.0	53.0	55.0	60.0
Poland.....	0.0	0.0	18.4	7.9	1.2	5.2	14.8	13.6	10.3	15.7
Romania.....	115.0	56.0	53.0	20.0	19.0	11.0	28.0	26.0	26.0	26.0
USSR.....	114.8	84.8	96.4	73.0	70.0	68.5	45.0	50.0	50.0	50.0
SOCIALIST COUNTRIES OF ASIA.....	132.8	161.0	208.8	169.7	251.6	274.4	199.3	234.2	271.4	494.7
China.....	132.8	161.0	208.8	169.7	251.6	274.4	199.3	234.2	271.4	494.7

Source: UNCTAD secretariat.

TABLE A17. QUANTITY OF EXPORTS OF TIN SEMI-MANUFACTURES (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
WORLD	6.4	9.5	8.1	7.6	8.5	9.8	9.6	8.3	14.1	8.9
DEVELOPED MARKET ECONOMY COUNTRIES	3.8	4.4	5.5	5.5	6.6	7.7	6.5	5.8	7.5	5.8
AMERICA	0.3	0.2	0.7	1.9	1.9	3.4	2.3	0.6	1.3	0.9
United States	0.3	0.2	0.7	1.9	1.9	3.4	2.3	0.6	1.3	0.9
EUROPE	2.9	2.6	2.9	2.5	2.7	3.2	3.2	4.3	4.2	4.2
EEC	*2.9*	*2.6*	*2.9*	*2.5*	*2.7*	*3.1*	*3.2*	*4.1*	*4.0*	*4.1*
Belgium-Lux	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.6	0.1	0.1
Denmark	0.2	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0
France	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.1	0.1	0.2
Germany,Federal Republic of	0.7	0.8	0.8	0.7	0.9	1.1	1.1	1.5	1.3	1.3
Ireland	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Italy	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1
Netherlands	0.7	0.7	0.8	0.7	0.8	0.8	0.9	1.0	1.1	0.8
Portugal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Spain	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1
United Kingdom	0.4	0.4	0.6	0.4	0.5	0.6	0.6	0.7	0.9	1.3
EFTA	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.0*	*0.2*	*0.2*	*0.1*
Austria	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Sweden	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1
Switzerland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
ASIA	0.4	1.2	1.2	0.4	1.7	0.7	0.6	0.6	0.4	0.5
Japan	0.4	1.2	1.2	0.4	1.7	0.7	0.6	0.6	0.4	0.5
OCEANIA	0.2	0.4	0.7	0.7	0.3	0.4	0.4	0.3	1.6	0.2
Australia	0.1	0.1	0.7	0.7	0.3	0.3	0.2	0.1	1.4	0.2
New Zealand	0.1	0.3	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.0
DEVELOPING COUNTRIES AND TERRITORIES	2.3	4.8	2.3	1.7	1.4	1.6	2.7	2.2	6.3	2.8
AMERICA	2.2	3.3	1.1	0.3	0.2	0.1	0.1	0.1	0.1	0.1
Brazil	2.1	3.2	1.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0
Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Peru	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
ASIA	0.1	1.5	1.2	1.4	1.2	1.5	2.6	2.1	6.2	2.7
South and South-East Asia	0.1	1.5	1.2	1.4	1.2	1.5	2.6	2.1	6.2	2.7
Hong Kong	0.0	0.9	0.9	0.7	0.6	0.7	0.8	0.5	0.6	1.1
India	0.0	0.0	0.0	0.3	0.2	0.3	0.5	0.1	0.1	0.1
Indonesia	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Malaysia	0.0	0.1	0.0	0.0	0.0	0.1	0.8	0.9	0.6	0.6
Philippines	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0

TABLE A17: QUANTITY OF EXPORTS OF TIN SEMI-MANUFACTURES (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Republic of Korea.	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Singapore.....	0.0	0.4	0.2	0.0	0.1	0.2	0.1	0.1	0.2	0.2
Thailand.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	4.1	0.0
Taiwan.....	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.4	0.6	0.7
SOCIALIST COUNTRIES OF EASTERN EUROPE...	**0.2**	**0.2**	**0.2**	**0.3**	**0.3**	**0.3**	**0.2**	**0.2**	**0.2**	**0.2**
USSR.....	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.2	0.2	0.2
SOCIALIST COUNTRIES OF ASIA.....	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.2**	**0.2**	**0.1**	**0.1**	**0.1**
China.....	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1

Source: UNCTAD secretariat.

