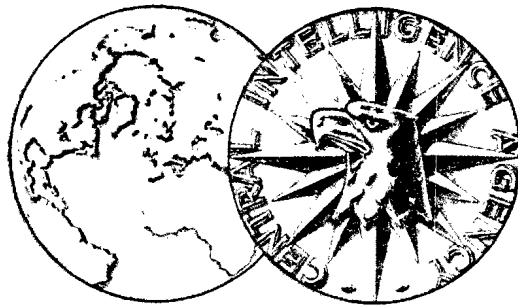


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WORLD TIN SITUATION



SR-27

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A SURVEY OF THE WORLD TIN SITUATION

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Malaya
NEI
Bolivia
Belgian Congo
China

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SUMMARY

The world's major tin-producing areas are the Far East, Bolivia, and Africa. The principal tin-producing countries of the Far East area are Malaya (the Malayan Union), Netherlands East Indies, Siam, China, and Burma, which together accounted for two-thirds of the world's production in 1939. The peak years of world mine production of tin were 1940 and 1941 when 239,000 and 246,000 long tons of tin (metal content of ore) were produced, the years just before the Japanese invasion. The production in Malaya for these two years was 84,000 and 78,000 tons respectively and in the Netherlands East Indies 43,000 and 51,000 tons. Most of the ore mined and concentrated in the Far East was smelted within the area, although some of the concentrates from the Netherlands Indies were shipped to the Arnhem Smelter in Holland and to the United States.

Rehabilitation of the mines, plants, and dredges in the Netherlands Indies has been more rapid than in Malaya and other countries of the Far East, and it is believed that tin production in the Indies will be restored to prewar levels in 1949 and in Malaya possibly a year or two later, depending on the speed at which the dredges can be repaired and equipment replacements obtained. Aside from delay in shipments of new equipment and spares, recovery has been impeded by a coal shortage, and by labor troubles due to the general social and economic disorganization to which the shortage of rice has considerably contributed.

Bolivia now ranks second in importance as a tin-producing country, although in prewar years it ranked third, and its economic well-being is dependent on exports of tin which constitute about 80 percent of its export trade. All Bolivian production of tin concentrates has in recent years been shipped to the United Kingdom and the United States for smelting. Prior to World War II about 75 percent of the tin exports went to England and the balance to Belgium, Holland, and Germany. Bolivia's production is now the chief source for supplying the Longhorn smelter at Texas City, Texas, but the exports to the United States fall short of smelter capacity.

Bolivia's peak production in recent years was 42,500 long tons (tin content of concentrates) in 1945, but dropped to 37,700 in 1946 and to 33,259 in 1947. The average annual tin production for the 5-year war period of 1941 to 1945 was 40,500 long tons. If labor troubles can be avoided and the present price* of 90 cents per pound f.o.b. vessels at South American ports can be maintained, it is believed that Bolivia's annual rate of exports of tin should increase substantially in 1948 over 1947.

An agreement for the purchase of 8,000 tons of Bolivian tin per year, in the form of concentrates, for five years was signed early in March 1947, between Bolivia

* Subsequent to this writing the price was increased to 99 cents f. o. b. vessels at South American ports.

Note: The information in this paper is as of April 1948.

The intelligence organizations of the Departments of State, Army, Navy, and the Air Force have concurred in this report.

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and Argentina and ratified in October. As yet there have been no shipments made, for negotiations as to the method of payment were still continuing in March 1948. If Argentina intends to use the Bolivian tin for a domestic industry in the near future, the concentrates would have to be shipped to the United States or United Kingdom for smelting as Argentine facilities are totally inadequate for the handling of such a tonnage. Plans for the erection of additional smelting facilities, however, are under consideration. It is possible that the Argentine government may be considering this purchase of relatively large tonnage for stockpiling purposes.

The two most important tin-producing countries in Africa are Nigeria and the Belgian Congo. Nigeria's tin production in 1939 was 9,567 long tons and during the war it was maintained well above 10,000 tons each year with a peak production of 12,883 tons in 1945. All Nigerian production of tin concentrates is exported to smelters in England for reduction to metal.

The importance of the Belgian Congo during the war was brought out by the fact that the mine production of tin increased from 7,140 long tons in 1939 to 17,070 in 1945, most of which was exported to the United States in the form of concentrates and metal. Exports of tin from the Belgian Congo to the United States for the 5-year period, 1941 to 1945, amounted to 50,000 tons of metal, and 19,000 tons of tin in concentrates for the period 1943 to 1945 inclusive. The production of tin in the Congo may decline at the less remunerative mines depending on the world market and economic factors. The principal tin smelter in the Belgian Congo is at Manono with a rated annual capacity of 10,500 long tons of refined tin.

The production of tin in the USSR falls far short of domestic requirements, although active search for tin in recent years has disclosed several tin-bearing deposits. Most of these deposits are low grade, difficult of access, and will need greatly improved transportation facilities for their economic exploitation. According to captured German documents the production of tin increased during the war to 7,500 tons in 1944, but it is not believed that there has been any increase in mine production since the termination of hostilities. It is believed that essential requirements of tin are at present less and that production of tin in the USSR may be estimated at about one-half of domestic needs.

The ore reserves of tin are limited and a much greater tonnage of ore will have to be developed before the USSR may be considered to have attained any semblance of self-sufficiency with respect to tin.

The mine production of other countries is discussed under tin production for the individual countries.

The total world's ore reserves have been estimated at 6,541,000 tons of contained tin, of which Malaya, China, Netherlands East Indies, Siam, and Burma of the Far East account for 78 percent. Bolivia and the Belgian Congo each account for about 7.7 percent, Nigeria 3.8, and all other countries about 3.0 percent. It is not difficult to note from the above where lies the largest source of supply and how important it is to get the mines in the Far East rehabilitated and back to normal prewar production. For the world's ore reserves see Table A of Appendix A.

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In contrast to the tin-producing areas, tin is not produced in appreciable amounts in any important industrial country. The United Kingdom imports its tin primarily in the form of concentrates, and prior to the war the United States imported refined tin largely from the Far East and United Kingdom. These two countries together consumed about 60 percent of the world's output of virgin metal. Now that the United States has its own tin smelter, it produces more refined tin from Bolivian concentrates than it imports as metal, but it will undoubtedly increase its imports of metal from the Far East and other sources when production of refined tin is again made available.

The Longhorn smelter at Texas City is operated by the Tin Processing Corporation. Its capacity was originally designed for 18,000 tons of fine tin per year, but was subsequently increased to 74,000 tons which has never been reached, owing to the low grade of Bolivian concentrates. Congress has extended the government's authority to operate the smelter until 30 June 1949, with a proviso that Congress make a thorough study of the advisability of maintaining a domestic tin-smelting industry on a permanent basis. Considering the present world tin shortage, it would seem highly essential to continue the operation of the Texas Smelter, especially in case our source of supply, other than Bolivia, were cut off.

The United States is entirely dependent on foreign sources for its supply of tin and is the world's largest consumer of tin. The most important and largest source of world supply is found in the Far East, and if this source of supply should be cut off from the United States and the United Kingdom, the only other sources would be Africa and Bolivia. Of course, if the Far East should be cut off from the United Kingdom, Britain's demands on the Belgian Congo and Nigeria would be greater, which would no doubt curtail shipments to the United States. It, therefore, stands to reason that the United States should stockpile sufficient tin to fill its requirements for at least two or three years, because of the great distances to principal producing areas and largest ore reserves.

Note: All tonnage figures in this report are long tons unless otherwise indicated.

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TIN SUPPLY AND ITS CONSERVATION DURING WORLD WAR II

The procurement of tin for stockpile purposes was relatively small in the United States until after the passage of the Strategic Materials Act in June 1940 which authorized purchases by the Reconstruction Finance Corporation. By the end of 1941 the Government owned 23,245 long tons of tin contained in ore and concentrates and 50,039 long tons of metal, of which the Reconstruction Finance Corporation held 42,606 tons, the Treasury Procurement 5,478 tons for the strategic stockpile, and the Navy Department 1,055 tons.

Events following Pearl Harbor necessitated prompt and drastic reduction in the use of tin. On 17 December 1941, an order was issued placing tin under full allocation control which forbade the fabrication, sale, transfer or disposal of tin except as authorized by the Director of Priorities. Subsequently, supplementary conservation orders and regulations were issued. In fact, throughout the war the orders were frequently modified or amended to effect more restricted regulations and were extended through auxiliary limitation and conservation orders to stop lesser loopholes in the restraining program. The effectiveness of these orders was demonstrated by the fact that consumption of primary tin declined from 103,086 tons in 1941 to 46,253 tons in 1943. Toward the end of the war restrictions were slightly relaxed and 55,642 tons of primary tin were consumed in 1945.