TABLE A18: QUANTITY OF IMPORTS OF TIN SEMI-MANUFACTURES (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
WORLD.....	10.8	9.8	9.3	8.5	8.8	8.1	8.5	8.1	9.2	9.4
DEVELOPED MARKET ECONOMY COUNTRIES...	5.4	4.9	5.0	3.6	3.8	3.0	3.9	4.6	5.9	6.0
AMERICA.....	1.9	0.8	0.3	0.3	0.4	0.5	0.5	0.5	0.4	0.6
Canada.....	0.0	0.0	0.1	0.1	0.0	0.2	0.1	0.0	0.1	0.1
United States.....	1.9	0.8	0.2	0.2	0.4	0.3	0.4	0.5	0.3	0.5
EUROPE.....	3.5	4.1	4.7	3.3	3.3	2.3	3.3	3.8	5.0	4.2
EEC.....	*2.7*	*3.2*	*3.6*	*2.4*	*2.3*	*1.4*	*2.4*	*2.9*	*3.9*	*3.0*
Belgium-Lux.....	0.3	0.3	0.2	0.3	0.2	0.3	0.3	0.3	0.4	0.2
Denmark.....	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.3	0.1	0.1
France.....	0.2	0.1	0.2	0.4	0.2	0.1	0.2	0.4	0.2	0.3
Germany,Federal Republic of.....	1.6	1.7	1.5	1.0	1.2	0.2	0.2	0.2	0.1	0.1
Greece.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Ireland.....	0.1	0.2	0.8	0.1	0.1	0.1	0.3	0.4	0.5	0.9
Italy.....	0.2	0.4	0.4	0.2	0.2	0.2	0.3	0.2	0.3	0.4
Netherlands.....	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.2	0.1
Portugal.....	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Spain.....	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.2	0.2
United Kingdom...	0.1	0.1	0.2	0.1	0.1	0.1	0.6	0.6	1.7	0.5
EFTA.....	*0.8*	*0.9*	*1.1*	*0.9*	*1.0*	*0.9*	*0.9*	*0.9*	*1.1*	*1.2*
Austria.....	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.1	0.2	0.3
Finland.....	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.2
Norway.....	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sweden.....	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Switzerland.....	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4
ASIA.....	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.3	0.1
Japan.....	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.3	0.1
OCEANIA.....	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	1.1
Australia.....	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3
New Zealand.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
DEVELOPING COUNTRIES AND TERRITORIES.....	3.6	4.4	4.3	4.9	5.0	5.1	4.6	3.4	3.3	3.4
AMERICA.....	0.2	0.3	0.2	0.3	0.5	0.2	0.4	0.2	0.2	0.2
Chile.....	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Colombia.....	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1
Dominican Republic	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Ecuador.....	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Mexico.....	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Venezuela.....	0.2	0.2	0.1	0.1	0.5	0.2	0.2	0.0	0.0	0.0
AFRICA.....	0.2	0.2	0.2	0.3	0.2	0.2	0.3	0.2	0.3	0.3

TABLE A18: QUANTITY OF IMPORTS OF TIN SEMI-MANUFACTURES (1978-1987)

(Thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Cameroon.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Nigeria.....	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sudan.....	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ASIA.....	1.8	2.6	3.1	3.4	3.3	4.0	3.2	2.7	2.4	2.7
West Asia.....	0.3	0.6	1.1	2.2	1.4	0.6	0.4	0.4	0.4	0.4
Iran (Islamic Republic of).....	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Saudi Arabia.....	0.1	0.5	1.0	2.1	1.3	0.5	0.3	0.3	0.3	0.3
South and South-East Asia.	1.5	2.0	2.0	1.2	1.9	3.4	2.8	2.3	2.0	2.3
Hong Kong.....	0.1	0.3	0.3	0.4	0.6	0.6	0.7	0.9	0.6	0.8
India.....	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.1
Indonesia.....	0.2	0.2	0.2	0.1	0.4	0.1	0.1	0.1	0.0	0.0
Malaysia.....	0.1	0.2	0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.2
Pakistan.....	0.2	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0
Philippines.....	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Republic of Korea.	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.3	0.4
Singapore.....	0.1	0.5	0.2	0.1	0.4	2.0	0.9	0.3	0.3	0.1
Thailand.....	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Taiwan.....	0.7	0.6	0.9	0.4	0.4	0.4	0.4	0.4	0.4	0.7
EUROPE.....	0.2	0.2	0.2	0.3	0.5	0.3	0.3	0.1	0.2	0.0
Malta.....	0.2	0.1	0.2	0.2	0.2	0.1	0.2	0.1	0.2	0.0
Yugoslavia.....	0.0	0.1	0.0	0.1	0.3	0.2	0.1	0.0	0.0	0.0
OCEANIA.....	1.2	1.1	0.6	0.6	0.5	0.4	0.4	0.2	0.2	0.2
Fiji.....	1.2	1.1	0.6	0.6	0.5	0.4	0.4	0.2	0.2	0.2
SOCIALIST COUNTRIES OF EASTERN EUROPE...	1.8	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
German Democratic Republic.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
USSR.....	1.8	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: UNCTAD secretariat.

Table 81

Exports of Tin-in-Concentrates

(000 tons Sn content)

destination / Origin	Latin America and Caribbean		North America		Europe		Japan		Other DME		Other Developing		Socialist countries of Europe and Asia		World	
	1978	1987	1978	1987	1978	1987	1978	1987	1978	1987	1978	1987	1978	1987	1978	1987
Argentina	—	—	—	—	0.6	—	—	—	—	—	—	—	—	—	0.6	—
Bolivia	1.6	0.4	3.8	2.5	8.4	4.8	—	0.5	—	—	—	—	—	.4	13.8	8.3
Peru	—	—	—	3.7	0.9	0.7	—	—	—	—	—	—	—	—	0.9	4.4
Total	1.6	0.5	3.8	6.2	9.9	5.5	—	0.5	—	—	—	—	—	—	15.3	12.7

Source: UNCTAD secretariat

Table B2

Exports of Tin Metal unwrought

(000 Tons)

destination / Origin	Latin America and Caribbean		North America		Europe		Japan		Other DME		Other Developing		Socialist countries of Europe and Asia		World	
	1978	1987	1978	1987	1978	1987	1978	1987	1978	1987	1978	1987	1978	1987	1978	198
Bolivia	1.4	0.8	3.9	0.9E	4.7	—	—	—	—	—	—	—	5.9	0.1	15.9	1.(
Brazil	0.4	0.8	1.3	10.2	—	7.1	—	—	—	—	—	0.3	—	2.7	1.7	21.1
Total	1.8	1.6	5.2	11.1	4.7	7.1	—	—	—	—	—	0.3	5.9	2.8	17.6	22.9

Source: UNCTAD secretariat

Table 83

Exports of Tinplate

(000 tons Sn GW)

destination / Origin	Latin America and Caribbean		North America		Europe		Japan		Other DME		Other Developing		Socialist countries of Europe and Asia		World	
	1978	1987	1978	1987	1978	1987	1978	1987	1978	1987	1978	1987	1978	1987	1978	1987
Brazil	0.8	14.6	0.09	3.3	—	13.4	—	.06	—	.01	—	44.9	—	16.5	0.9	92.8
Chile	3.1		—		—		—		—		—		—		3.1	3.0E
Costa-Rica	0.9	—	—	—	—	—	—	—	—	—	—	—	—	—	0.9	—
Mexico	—		1.8		—		—		—		—		—		1.8	5.7
Venezuela	4.0E	6.5	—	0.8	—	6.8	—	—	—	—	—	1.9	—	8.7	4.0E	24.7
Total	8.8	21.1	1.9	4.1	—	20.1	—	0.6	—	.01	—	46.8	—	25.2	10.7	126.2