Conservation was generally effected in three ways: (1) through prohibition or nearly complete prohibition of tin for use in certain items, such as foil for packaging or decorative purposes, collapsible tubes, and jewelry. (2) A second method was by reducing the tin content of alloys and tin plate, such as solders, bronzes, and bearing metals. The greatest saving in this field was obtained by reducing the thickness in tin plate coating for many uses. Part of this saving was accomplished through specification control and part through the introduction of electrolytic plating which made it possible to produce tin plate with coatings of 0.5 pounds per base box and less as against 1.0 to 1.5 pounds by dipping. This type of plate was suitable for many applications and as it became available its use was specified whenever possible. It has been stated that industrial research has made it possible to produce 26 billion cans in 1947 with 40 percent less tin than was consumed in 1941 in making 25 billion cans; electrolytic tin plate, low tin content solders, and other research developments, in metal can production alone, will have saved some 80,000 tons of tin during the six years ended December 31, 1947. (3) A third method of conservation was through substitution. In this field the displacement of metal by glass containers, partly as a result of concurrent limitations on steel, was the most important factor. Fiber containers found increasing uses as well as chemically treated plate for certain cans.

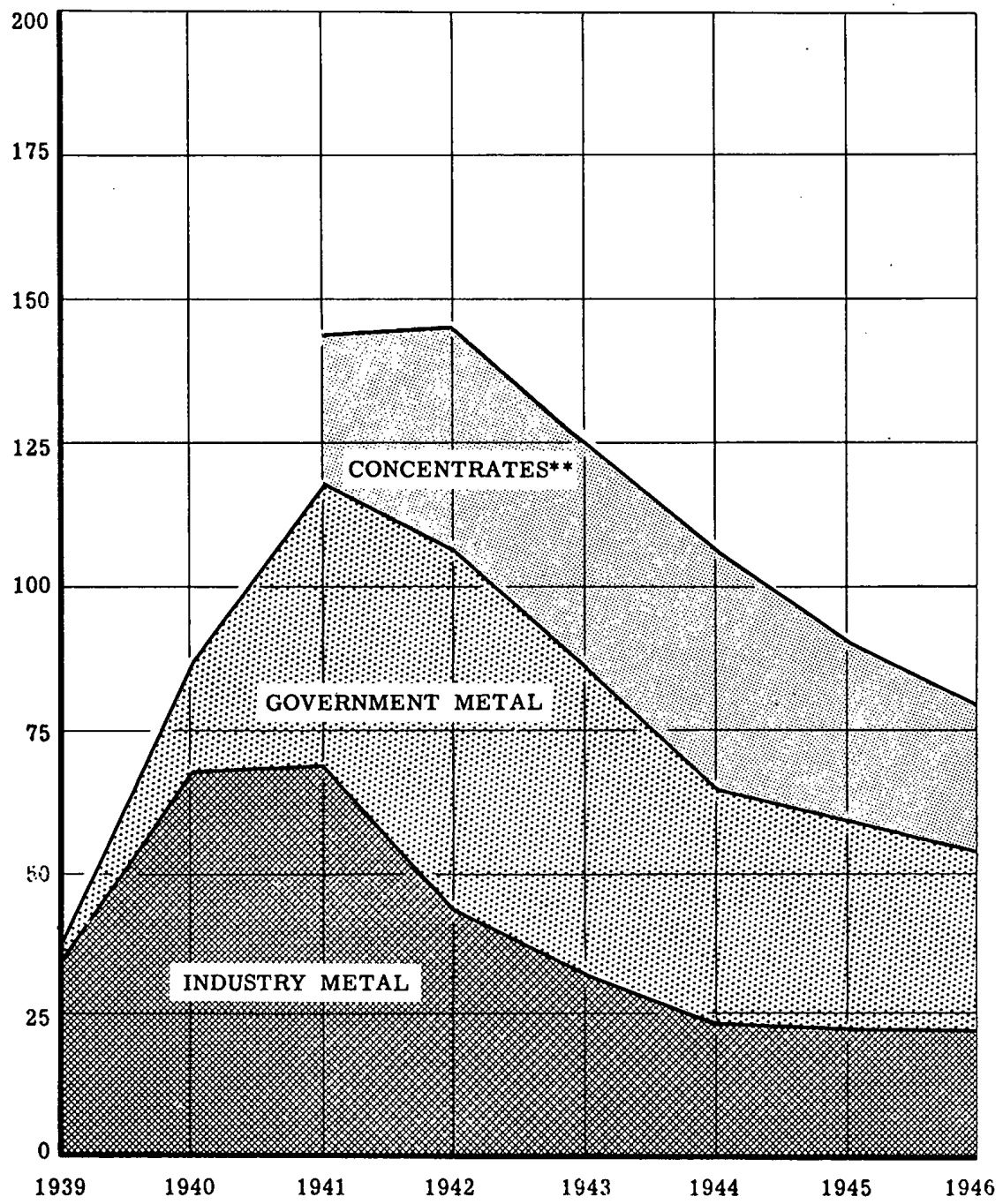
As a result of distribution and conservation controls, at no time during the war period was any war or essential civilian program held up for lack of tin. It must be remembered, however, that the United States had a fairly good supply of tin in the form of metal and concentrates when it entered the war and was able to acquire

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STOCKS OF TIN METAL AND CONCENTRATES (Metal Content) IN THE UNITED STATES* 1939-1940

THOUSANDS OF LONG TONS



* End of year.

** Mostly Government. Data prior to December 1941 are not available.

Source: U.S. Department of Commerce.

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additional supplies from the Far East before they were cut off by Japan, and from the Belgian Congo and Bolivia. Should our sources of supply from the Far East as well as from the Belgian Congo be cut off, our only source of supply would be Bolivia. Our supplies at present are none too plentiful and it stands to reason that the United States should build up and maintain a stockpile of tin to meet its needs for a period of at least two or three years. Stocks of tin metal and concentrates (metal content) in the United States for the years 1939 to 1946 are indicated by the chart on page 2.

According to the Department of Commerce, stocks of tin at the end of 1947 are given as follows:

	LONG TONS (TIN CONTENT)
Government: ¹	
Concentrate	19,282
Pig	24,555
Industrial:	
Pig	14,438
Other	9,112
	<hr/>
TOTAL	67,387

¹ Does not include strategic stockpile.

During the war, supplies of both tin metal and concentrates available to the United Nations were allocated by the Combined Raw Materials Board. When that Board was discontinued at the end of 1945, the United States, United Kingdom, France, Belgium, and the Netherlands established the Combined Tin Committee to allocate the pig tin exportable surpluses of the world's major producers among consuming countries. Concentrates are no longer allocated. Certain countries with smelters, such as the United Kingdom and Malaya for example, produce more pig than they consume. To insure an equitable distribution, their surplus of pig tin is allocated to those countries where smelters are lacking or are not producing enough pig tin to meet their respective requirements, such as the United States. The allocations to different countries for 1947 have totaled about 57,000 tons of pig tin over half of which was allocated to the United States.

The imports of tin into the United States by country of origin for the years 1939 to 1947 are given in Table 1.

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TABLE 1—IMPORTS OF TIN INTO THE UNITED STATES BY COUNTRY OF ORIGIN

(In long tons)

	1939	1940	1941	1942	1943	1944	1945	1946	1947
<i>Concentrates</i> ¹									
Argentina	..	..	1,609	..	..	60	..	..	..
Belgian Congo	..	..	..	..	4,094	7,549	7,401	7,214	350
Bolivia	..	..	20,514	20,750	21,048	27,701	25,984	28,566	22,967
French Cameroons	..	..	179	161	283	177	129	58	..
Mexico	..	..	114	45	212	61	13	..	..
Netherlands East Indies	..	..	6,220	7,977	..	..	..	2,206	4,894
Siam (Thailand)	..	..	..	..	..	..	..	..	2,280
Other	500 ²	3,000 ²	34	..	8	..	2	72	12
Total	500	3,000	28,670	28,933	25,645	35,548	33,529	38,116	30,503
<i>Metal</i>									
Belgian Congo	100	4,899	11,030	11,225	11,550	10,000	6,494	628	4,550
British Malaya	46,785	96,454	104,872	7,791	5	..	..	..	12,440
China	3,259	3,889	2,845	3,625	..	3,338	1,946	..	2,607
Netherlands									
East Indies	5,316	12,101	17,739	3,922	..	..	..	1,847	..
Portugal	25	104	..	99	364	..	..	9	..
United Kingdom	10,698	4,851	3,641	87	..	..	..	4,208	246
Other	3,719	2,512	746	4	111	..	973	24	13,849 ³
Total	70,102	124,810	140,873	26,753	12,030	13,338	9,413	6,716	33,692

¹ The above figures of imports of concentrates are on a tin-content basis. The amount of actually recoverable refined tin will be less because of treatment and smelting losses.

² Imports of tin concentrates came largely from Bolivia and were consigned for treatment in private plants in this country.

³ Japan 9,820 tons; Siam 4,029 tons.

SOURCE: Department of Commerce.