Source: UNCTAD secretariat

Table C1
World tin smelters

Country, Company and location	Furnaces			estimated grades of consc. treated	installed capacity	Total (tonnes)
	Reverb	Rotary	electric			
ARGENTINA:						400
Estansa S.A. (Palpala, Jujuy) h/	–	3	–		400	
AUSTRALIA:						4.200
Tolltrock Metal Products (Alexandria), Sydney	1	–	–	71.50% Sn	3.000	
Greenbushes Tin (Greenbushes)	–	–	1	70% Sn	1.200	
BELGIUM						3.000
Metallo-chimique (Beerse)	–	5	–	20–50% Sn	3.000	
BOLIVIA		0				
Empresa Nacional de Fundiciones						29.200
("Alta Ley", Vinto)	4	3v/	–	38.3 % Sn	16.750	
("Baja Ley", Vinto)	1c/	1v/	1	29.74% Sn	6.450	
Fundición d'estaño (Oruro), h/					5.000n	
Fundición Hochet (La Paz) h/					1.000	
BRAZIL						49.200
Paranapanema	–	–	4	62.55% Sn	30.000	
Bera do Brasil (Santo Amaro)	–	–	5	65 % Sn	5.400	
Best Metais e Soldas (Sao Paulo) h/		–	3	65 % Sn	1.200	
CESBRA-Cia. Estanifera do Brasil (Volta Redonda) h/	–	–	10	55–60% Sn	6.600	
Cia. Industrial Amazonense (Manaus) h/	–	–	5	65 % Sn	3.600	
Cia. Industrial Fluminense (Sao Joao del Rei) h/	–	–	4	41 % Sn	2.400 a/	
BURMA:						
Myanma Oil Corp. (Syriam) h/				55 % Sn	1.000	1.000
CHINA, P.R.: h/						14.600
State Tin Enterprise (Gejieu, Yunnan)	6	–	–	40.45% Sn	10.000	
(Liughou, Guangxi)					2.000	
(Pinggui, Guangxi)					1.000	
(Guangzhou, Guangxi)					1.000	
(Limu, Guangxi)					400	
(Hengyang, Hunan)					100	
(Ganjhou, Jiongxi)					100	
(Liepang, Guangxi)					6.000 to	
(Liepang, Guangxi)					12.000 b/	

Table C1
(continued)

Country Company and location	Furnaces			estimated grades of consc. treated	installed capacity	Total (tonnes)
	Reverb	Rotary	electric			
GERMAN D.R.: h/						4.200
VEB Bergbau & Huttenkombinat						
Albert Funk (Freiberg)	3	1	–	10–55 % Sn	4.200	
INDONESIA:						
Peleburan Timah Indonesia				–		26.000
Mentok (Bangka)	4	–	–	71.6 % Sn	26.000	
JAPAN: h/						
Mitsubishi Metal Corp. (Naoshima-cho, Kagawa and Ikuno-cho, Hyogo)	–	–	2	52 % Sn	3.300	
KOREA Rep. of:						4.800
Keymetals Korea (Andong)	2	–	–	40–70% Sn	3.000	
korea Mining & Smelting (Chang-hang)	–	2	1	60–75% Sn	1.800	
MALAYSIA:						120.000a/
Datuk Keramat Smelting (Panang)	5	–	–	62 % Sn	60.000 a/	
Malaysia Smelting Corp. (Butterwolth)	5	–	–	70 % Sn	60.000 a/	
MEXICO:						12.000
Metales Potosi (San Luis Potosi)	–	–	4	39 % Sn	4.800	
Estaño Electro (Tlalnepantla) h/	3	1	–	25–60% Sn	6.000	
Fundidora de Estaño (San Luis Potosi) h/					1.200	
NETHERLANDS:						12.500
Hollandsche Metallurgisch Industrie Billiton (Arnhem)	–	2	–	54.4% Sn	12.500 o/	
NIGERIA:						4.500
Nakeri Smelting(Jos)(1985)	1	–	–	73 % Sn	4.500	
PORTUGAL:						800
Nova Empresa Estañifera de Mangualde (Mangualde)h/					800	
RWANDA:						2.000
Societe Miniere de Rwanda (Kigali) h/	–	–	2	69.33% Sn	2.000	
SINGAPORE:						8.000a/
Kimetal (Jurong Trading Estate) h/	–	–	2	30–74% Sn	8.000 a/	

Table C1
(continued)

Country, Company and location	Furnaces: Reverb	Rotary	electric	estimated grades of consc. treated	installed capacity	Total (tonnes)
SOUTH AFRICA:						3.300
South African Iron & Steel h/ (Vanderbijlpark)	–	–	1	66 % Sn	1.000	
Rooiberg Tin (Rooiberg)h/	–	–	2	18.55% Sn	2.000	
Zaaiplaats Tin Mining (Potgietersrus)	1	–	–	62 % Sn	300	
SPAIN						5.800
Ferroaleaciones Españolas (Medina del Campo)	–	–	5	62 % Sn	3.600	
Minero Metalurgica del Estaño (Madrid) h/					1.000	
Metalurgia de Cubas (Madrid)	–	–	2	60 % Sn	1.200	
THAILAND:						44.120
Thailand Smelting & Refining (Phuket)	4	–	2	70 % Sn	38.000	
Thai Tin Smelter (Bangkok) h/	2	–	–	73 % Sn	1.800	
Lianggiab (Bangkok) h/	1	–	–		360	
Siam Charoen (Prathum Thani) h/	1	–	–		360	
Thai Pioneer Smelter (Phuket) h/					3.600	
UNITED kINGDOM:						23.000
Capper Pass & Son				10–40% Sn	19.000	
(North Ferriby)	3b/	–	1	40–70% Sn	4.000	
USA:						30.000e/
Tex Tin Corp.(Texas City)	–	1	–	15–70% Sn	30.000	
USSR: h/						30.000
State Tin Enterprise (Novosibirsk, Podolsk, Ryazan, Egekhaya, Gora Leningrad, Sherlavoya)						
ZAIRE:						7.000
Zairetain (Manono) h/				65 % Sn	7.000	
ZIMBABWE:						2.000
Kamativi Tin Mines (Kamativi)	–	2	–	59.47% Sn	2.000	

n/– nominal e estimate.
a/– in terms of concentrates
b/– under construction
r/– includes on ones on standby
o/– includes non–tin outputs (solder etc.)
h/– historical data (no notification of change in 1987 recieved)
e/– Siromelt unit
c/– cyclone unit

Source: Tin International, March 1988

Table C2
World Tinplate Production Survey

Company and Plant	Electrolytic Lines ETL	TFS	Dual	HD Pots	Estimated 1986 Output Electro	HD	Installed Capacity Electro	HD	Total (tonnes)
ALGERIA:									90,000
Société Nationale de Sidérurgie (Annaba)	1	–	–	–	*24,000	–	90,000	–	
ARGENTINA:									110,000
Sociedad Mixta Siderurgia Argentina (San Nicolas)	1	–	–	1a/	91,000	–	110,000	–	
AUSTRALIA: Broken Hill Pty (Port Kembla)	2	–	–	–	350,000	–	500,000	–	500,000
BELGIUM:									523,000
S.A. Cockerill-Sambre (Froblatil)	–	–	1	–	183,000	–	290,000	–	
(Flemalle)	1	–	–	–	122,000	–	233,000	–	
BRAZIL:									610,000
Cia. Siderurgica Nac. (Volta Redonda)	3	–	1	–	575,000	–	610,000	–	
BULGARIA:									120,000
Kremikovtzi Iron & Steel (Kremikovtzi)	1	–	–	–		–	120,000	–	
CANADA:									811,465
Dofasco Inc. (Hamilton)	2	–	1	–	300,000	–	425,000	–	
Stelco Inc. (Hamilton)	2	–	1	–	*280,000	–	386,465	–	
CHILE:									88,000
Acero Comercial S.A. (Talcahuano)	1	–	–	–	41,865	–	88,000	–	
COLOMBIA:									60,000
Paz.sa (Medellin)	1	–	–	–	60,300	–	70,000	–	
CZECHOSLOVAKIA:									200,000
Vychodoslovenske Zeleziarne (Kosice)	1	–	–	5			160,000	40,000	
FRANCE:									1,285,000
Carnaud S.A. (Basse-Indre)	1	–	1	–	*280,000	–	380,000	–	
Soc. Lorraine de Laminage Continu (Florange)	1	–	–	–	*252,000	–	280,000	–	
(Thange)	1	–	1	–	*217,000	–	325,000	–	
Union Sidérurgique du Nord et de l'Est de la France (Mardyck)	1	–	–	–	240,000	–	300,000	–	

Table C2 (Continued)