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TABLE 2—CONSUMPTION OF TIN IN THE UNITED STATES

Product	1939			1940			1941			194	
	Pri- mary	Second- ary	Total	Pri- mary	Second- ary	Total	Pri- mary	Second- ary	Total	Pri- mary	Seco ary
Tin plate	36,640 ¹	1	36,640	38,674 ¹	1	38,674	44,854 ¹	1	44,854	28,522	
Terneplate	317	1,137	1,454	455	1,058	1,513	917	1,129	2,046	339	5
Solder	9,578	7,701	17,279	10,222	8,797	19,019	18,084	10,141	28,225	7,228	6,6
Babbitt	3,850	1,598	5,448	4,473	3,173	7,646	7,495	3,104	10,599	3,195	2,9
Bronze and Brass	3,385	3,051	6,436	5,444	9,216	14,660	10,067	13,103	23,170	10,646	17,0
Collapsible tubes	3,507	2	3,507	3,512	2	3,512	4,233	212	4,445	1,048	1
Tinning	2,165	172	2,337	2,455	265	2,720	3,987	145	4,132	2,764	2
Foil	2,001	2	2,001	1,713	..	1,713	4,292	..	4,292	576	
Chemicals (other than tin oxide)	167	288	455	52	330	382 ²	280	690	970	36	2
Pipe and Tubing	606	2	606	661	2	661	1,325	2	1,325	143	
Tin oxide	651	359	1,010	651	506	1,157	995	495	1,490	84	
Type metal	149	990	1,139	84	1,048	1,132	287	1,528	1,815	40	1,1
Galvanizing	1,028	..	1,028	963	..	963	863	104	967	82	
Bar tin	1,100	241	1,341	1,000	91	1,091	1,526	607	2,133	601	1,1
Misc. alloys	404	45	449	353	11	364	480	137	617	558	2
White metal	466	42	508	953	83	1,036	2,463 ³	98 ³	2,561	83 ⁴	1,1
Miscellaneous	569	221	790	659	262	911	938	116	1,054	343	
Total	66,583	15,845	82,428	72,324	24,830	97,154	103,086	31,609	134,695	56,288	29,3

¹ Includes small quantity of pig tin derived from detinning operations.

² Small quantity included under "Miscellaneous."

³ Includes 454 tons of primary and 20 of secondary.

⁴ Includes 9 tons of primary and 2 of secondary for Britannia ware and 2 tons of primary for pewter.

⁵ Includes 5 tons of secondary for pewter.

⁶ Includes "Miscellaneous."

⁷ Included under "Chemicals."

SOURCE: U. S. Bureau of Mines.

TABLE 2A — CONSUMPTION OF TIN IN PRODUCTS (TIN CONT

PRODUCT	194
Tin plate and terneplate	
Solder	
Babbitt	
Bronze and Brass	
Collapsible tubes	
Tinning	
Foil	
Chemicals (other than tin oxide)	
Pipe and Tubing	
Tin oxide	
Type metal	
Miscellaneous	
TOTAL	

¹ Other and unclassified.

² Includes about 3,000 tons of secondary pig fro

SOURCE: Department of Commerce.

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CONSUMPTION AND USES

The present shortage of tin is the direct outgrowth of the wartime devastation of Far Eastern producing areas. On current evidence, this shortage will continue for some time. Domestic requirements of tin for the year 1948 are estimated at approximately 90,000 tons under restrictions now in force.

World supply estimates made public by the inter-governmental Tin Study Group in Brussels in April 1947, indicate that current supplies of tin will fall short of demand at least until some time in 1949, and for that reason tin will probably continue to be allocated. The United States normally consumes about one-half of the world's total output of tin, but is entirely dependent on foreign sources.

Although tin is not used directly in the production of steel, its consumption is closely linked with the steel industry. The largest use of tin is in the production of tin plate, that is, steel sheets covered with a layer of tin as a protective coating, the major part of which is in tin containers needed for packaging food. A small amount is used to put a lead-tin coating on steel in the manufacture of terne plate. Its use for plating steel, in solder, and in bearing alloys for use in machines made of steel accounts for about 60 percent of the tin consumption. Solder, bearing metal, and bronze account for the bulk of the metal used in alloy form, with lesser amounts in die casting alloys and similar combinations. Other uses are in collapsible tubes, type metal, foil, and other products. A small percentage of the total consumption is in industrial uses in the form of chemical compounds as oxide and chloride.

There are few direct military uses, but on the other hand, war demand considerably increases the consumption of tin in many of its ordinary industrial uses, particularly tin containers, solder, and bearing metal. Such uses as we find of tin in military equipment are simply adaptations of the ordinary industrial uses, applied to products that happen to be of a military character.

The total consumption of tin in the United States by finished products is given in Table 2 and Table 2A for the years 1939 to 1947.

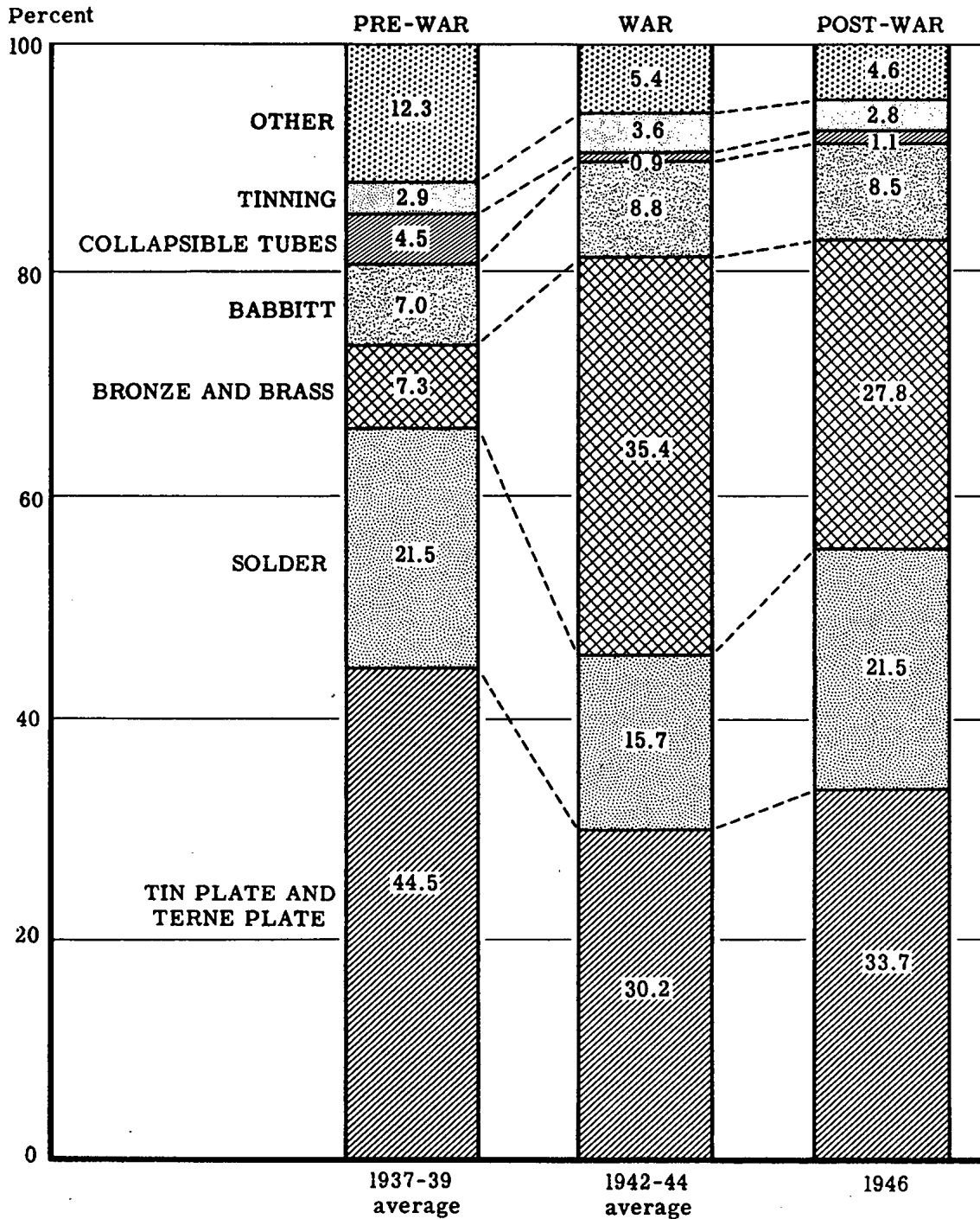
From these tables it will be noted that the proportion of tin used in tin plate during the years 1939, 1940, and 1941 was much greater than during the years following when restrictions were in effect. On the other hand, a larger proportion was used in alloys of bronze and brass during the war period because of greater requirements by the military services. As long as tin is in short supply and restrictions remain in force, the free use of tin for certain finished products will continue to be limited. The accompanying chart indicates the consumption of primary and secondary tin in the United States by finished products (tin content) for selected periods 1937 to 1946.