Company and Plant Location	Electrolytic Lines ETL	TFS	Dual	HD Pots	Estimated 1986 Output Electro	HD	Installed Capacity Electro	HD	Total (tonnes)
GERMANY, FEDERAL:									1,569,500
Ewald Giesel KG									
(Letmathe)	2	–	–	–	* 60,000	–	65,000	–	
(Monenlinburg)	–	–	–	3	–	*1,200	–	1,500	
Hoesche Werke AG									
(Dortmund)	1	–	1	–		–	367,000	–	
(Wissen)	1	–	–	5			176,000	20,000	
Rasselstein AG									
(Andernach)	3	–	1	–	650,000	–	940,000	–	
GREECE:									80,000
Hellenic Steel (Diavata)	1	–	–	–	53,500	–	80,000	–	
HUNGARY:									
Metalimpex (Dunaujvaros)				Production discontinued during 1986					
INDIA:									390,000
KR Steelunion (Thane)	–	–	–	1	11,000	–	150,000	–	
Hermes Industries Corp.									
(Bombay)	–	–	–	2a/	–	–	–	–	
Steel Authority of India									
(Rourkela)	1	–	–	–		–	150,000	–	
Tinplate Co. of India									
(Jamshedpur)	–	–	1	1a/	* 52,000	–	90,000	–	
INDONESIA:									130,000
P.T Pelat Timah Nusantara									
(Ciiegon)	1	–	–	–	100,000	–	130,000	–	
ITALY:									805,000
Industrie Cantieri Metallurgici Italiani									
(Naples)	2	–	–	–	* 12,200	–	250,000	–	
Nuova Italsider (Genoa)	2	–	–				432,000	–	
La Magona d'Italia									
(Piombino)	1	–	–	–	*100,000	–	120,000	–	
JAPAN:									2,418,000
Kawasaki Steel (Chiba)	1	1	1	–	437,000	–	540,000	–	
Nippon Kokan K.K.									
(Fukuyama)	1	1	–	–		–	350,000	–	
(Keihin)	1	–	–	–		–	140,000	–	
Nippon Steel Corp.									
(Kawata)	3	2	–	–		–	522,000	–	
(Hirogata)	2	–	–	–		–	276,000	–	
(Nagoya)	1	1	–	–		–	216,000	–	
Toyo Kohan (Kudamatsu)	3	3	–	–		–	504,000	–	
KOREA, SOUTH:									295,000
Dong Yang Tinplate Ind. Co (Pohang)	–	–	1	–	94,500	–	125,000	–	
Dongbu Steel Co. (Inchon)	–	–	1	–	111,000	–	120,000	–	
Sin Hwa Silup Co.(Seoul)	1	–	–	–	* 30,000	–	50,000	–	

Table C2 (continued)

Company and Plant Location	Electrolytic Lines ETL	TFS	Dual	HD Pots	Estimated 1986 Output Electro	HD	Installed Capacity Electro	HD	Total (tonnes)
MALAYSIA:									90,000
Perusahann Sadur Timah Malaysia (Padir Guday	1	–	–	–	* 45,200	–	90,000	–	
MEXICO:									375,000
Altos Hornos de Mexico (Monclova)	3	–	–	–		–	315,000	–	
Hojalata y lamina (Monterrey)	1	–	–	–	12,000	–	60,000	–	
NETHERLANDS:									580,000
Hoogovens Groep BV (Ijmuiden)	3	–	–	–	*560,000	–	580,000	–	
NORWAY:									135,000
A/S Norsk Jerneverk (Bergen)	1	–	–	–	95,000	–	135,000	–	
PERU:									100,000
Empresa Siderurgica del peru (Chimbote)	1	–	–	–	* 40,000	–	100,000	–	
PHILIPPINES									140,000
National Steel Corporation (Rizal	2	–	–	–	120,000	–	140,000	–	
POLAND:									120,000
Impexmetal (Krakow)	1	–	–	–	* 90,000	–	120,000	–	
PORTUGAL:									82,000
Siderurgia Nacional E.P. (Seixal)	1	–	–	1a/	60,000	–	82,000	–	
SOUTH AFRICA:									309,600
S.A. Iron & Steel Industrial Corp. (Vanderbijlpark)	1	–	–	–	289,813		309,600	–	
SPAIN:									625,000
Empresa Nacional Siderurgica (Aviles).	2	–	–	–	*205,000	–	300,000	–	
Altos Hornos de Vizcaya (Echevarri)	2	–	–	–	235,000	–	325,000	–	
TAIWAN:									100,000
Taiwan Machinery Mfg. Corp. (Kaohsiung)	1	–	–	–	45,000	–	100,000	–	
THAILAND:									150,000
Thai Tinplate Mfg. Co. (Samutprkarn)	2	–	1	6a/	* 80,000	–	150,000	–	

Table C2 (Continued)