Table 3 gives some idea of the apparent consumption of tin in the leading countries from 1939 to 1947 in long tons.

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**CONSUMPTION OF PRIMARY AND SECONDARY TIN IN
THE UNITED STATES BY FINISHED PRODUCTS (TIN CONTENT)
FOR SELECTED PERIODS DURING 1937-46**



Source: Basic data from Bureau of Mines, U. S. Department of Interior
and U. S. Department of Commerce.

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TABLE 3—APPARENT TIN CONSUMPTION, LONG TONS

	1939	1940	1941	1942	1943	1944	1945	1946	1947
<i>Africa</i>									
Egypt	342	529	508	681	93	384	358	450	438
Union of S. Africa	642	796	660	450	800 ¹	1,127	931	823	1,200
Other ²	185	330	140	83	187	498	138	74	237
Total	1,169	1,655	1,308	1,214	1,080	2,009	1,427	1,347	1,875
<i>North and South America</i>									
Argentina	1,734	2,065	2,172	1,234	792	992	464	500 ¹	900
Brazil	1,260	902	1,589	526	231	407	515	850 ¹	600
Canada	2,601	5,285	7,814	3,769	1,521	1,428	3,300	3,300	4,920
Chile	130	252	345	279	40	81	88	150 ²	180
United States ³	66,583	72,324	103,086	56,288	46,253	59,156	55,642	54,627	63,078
Other ²	380	476	633	332	147	365	337	413	668
Total	72,688	81,304	115,639	62,428	48,984	62,429	60,346	59,840	70,346
<i>Asia</i>									
China	400 ¹	400 ¹	400 ¹	..	..	..	..	..	..
India	3,524	2,772	4,203	..	..	..	..	2,900 ²	5,160
Japan	11,184	10,800	9,500	11,000	13,000	11,000	3,150	..	1,800
Netherlands E. Indies	650	500 ¹	300 ¹	..	..	..	..	..	..
Turkey	266	790	515	178	94	402	450	450	480
Other ²	284	417	103	107	126	230	200	352	436
Total	16,308	15,679	15,021	11,285	13,220	11,632	3,800	3,702	7,876
<i>Europe</i>									
Belgium	1,217	697	..	..	40	17	1,200 ¹	1,500 ¹	1,800
Czechoslovakia	853	375	3	..	..	..	..	500 ¹	1,824
Denmark	1,236	523	124	81	85	58	228	777	522
Finland	299	185	42	115	65	38	15	347	162
France	7,726	11,785	945	..	34	..	3,171	5,500 ¹	7,800
Germany	11,000 ¹	2,560	1,600	1,700	1,840	100	..	..	300
Hungary	633	477	19	166	9	51	..	93	360
Italy	3,716	3,942	1,575	1,903	1,687	..	..	660 ¹	3,600
Netherlands	1,220	400 ¹	..	..	..	..	1,000 ¹	1,500 ¹	1,860
Norway	674	567	70	29	9	1	272	545	420
Poland	1,200 ¹	..	..	..	..	..	6 ¹	500 ^{1,2}	880
Portugal	270 ¹	270 ¹	270 ¹	270 ¹	270 ¹	270 ¹	250 ¹	250 ¹	5
Roumania	283	386	15	67	115	89	..	..	5
Spain	854 ¹	1,066	786	110	406	508	600	600 ¹	5
Sweden	2,917	2,118	..	..	51	51	365	568	1,242
Switzerland	1,101	1,360	306	280	117	62	65	628	1,200
United Kingdom ⁴	27,279	29,225	30,000 ¹	23,478	17,631	18,435	16,396	25,606	27,384
Yugoslavia	472	..	..	..	..	..	..	..	588
Other	382	370	97	149	105	71	193	140	870
Total	63,332	56,306	35,852	28,348	22,464	19,751	23,671	39,714	51,790 ¹
Australia	2,272	2,616	3,095	3,012	2,338	2,049	1,991	2,000 ¹	2,160
New Zealand	338	543	585	20	424	430	250	250	480
Total	2,610	3,159	3,680	3,032	2,762	2,479	2,241	2,250	2,640
Total World	162,000	160,000	171,500	115,500	100,500	99,500	96,200	110,700	131,400

¹ Estimates.² Imports of country in question as shown from the trade returns of other countries exporting to it.³ 1939-46 Source: Bureau of Mines.⁴ As from 1942: Ministry of Supply, showing actual consumption.⁵ Not available.

NOTE: USSR is not included. See Section covering USSR. Most figures for 1947 are approximations which will undoubtedly be corrected at the meeting of the International Tin Study Group to be held in Washington during April.

SOURCE: Statistical Bulletin of the International Tin Study Group.

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At the international meeting in Brussels (April 1947) the Tin Study Group estimated that the quantity of tin likely to be available for consumption in 1947 would be between 140,000 and 150,000 tons, provided present restrictions were continued. The actual available tonnage, however, was approximately 135,000 tons.

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WORLD MINE PRODUCTION OF TIN

The principal tin ore deposits are located in remote areas of the world. The most important producing area includes the Asiatic countries of Malaya, Netherlands East Indies, China, Siam (Thailand), and Burma, while Bolivia is the major producing country of the Western Hemisphere. The Belgian Congo and Nigeria were important producing countries during World War II, the former increasing production of 7,140 long tons in 1939 to over 17,000 tons in 1945.

Other important countries, but with relatively smaller production, are England (Cornwall), Portugal, Spain, Argentina, Indochina, Japan, and Australia. The production of tin from each of these countries ranges from about 1,000 to 3,500 tons per year. Countries producing a few hundred tons annually are Mexico, Canada, the French Cameroons, Union of South Africa, Southern Rhodesia, and Uganda.

In 1939 the Malay States produced 27 percent of the world's production while the Netherlands East Indies accounted for 16 percent, Siam 10 percent, China 8.7 percent, and Burma about 5 percent. Including Indochina and Japan, the production of tin from all the Asiatic countries in 1939 represented over two-thirds of the world's production.

About 80 percent of the Bolivian tin output comes from the mines owned by the three large operating companies of Patiño, Hochschild, and Aramayo. The balance comes from relatively smaller companies. In 1939 the exports of 27,211 tons of tin in concentrates accounted for about 15.8 percent of the world's production, but this tonnage was considerably increased during the war years, reaching 42,487 tons in 1945. While Bolivian tin production was increased during the war, the production in the Far East was greatly curtailed because of Japan's occupation of the Malayasia tin producing area. This is clearly indicated in Table 4 which covers the world mine production of tin for periods 1925-29 (average) and 1939 to 1947 by principal producing areas and countries. A more comprehensive coverage of world mine production is given in Tables B and C of the Appendix.

At the international meeting of the Tin Study Group held in Brussels in April 1947, the world tin situation was reviewed. In view of the difficulties experienced in the Far East in obtaining delivery of mining plant and equipment, the shortage of coal, and the inability of labor to secure sufficient supplies of rice and consumers' goods, the Study Group, after examining the statistical position, revised downward the estimates of production made in 1946. As a result, a report of the Statistical Committee gave the following estimate of world production for the years 1947, 1948, and 1949 in long tons of contained tin:

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	1947	1948	1949
Far East	50,000	96,400	135,200
Africa	25,500	26,700	28,000
South America	41,500	41,500	41,500
Other Countries	6,000	6,500	7,000
	<hr/>	<hr/>	<hr/>
TOTAL	123,000	171,100	211,700
Less 5 percent allowance	6,150	8,550	10,585
	<hr/>	<hr/>	<hr/>
TOTAL (round figures)	117,000	163,000	201,000

Although progress has been made in the rehabilitation of the mines and dredges, difficulties in securing necessary equipment and unsettled conditions generally have continued to obtain. Because of these and other factors which would have a retarding effect, the estimates of production for the Far East and South America may be considered optimistic.

In prewar years more than two-fifths of the world output of tin was produced by British capital. Dutch, Chinese, and Bolivian interests had important holdings while those of Belgian, US and Argentine investors were of minor importance. At the present time Bolivian, British, and Belgian capital accounts for the most important portions of world mine production, in that order, while those of the Dutch and Chinese are comparatively small, but a trend toward the prewar pattern is underway.

For the location of the principal tin mines and tin-producing areas see Table E of Appendix A and accompanying map.

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TABLE 4—WORLD MINE PRODUCTION OF TIN (CONTENT OF ORE), 1925-29 (AVERAGE)
AND 1939-47 BY COUNTRIES, IN LONG TONS

	1925-29 (average)	1939	1940	1941	1942	1943	1944	1945	1946	1947
Far East										
Malaya	56,837	46,827	84,028	78,000 ¹	15,748	26,000	9,309	3,152	8,432	27,030
N.E.I.	33,266	27,755	43,193	51,000 ¹	9,812	17,457	6,719	843	6,535	15,910
Siam	8,204	17,325 ²	17,447	15,000 ¹	7,843	5,839	3,194	1,275	500 ¹	1,400
China	7,085 ³	15,000 ¹	11,500 ¹	12,000 ¹	7,000 ¹	7,500 ¹	3,000 ¹	1,500 ¹	2,500 ¹	1,500
Burma	2,228	8,536	5,500 ¹	5,000 ¹	²	1,000 ¹	500 ¹	200 ¹	²	200
Indochina,										
French	691	1,467	1,472	1,295	1,029	653	358	100 ¹	²	..
Japan	590	1,473	1,760	2,177	1,894	1,107	374	..	²	1,200
Australia	2,830	3,067	3,501	3,494	2,931	2,635	2,547	2,282	2,127	2,100
Total	111,731	121,450	168,455	167,966	46,257	62,191	26,001	9,352	20,094	49,340
Africa										
Nigeria	8,319	9,567	12,177	12,229	12,574	12,835	12,512	11,224	10,333	9,400
Belgian										
Congo	967	7,140	12,075	15,751	15,754	17,007	16,858	17,070	14,095	14,630
Others	..	2,062	2,060	1,754	1,618	1,640	1,425	1,351	1,265	1,520
Total	9,286	18,769	26,312	29,734	29,946	31,482	30,795	29,645	25,693	25,550
South America										
Bolivia ³	37,169	27,211	37,940	42,199	38,293	40,312	38,720	42,487	37,717	33,250
Others	32	1,702	1,553	968	1,073	1,139	1,004	823	631	650
Total	37,201	28,913	39,493	43,167	39,366	41,451	39,724	43,310	38,348	33,900
North America										
Canada,										
Mexico, U.S.	26	323	394	297	924	779	553	553	690 ¹	550
Europe										
United										
Kingdom	2,658	1,633	1,620	1,509	1,363	1,359	1,289	993	793	950
Others	868	2,027	2,323	2,863	3,417	4,440 ¹	2,780 ¹	620 ¹	2,415 ¹	1,450
Total	3,526	3,650	3,943	4,372	4,780	5,799	4,069	1,613	3,208	2,400
Grand										
Total¹	163,000	173,000	239,000	246,000	122,000	142,000	102,000	86,000	89,000	111,740

¹ Estimated.² Data not available; estimate included in total.³ Exports.

SOURCE: 1925-46 Bureau Mines. 1947 preliminary estimates by the U.S. Section of the International Tin Study Group. The Statistical Sub-Committee of the International Tin Study Group (Conference 19-24 April 1948) has estimated the production of Burma and China for 1947 at 900 and 4,000 long tons, respectively. Other sources consider these estimates to be high because of the unsettled conditions in these countries.

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WORLD SMELTER PRODUCTION OF TIN

While Malaya produced 27 percent of the world's mine production of tin in concentrates in 1939, its smelter production, according to Table 5, accounted for 45 percent of the world's production of refined tin. Next in importance in production of refined tin was the United Kingdom with 20.8 percent. Bolivia was out of the smelting picture as the major part of its mine production was exported to the United Kingdom and the balance to other European countries.

During 1940 and 1941, before the Japanese invasion, the smelter production in Malaya and the Netherlands East Indies was increased by something over 50 percent. In 1942 and the years following, however, there was an abrupt drop in smelter production in the Far East as indicated in Table 5.

There is sufficient smelting capacity in the Far East to provide for US consumption and when the mines have been rehabilitated, dredges repaired, and other factors which are impeding production have been overcome, the smelter production is expected to return to normal. This may take two or three years.

When it became apparent in 1940 that our regular sources of tin supply were threatened, plans were made for the construction of a federally financed tin smelter. It was decided to locate the plant at Texas City, Texas, as this location is convenient for receiving ore from Bolivia and is accessible to a plentiful supply of acid and of cheap natural gas for fuel. The construction of the Longhorn Tin Smelter was begun in October of 1941 under the supervision of the Tin Processing Corporation, and smelting operations began in April 1942. The capacity of the smelter was originally designed for 18,000 tons of fine tin per year to be produced from Bolivian ores, but the plant was enlarged to an annual capacity of 52,000 tons when two of the large tin smelting centers of the world—Singapore and Penang—fell into the hands of the Japanese. The annual capacity was subsequently increased to 74,000 tons of fine tin but the highest production to date was 43,500 tons in 1946, owing to the low grade of Bolivian concentrates. The bulk of the concentrates smelted in the Texas City smelter originates in Bolivia, although supplementary quantities have been received from the Belgian Congo and the Netherlands East Indies.

As the Bolivian tin concentrates which come from lode mines are for the most part low grade, it necessitated building at Texas City a plant to beneficiate them by further concentration, roasting and leaching before smelting.

In 1945 and 1946 the smelter supplied the major part of the primary tin consumed in the United States. During 1947 the Longhorn smelter produced 33,280 long tons of tin. This drop was largely due to labor difficulties in Bolivia. Since it is the only major smelter of primary metal in the United States, its output will be essential during 1948 and 1949, especially as the entire output can be sold to the United States.

Legislation was passed by Congress extending the government's authority to operate the Longhorn Smelter until 30 June 1949, with a proviso that Congress make a

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thorough study and investigation of the advisability of maintaining a domestic tin smelting industry on a permanent basis.

Capital invested by British Nationals controlled more than two-fifths of the world smelter production of tin in prewar years, Bolivians held one-fifth, the Dutch and Chinese combined one-fifth, while German, Belgian, and Japanese had small holdings. Now the United States, with the federally financed Longhorn smelter, accounts for about two-fifths of the world output, substantial portions by British and Bolivian interests, while Belgian, Chinese, and Dutch interests are of minor importance. How much the pattern will change depends on the future of the Longhorn smelter.

A list of the major tin smelters of the world is given in Appendix A in Table D.

TABLE 5—WORLD SMELTER PRODUCTION OF TIN BY COUNTRIES, IN LONG TONS

Country	1929-35 (average)	1939	1940	1941	1942	1943	1944	1945	1946	1947
Argentina	..	1,080	881	768	709	552	467	714	500 ¹	480 ¹
Australia	2,952	3,294	3,544	3,656	3,024	2,565	2,442	2,359	2,000 ¹	2,000 ¹
Belgian Congo	..	2,711	7,832	11,818	13,963	11,068	10,000 ¹	6,713	2,372 ¹	36,000 ¹
Belgium ¹	720	3,100 ²	³	³	³	³	³	..	2,000 ¹	15,000 ¹
British Malaya	88,855 ⁴	81,536 ⁴	126,945 ²	125,000 ¹	10,000 ¹	15,000 ¹	5,000 ¹	2,500 ¹	7,500 ¹	30,000 ¹
Canada	..	..	..	29	553	347	231	379	390	360 ¹
China	7,080 ⁵	14,019	10,517	11,188	7,756	7,091	1,982	1,000 ¹	1,929	3,600 ¹
Germany ⁶	3,444	7,000	3,000	3,000	4,000	5,000	4,000	³	³	..
Indochina, French	..	³	³	69	337	389	213 ¹	14 ¹	³	..
Italy	..	146	330	72	228	110	³	6	30 ¹	120 ¹
Japan ⁷	606	2,025	1,661	2,620	3,870	2,058	759	121	68	600 ¹
Mexico	³	90	116	150	320	395	286	166	263	240 ¹
Netherlands	1,000 ⁸	14,600 ¹	2,967	³	³	³	³	³	800 ¹	8,750
Nether- lands E.I.	14,749	13,941	22,035	23,000 ¹	8,000 ¹	12,000 ¹	3,000 ¹	500 ¹	..	..
Norway	³	283	206	98	48	23	27	80	³	..
Portugal	2 ⁹	30	781	1,481	2,381	3,058	373	182	114	240 ¹
Siam (Thai- land)	113 ¹⁰	..	..	..	1,000 ¹	3,500 ¹	2,500 ¹	1,000 ¹	³	..
Spain	..	138	112	86	99	121	515	1,111	1,150 ¹	960 ¹
Union of S. Africa	..	..	33	143	535	862	1,150	1,033	858	678 ¹
United Kingdom	45,800	37,400	³	40,000	30,000	31,026	25,000 ¹	28,000 ¹	28,590 ¹	27,544
United States	..	..	1,391 ¹¹	1,839 ¹¹	16,168 ¹¹	21,489 ¹¹	30,884 ¹¹	40,475 ¹¹	43,500	33,280
Total (esti- mate)	165,000	181,000	224,000	225,000	103,000	117,000	89,000	86,000	92,000	127,500

¹ Estimates.

² Yearbook of American Bureau of Metal Statistics.

³ Data not available; estimate included in total.

⁴ Exports plus difference between carry-over at end and beginning of year.

⁵ Exports.

⁶ Includes production of some secondary tin.

⁷ Preliminary data.

⁸ Estimated production in 1929.

⁹ Average for 1926-27.

¹⁰ Average for 1926-28

¹¹ Including tin content of ores used direct to make alloys.