Company and Plant Location	Electrolytic Lines ETL	TFS	Dual	HD Pots	Estimated 1986 Output Electro	HD	Installed Capacity Electro	HD	Total (tonnes)
TURKEY									100,000
Eregli Iron & Steel Works Co.(Eregli)	1	–	–	–	85,000	–	100,000	–	
UNITED KINGDOM:									1,416,000
British Steel Corp.									
(Ebbw Vale)	3	–	–	–	433,000	–	476,000	–	
(Trostre)	2	1	1	–	415,000	–	425,000	–	
(Velindre)	4	–	–	1	121,000	–	510,000	–	
London Tinning Co. (London)	–	–	–	1	–	1,000	–	5,000	
USA:									5,862,435
Betgkegen Steel									
(Sparros Point)	2	1	–	–		–	900,000	–	
ITV Steel (Aliquippa)	2	–	–	–	380,000	–	400,000	–	
(Indiana Harbor)	1	1	–	–	400,000	–	400,000	–	
California Steel(Fontana)	2	–	1	–		–	370,135	–	
Weirton Steel (Weirton)	2	1	1	–			1,007,400	–	
National Steel (Portage)	1	1	–	–		–	299,400	–	
Thomas Steel Strip Corp. (Warren)	–	–	–	1	–	*1,000	–	4,500	
US Steel Corp.									
(Dravosburg)	2	–	–	–		–		–	
(Fairfield)	2	–	–	–		–		–	
(Fairless)	2	1	–	–		–	2,279,000	–	
(Gary)	3	1	–	–		–		–	
(Pittsburg)	3	–	–	–		–		–	
Wheeling-Pittsburgh (Yorkville)	1	–	1	–		–	202,000	–	
VENEZUELA:									220,000
SVG Siderurgica del Orinoco (Matanzas)	1	–	1	–	115,000	–	220,000	–	
YUGOSLAVIA:									150,000
Hemijska Industrija "Zorka" (Sabac)	1	–	–	–	* 52,000	–	150,000	–	

Notes: a/ Not in production and excluded from installed capacity but miantained on plant inventory

b/ All US figures are in short tons.

*Estimated from 1984/85 figures – no notification of change for 1986.

All figures are rounded to the neares tonne.

Source: Canning international, February 1988

Table C3

Soft solder alloy compositions and areas of usage

Nominal chemical composition(%) Sn		Pb		Sb	Nominal melting point or range(C) Ag	Grade in British Standard Other	Typical uses
100	–	–	–	232	3252	Grade T2	Can side seams. Creep resistant joints. Non-Toxic.
64	Rem	0.6/0.2	–	183-185	219	Grades A, AP)	High grade electrical, electronic and instrument work. Can side seams.
60	Rem	0.5/0.2	–	183-188	219	Grades K, KP)	
50	Rem	0.5	–	183-212	219	Grades F	Sheet metal work and light engineering.
40	Rem	0.4	–	183-234	219	Grades G	General engineering and capillary fittings. Can side seams.
30	Rem	0.3	–	183-255	219	Grades J	Plumber's solder, cable jointing. Motor car radiators.
20	Rem	0.2	–	183-276	219	Grades V	Motor car radiators Electric lamp bases.
10	Rem	0.5	–	267-301		–	Cryogenic equipment. Thin film circuits.
2	Rem	–	–	320-325		–	Can side seams
50	Rem	2.5-3.0	–	185-204	219	Grade B	) Slightly cheaper and
40	Rem	2.0-2.4	–	185-227	219	Grade C	) stronger versions of
30	Rem	1.5-1.8	–	185-248	219	Grade D	) the non-antimonial BS 219 Grades F,G J, but only suitable for use on zinc-free substrates.
62	Rem	0.2	2	178-184	219	Grade 62S	Reduced rate of attack on silver substrates. Higher creep strength than Sn Pb40
95	–	5	–	236-243	219	Grade 95A	(Elevated temperature (applications - resistance to creep.
96.5	–	–	3.5	221	219	Grade 96S	(Elevated temperature (applications - resistance to creep. (Reduced rate of attack on silver substrates. Non-toxic.

Table C3 (Continued)

1 5	97.5 93.5	–	1.5 1.5	–	309–310 296–301	219(1959)Grade1S) 219 Grade 5S)	Equipment operating at either elevated or cryogenic temperatures
30	Rem	–	–	Cd 18	145	219 Grade T	Avoidance of heat damage to insulation and for adjacent joints made with higher m.p. solder.
80	–	–	–	Zn 20	200–270	–	Soldering aluminium.
48	–	–	–	In 52	117	–	Sealing glass and glazed ceramics

Source: International Tin Research Institute