SOURCE: Bureau of Mines 1925-46; Department of Commerce 1947.

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PRINCIPAL TIN PRODUCING AREAS

1. FAR EAST.

a. Malaya.

The territory covered by the term Malaya includes the Federated and Unfederated Malay States, now known as Malayan Union, and the Straits Settlements. Most of the tin ore produced in the Malay States is treated in smelters located in Straits Settlements.

In the Federated States the deposits are located in Perak, Selangor, Pahang, and Negir Sembilan, while in the Unfederated States, small tonnages have come from Johore, Kedah, Kelantan, Perlis, and Trengganu.

In 1937 there were more than 1,000 tin mining operations in Malaya and there were hundreds of companies operating these properties. Approximately 120 dredges owned by perhaps 75 companies were in operation before the Japanese occupation. Operations for the most part were profitable but the companies distributed their earnings in dividends and rarely retained more than a small amount as operating capital. With their dredges damaged, ruined, or sunk, most of them do not possess the money required to rehabilitate or to purchase new dredges. Many of these companies, even after they receive compensation from the government for the damage they suffered, may never again purchase a dredge because the acreage of their holdings which remain undredged will not be large enough to amortize the investment in a dredge before the property is exhausted. They may hold the property for a time to await developments or, if they are fortunate in being contiguous to another property in similar position, may either sell the ground, lease it, or amalgamate with the adjoining property and thus have sufficient acreage to amortize the cost of a new dredge. Another possibility is the use of dredges which have portable pontoon-type hulls and superstructures which are more readily and cheaply dismantled and moved than the existing designs. As most Malayan tin mines are inland from the coast, it is the practice to erect dredges on the operating sites. This means that for a given type, there will be a greater time lag between ordering and putting into operation than with tin deposits directly accessible by boat. In any case, it will result in a much slower rehabilitation. Rehabilitation of the tin industry in Malaya has also been retarded by a shortage of coal, high labor costs, and delays in the delivery of equipment.

Not quite half of the tin concentrates produced in Malaya came from dredging enterprises, approximately one-third from gravel pumping operations, and the balance, about one-fifth, from hydraulicking, Dulang washers, and underground lode mines.

Compared with a mine production of 84,028 long tons of tin in 1940 the production in 1946 was only 8,432 tons and 27,030 tons in 1947.

According to the Statistical Bulletin of the International Tin Study Group exports of tin metal from Malaya in 1946 and 1947 to countries of destination are given as follows:

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COUNTRY OF DESTINATION	LONG TONS	
	1946	1947
Canada	1,070	2,580
United States	16,250
India	1,445	3,340
Belgium	990	.....
France	1,470	.....
Italy	1,200	.....
United Kingdom	589	335
Other Europe ¹	475	6,565
Other countries	45	819
TOTAL	7,284	29,889

¹ Figures for 1947 are for Europe (Continent).

b. Netherlands East Indies.

These islands were among the early producers of tin, and lying as they do in the Oriental tin belt, the ores are of the same character and high grade as the adjacent deposits of Malaya. About 60 percent of the output is from the island of Banka and 30 percent from Billiton, with the balance coming from Singkep, Sumatra, and the Riouw Archipelago. Operations on Banka are entirely alluvial, but on Billiton and Singkep there are also lode deposits. Mining has been mostly by open-pit methods, by hand, or with gravel pumps, but dredges have now been introduced.

Although rehabilitation of the tin industry in the Netherlands East Indies may be retarded by shortages of coal and shipping facilities, the problem of rehabilitation is quite different from that of Malaya for several reasons. In the Netherlands East Indies there have been two organizations producing tin—the Banka properties which have been run by the government¹ and the Billiton properties in which the government holds a majority interest. Consequently, millions of dollars worth of new equipment can be ordered by the government or by Billiton with the backing of the government. In the case of dredges, they can be built in Europe or the United States and floated to the scene of operations which are the submarine deposits along the coasts of the Banka, Billiton, and Singkep Islands. Two new dredges built in the United States have been towed across and placed in operation at Banka. The capacity of these dredges is 500,000 cubic yards per month. Also new dredges being built in the Netherlands are expected to be available in 1948. With the aid of new equipment and the dredges repaired in 1946, the production in 1947 was 15,910 long tons, as against 6,535 tons in the year previous.

The Banka mines, which are among the world's lowest-cost tin producers, comprise more than a dozen dredges and over 40 open-pits, although many mines are operated from time to time. Billiton and Singkep have been increasingly mechanized in recent years.

¹ The government has relinquished to the Billiton Company the management of the tin mines on Banka.

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Tin exports from the Netherlands East Indies in 1946 were 3,797 tons of pig tin and 4,950 tons in concentrates. Of the 4,950 tons of concentrates 2,101 were exported to the United States and the balance to the Netherlands. The excess over production was derived from stocks, left by the Japanese, consisting of 3,818 tons of metal and 6,618 tons of concentrates (about 70 percent tin). According to J. J. Croston the Japanese produced 31,354 metric tons of tin during the occupation period. In 1947 exports of concentrates (tin content) amounted to 15,608 long tons.

c. Siam—(Thailand).

The tin deposits of Siam connect with those of Burma on the north and Malaya on the south, and are of the same general character, predominantly alluvial. The deposits lie along the mountain range that forms the backbone of the peninsula, with the most productive areas on the western side at Puket Island and Tongkah Harbor. Dredging is carried on in the coastal region and some hydraulic mining in the interior.

Siam is a substantial producer of tin concentrates which are derived almost entirely from dredging operations and, except for small amounts smelted for local consumption, the concentrates go to the smelters at the Straits. Most of the production was reportedly taken over without much damage to equipment and the Japanese are supposed to have placed reliance upon this source of supply.

The production of tin in 1940 reached 17,447 long tons followed by 15,000 tons in 1941. In 1942 the production dropped to 7,843 tons and declined each year thereafter to 1,275 tons in 1945. The production in 1946 has been estimated at 500 tons and it may have reached 1,400 tons in 1947, but it will probably be 2 or 3 years before the higher tonnages can again be realized because of lack of equipment and unsettled conditions.

d. China.

China has been an important producer of tin for several centuries, but there is no record of output for earlier years and records for recent years are confined to exports, with little or nothing known as to the amounts of metal involved in local consumption.

The ore is found in lodes extending to considerable depths. The output comes largely from the Kochiu district in southeastern Yunnan, near Mengtze, and from the neighboring provinces of Kwangtung and Kwangsi. Mining and concentration are carried on by rather primitive methods and the concentrates are smelted within the country.

Prior to the war, China shipped some tin to the United States and occasional shipments were made during the war. The USSR also received substantial amounts from China. Normally the country possesses the capacity to produce about 15,000 tons of tin per year, but the increased costs in China have greatly reduced production. As noted in Table B of Appendix A, the mine production of tin in 1945 has been estimated at 1,500 tons and 2,500 tons for 1946. Until adequate food and other supplies are made available at reasonable cost, it is unlikely that China will be able to get its production back to normal for some time, especially at mines that have required extensive rehabilitation. Transportation difficulties have also limited exports of tin.

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The tin reserves of China have generally been estimated at 1,500,000 tons, although there have been other estimates ranging from 652,000 to 1,873,000 tons.

e. Burma.

The Malayan tin deposits extend up the peninsula through the lower portion of Siam and into Lower Burma. The output of tin from Burma is relatively small and derived from half a dozen dredging operation enterprises and a few lode-mining companies. As in the case of Malaya, the producers are individual company operations and are confronted with similar economic problems.

In contrast to a production of 8,536 long tons in 1939, the output has dropped to only a few hundred tons after the Japanese occupation and since the end of the war. Tungsten is associated with most of the ores which adds to the value of metal recovered.

f. Australia.

Following discovery of the Mount Bischoff tin deposits in Tasmania during 1870, Australia became one of the important tin-producing countries of the world and ranked first during the period from 1873 to 1882 with the exception of two years. With the exhaustion of the Mount Bischoff ores, except what is worked by leasers, production has gradually declined to an annual production between 2,000 and 4,000 tons.

The Australian States, Queensland, Tasmania, and New South Wales, are the most important and rank about equal in tin output. Of minor importance is the production from the States of Victoria, Northern Territory, and Western Australia.

The bulk of the Australian tin production comes from a number of relatively small producers in eastern Australia and the greater part of the output from stream tin placers. Primary vein deposits are also a source of considerable tin ore and eluvial deposits immediately below vein outcrops still yield some ore. In Victoria tin is largely recovered as a by-product of gold dredging along Reedy Creek, Eldorado, near Wangaratta. The cassiterite produced in Western Australia comes from alluvial deposits at Greenbushes in the southern part of the state and from Pilbara district in the northwest.

Prior to the war the consumption of tin in Australia (including New Zealand) averaged about 2,000 tons annually, and with the production of over 3,000 tons there had been an exportable surplus. After 1940, and during the war period, however, production of tin did not meet requirements and some tin had to be imported. After the war, lack of manpower and drought continued to hamper tin mining in Australia.

Several small smelters are operated in Australia but the principal one is the Lempriere Smelter of 6,500 tons capacity, situated at Alexandria (Sydney), N.S.W., and owned by O. T. Lempriere & Company, Pty, Ltd. The capacity of this smelter is in excess of present Australian and New Zealand requirements.

g. Other Countries of the Far East.

The remaining tin-producing countries are Indochina and Japan. The maximum production from these countries is approximately 1,500 tons for Indochina and 2,000 tons for Japan.

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The tin mines of Indochina were seriously damaged during the war and some time will be required for making repairs and bringing the mining operations back to prewar output. Internal political disturbances may also retard the rehabilitation of the mines.

Japan has excess smelting capacity but it is a relatively minor factor in the world tin industry except for the operations of its trading companies such as Mitsui and Mitsubishi. The Mitsubishi tin smelter is in Osaka and the one of Toyo is at Oita. The industry was entirely disrupted at the time of the Japanese surrender and it will probably be some time before production of tin is again back to normal.

2. AFRICA.

a. Belgian Congo.

The importance of the Belgian Congo during the war is brought out by the fact that the mine production of tin increased from 7,140 long tons in 1939 to 17,070 in 1945, and the imports of tin into the United States from the Congo for the years 1940 to 1946 were as follows:

	TIN METAL	CONCENTRATES (TIN CONTENT)
1940	4,899	27
1941	11,030	...
1942	11,225	...
1943	11,550	4,094
1944	10,000	7,549
1945	6,494	7,401
1946	628	7,214

The mine production in 1946 was 14,095 long tons, a drop of about 3,000 tons from the year previous. Production of tin for 1947 is estimated at 14,630 tons.

Practically the whole output of tin in the Belgian Congo comes from a mineralized belt east of the Lualaba River which includes the southern part of Stanleyville Province, Costermansville Province, Ruanda-Urundi and the northern part of Elisabethville Province. The greater portion of the output has thus far been obtained from shallow alluvial and detrital deposits. Some pegmatite lode deposits are worked where the lodes are soft and the cassiterite is free of the gangue to permit its recovery by simple washing methods. The most important tin-mining companies are Geomines, Union Miniere, Sermikat in the Province of Elisabethville, Symetain and Cobelmin with properties in both the Costermansville Province and southern part of Stanleyville Province, and the Somuki Company in Ruanda-Urundi Province. The tin ore reserves of the Belgian Congo are estimated at 500,000 tons of metal content.

The principal tin smelter in the Belgian Congo is at Manono. During the war there was another plant converted to tin smelting at Lubudi, but this has since been discontinued. The annual capacity of the Manono smelter is said to be 10,500 tons.

b. Nigeria.

The tin production of Nigeria is important, the bulk of its output being produced from alluvial deposits situated in the Bauchi Plateau in the northeastern section

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of the colony. Development has been hindered by shortage of water and inadequate transportation facilities. The Geological Survey of Nigeria has been remapping the tin field on the Jos Plateau in a search for new deposits and has resurveyed a considerable area south of Bukuru.

It will be noted from Table B of Appendix A that the mine production of tin in 1939 was 9,567 long tons and it has been well maintained above 10,000 tons each year following through 1946, with a peak production of 12,835 tons in 1945. All the tin ore or concentrates are exported to smelters in England for reduction to metal.

The ore reserves in terms of fine tin are estimated at 250,000 long tons, although some estimates have been given as low as 100,000 tons to as high as 300,000 tons.

3. LATIN AMERICA.

a. *Bolivia.*

Bolivia's economic well-being is dependent upon exports of tin which constitute about 80 percent of its export trade. Prior to World War II about 75 percent of the tin exports went to England and the balance to Belgium, Holland, and Germany.

The tin belt of Bolivia is on the high plateau of the Andes and extends from the Peruvian frontier on the north to the Argentine on the south, a distance of about 500 miles. The average width of the tin belt is about 60 miles. The elevation of the plateau is around 13,000 feet, but the mountain ranges rise to elevations over 20,000 feet. The tin deposits are found at altitudes from 12,000 feet to 15,000 feet.

Bolivia's tin production comes principally from comparatively narrow veins instead of from placer deposits as in the case of most of the other large tin areas of the world. The production costs of tin in Bolivia are considerably higher than those of the placer deposits where large-scale dredging can be applied at low costs. There are some alluvial deposits in Bolivia, however, and a few are exploited.

The cassiterite obtained in placer operations is in general fairly clean and offers no great problem in its reduction to metallic tin. In the lode deposits of Bolivia, however, the cassiterite is often accompanied with the mineral stannite, a copper-iron-tin sulphide; tealite, a lead-tin sulphide, and other complex tin minerals. In addition, the tin minerals are associated with various other sulphides, especially iron and zinc, and with tungsten, bismuth, antimony, and silver minerals. Many of the present tin mines of Bolivia were formerly worked for their silver content and today both tin and tungsten ores are mined from the same lode.

The complexity of the Bolivian ores offers a serious problem, first in the separation of the tin minerals from the crude ore and second in the smelting of the concentrates to reduce the tin minerals to metallic tin.

The ultimate recovery of tin from Bolivian ores is between 50 and 60 percent. An improvement in the metallurgical treatment of Bolivian ores offers an excellent field for increased production. This will not be an easy task, however, and will probably take some time before a treatment method or process can be developed to effect high recoveries of tin from these complex ores.

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Considering the high altitude and rigorous condition of living of the working people, the natives have proved to be the best labor adapted to the particular conditions. The shortage of labor has hindered greater mining activity which might partly be remedied by more mechanization, especially at the smaller mines.

The principal producing companies are Patiño Mines and Enterprises Consolidated, Inc., Hochschild S.A.M.I., and Compagnie Aramayo de Mines en Bolivie. The main problem confronting the producers is connected with labor costs and labor relations. The costs of materials have increased considerably during the past few years, but the major portion of the increase can be attributed to increased labor charges. The Bolivian government is vitally interested in maintaining high production of tin and a high price for exports of the product, as a large proportion of the national revenue comes from taxes on exports of tin concentrates and the taxes are based on the selling price. Thus the country's economy depends on high production and high prices and it can, therefore, be assumed that the government will do all it can to solve the problems between labor and industry.

The chief source of tin, at present, for supplying the Longhorn smelter at Texas City, Texas, is Bolivia. As a result of negotiations between Bolivia and the United States for the purchase of the former's production of tin, the Reconstruction Finance Corporation agreed on 28 March 1947, effective 1 April, to pay 76 cents per pound for purchases to be made during the remainder of 1947, for production costs had risen to a point where the increase in price was necessary in order to maintain Bolivia as a source of supply. Labor troubles cut production during the summer months of 1947 so that exports for the year dropped to 33,259 tons. A new price,* effective 1 January 1948, of 90 cents per pound, f.o.b. vessels at South American ports, was agreed to by Bolivian producers and the Reconstruction Finance Corporation and if this new price is maintained, Bolivia's annual rate of tin exports should be substantially increased in 1948.

No systematic and complete survey of Bolivia's tin resources has been made, but it has been roughly calculated that the proven plus probable reserves of tin of the country's known mines are estimated to be 500,000 tons of fine tin. The geographical location of the deposits is the greatest impediment to their development. Some areas exist which would be capable of much higher production, but their inaccessibility precludes intensive exploitation owing to the lack of transportation facilities and high costs compared with the tin fields of Africa and the Far East.

b. Argentina.

The annual tin production of Argentina for the period 1939 to 1947 has averaged about 1,000 long tons, which has about equalled domestic consumption. This production has come almost entirely from placer deposits and the nearby veins of tin-silver ores at the mines of the Sociedad Minera Pirquitas in the Province of Jujuy. In the Province of Catamarca there are some tin mine workings as well as in the Province of La Rioja. Other deposits are said to occur but have not been prospected.

* Subsequent to this writing the price was increased to 99 cents f.o.b. vessels at South American ports.

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The tin concentrates from the Pirquitas placers are smelted at the company's smelter in Buenos Aires.

An agreement for the purchase of 8,000 tons of tin per year in the form of concentrates for five years, at a price of 76 cents a pound during 1947, was signed early in March 1947, between Bolivia and Argentina and ratified 24 October but none of the 8,000 tons of tin called for in the contract has as yet gone to Argentina. If it is intended to use the Bolivian tin for a domestic industry, it should be borne in mind that the concentrates would have to be shipped to the United States or United Kingdom for smelting, as Argentine facilities are totally inadequate for the handling of such a tonnage. Plans for the erection of additional smelting facilities, however, are under consideration. It is possible that the Argentine government may be considering the purchase of these relatively large tonnages for stockpiling purposes.

c. Mexico.

According to official figures the production of tin in Mexico is relatively small and has averaged about 300 long tons per year during the period 1939-1947. The peak year for this period was 1943 with a production of 426 tons.

Tin occurs in the small mountain ranges found in the high plateaus lying to the east of the Sierra Madres extending in a zone about 50 miles wide beginning in the north of the State of Durango and including the States of Zacatecas, Guanajuato, Aguascalientes, San Luis Potosí, Jalisco, Queretaro, and Michoacan.

The known ore deposits are small and are mainly detrital, but there are some occurrences in narrow veins. There are no individual tin mining operations of importance. The tin ore is largely recovered through the efforts of numerous small mining enterprises or individual prospectors who search for the cassiterite on the surface or in shallow excavations and dispose of their comparatively small production to small local ore buyers who in turn sell to the larger purchasers.

The most important company in the Mexican tin-producing industry is the Cia. Estanifera Mexicana which has been engaged in buying, smelting, and exporting tin ores since 1932. The headquarters of this company are in the city of San Luis Potosi, where it operates a plant capable of producing 30 tons per month of 99 percent tin, which is sold to consumers within the country. Ore not needed for smelting is sold to buyers in England and the United States. This company buys its ore in small lots from producers and traders throughout the tin bearing areas.

d. Brazil.

The production of tin in Brazil is small and comes mostly from alluvial deposits in the State of Minas Gerais from an area along the Rio das Mortes and its tributaries. According to Anderson of the Bureau of Mines, Minas de Estanho de Sao Joao d'El-Rei has proposed construction of a gravity-concentration plant with a capacity of 100-125 tons a day of ore containing cassiterite.

Some tin has been produced in the states of Rio Grande do Norte and Rio Grande do Sul, usually from placer operations in the vicinity of pegmatite masses.

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The production is smelted locally, producing a good quality of tin. In the state of Rio Grande do Sul tin-bearing lode deposits have been found near Encruzilhada, and to the south alluvial deposits on the banks of the Camaquam River, but are considered relatively unimportant.

Official figures are not available, but the tin production is relatively small and Brazil's consumption of tin is provided largely by imports.

4. UNITED KINGDOM.

Cornish tin mining, which began before the Christian era, is rapidly becoming extinct. Available records show that its peak was from the middle of the Civil War to the depression of 1893 and averaged something over 9,000 tons with a maximum production of about 11,000 tons in 1871. In the first two decades of the present century, production was about half that of the 30-year period mentioned; was more than halved again in the succeeding two decades; and in 1946 was only 793 tons.

After six years of war the mineral industry of the United Kingdom has been greatly affected by the sudden change to peacetime conditions. The United Kingdom ranks second both in the smelting of tin and as a consumer of tin. It is also second among the world producers of tin plate, which usually accounts for about 40 percent of its pig tin consumption. Foreign trade in tin was greatly changed by the course of the war, for prior to the fall of Singapore, imports of tin concentrates increased materially above the prewar level and reached 83,902 long tons of contained tin in 1940, dropped to little more than half that in 1942, and reached a low point of 32,948 tons in 1944. Pig tin imports fell from nearly 12,000 tons in 1938 to zero in 1941 and remained negligible through 1945. Tin exports (including re-exports) averaged about 18,500 tons in 1938-39, dropped sharply to 6,500 tons in 1941, and for the next four years averaged about 8,500 tons. Of the 6-year (1940-45) total of 56,000 tons, a large part was sent to the USSR.

Shortage of labor has made it impossible to expand exports of tin plate by re-opening more plants. Demobilized workers have been reluctant to return to the tin plate industry and in July 1945, less than 10,000 were employed compared with 25,000 in 1939. If labor were available, the output of 1945 (278,700 tons) could almost be doubled within a reasonable time.

Normally the United Kingdom imports both tin concentrates, chiefly from Bolivia, Nigeria, British Malaya, and South Africa, and some refined tin from British Malaya, Netherlands, Belgium, and China. The imports of tin concentrates for 1946 amounted to 34,476 tons of contained tin and for the first nine months of 1947 imports of concentrates totaled 26,572 tons, of which 14,928 came from Bolivia and 10,006 tons from Nigeria. There were no imports of metal.

The smelter production during the period 1939 to 1946 ranged from 40,000 tons in 1941 to a low of 25,000 tons in 1944. The 1946 production was estimated at 28,590 tons, and 27,544 tons for 1947.

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Consumption of tin in the United Kingdom in 1947:

	LONG TONS
Tinplate	8,932
Solder	5,621
Alloys (white-metal, bronze, etc)	13,535
Foil and collapsible tubes	3,318
Tinned copper wire	716
Tin compounds and salts	868
Tinning	981
Miscellaneous uses	613
	<hr/>
TOTAL All Trades	34,584

Of the 34,584 tons, virgin tin accounted for 27,384 tons and tin in scrap 7,200 tons.

SOURCE: Ministry of Supply.

5. CANADA.

Tin production in Canada during 1946, according to preliminary estimates, totaled 390 long tons recovered as a by-product of lead-zinc ores at the Trail Smelter, compared with 379 tons in 1945. Imports of tin metal in 1946 are reported as 3,677 long tons.

All tin produced in Canada at present is from the Sullivan lead-zinc mine in British Columbia, but great interest is being shown in the possibility of commercial production of tin from the Murray Bay area of Quebec. The Mountain Crest Mines, Ltd. already is operating mines in the area and planning substantial expansion, and a new company, the Saguenay Mining and Smelting Company, believed to be a subsidiary, is contemplating sizable operations in the same area.

6. USSR.

The production of tin in the USSR still falls far short of domestic consumption requirements, although active search for tin, which began in 1925, has disclosed several tin-bearing deposits. These deposits are mostly of low grade and situated in places difficult of access. Development of the tin industry has, therefore, lagged, and increasing quantities of tin have been imported in recent years.

Although data are lacking as to the output and mining facilities of individual properties or areas, the Soviet authorities in recent years have emphasized the progress made by prospecting and developing the tin resources. Starting with negligible reserves in 1925, the potential tin reserves of the Soviet Union, as of 1 January 1933, were estimated at 10,000 tons of metal in the ground, and by 1937 at about 30,000 tons.

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The Chita region is the oldest tin-producing area of the USSR. The Khapcheranga mine in the Kirensk district of the Transbaikal is perhaps the best known of recent developments. The metal occurs as cassiterite in several lodes that cut the sedimentary formation for a distance of nearly one kilometer. Also in the Transbaikal is the Sherlovaya tin deposit. Here the tin is found in numerous small quartz veins, and in disseminated form in the granite intrusive that forms the Belshaya mountain range. These two properties are probably the most important for the production of tin at present. Another important tin deposit in the same district is at Onon on the left bank of the river of the same name, a few kilometers from the Olovyannaya station of the Transbaikal railroad. The tin occurs in several quartz lodes and the distribution of cassiterite is irregular, as are the length and width of the lodes. Wood and water supplies are available and there is a concentrating plant near Olovyannaya on the Onon River.

Tin is also found in the Kirgiz and the Tadzhik SSR's. According to recent information, concentrating installations have been put in operation and are producing lead, zinc, and tin concentrates. One group of deposits in the Tadzhik SSR is situated on the northern slope of the Turkestan and Altai ranges. From the standpoint of tin production, an advantage of these deposits is the absence of copper, lead, antimony, and other minerals which often impede a clean separation of tin from tin bearing ores.

The tin deposits in the Yakut ASSR are said to be larger and more numerous than those of the Chita region, but commercial exploitation is handicapped by the lack of adequate means of transportation, as are the deposits in the very north of the Khabarovsk Territory.

A new concentrating plant has been constructed and placed in operation by the Khinganolovo Combine at Khabarovsk but details are not available.

The tin smelters in the USSR, which have been listed below, are reported to be relatively small, but their condition and individual capacities are not known.

NAME	LOCATION
Leningrad	Leningrad
Podolsk	Podolsk, near Moscow
Altai-Naryn	Kazakhstan
Khapcheranga	Khapcheranga, Chita
Transbaikal	Onon and Ualba, Chita
Sherlovaya Gora	Sherlovaya Gora, Chita
Verkhovansk	Ege-Khai, Yakutia
Simancha	Simancha, near Tetiuke
Novosibirsk	Novosibirsk

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According to captured German documents, statistics on the USSR tin economy covering consumption, production, and imports are given as follows:

CONSUMPTION			
YEAR	AMOUNT (TONS)	YEAR	AMOUNT (TONS)
1929	4,500	1934	5,900
1930	5,000	1935	7,400
1931	4,500	1936	9,800
1932	3,900	1937	12,500
1933	4,100	1938	13,000
PRODUCTION			
1933	390	1943	6,750
1942	5,500	1944	7,500
IMPORTS			
1934	5,805	1942	13,500
1935	7,400	1943	12,000
1936	9,800	1944	19,500
1937	12,507		

The 19,500 tons for the year 1944 appears high, although a part of it may have come from Japan as the USSR was not at war with Japan during that year and Japan, after occupying China, Siam, and Netherlands East Indies, undoubtedly had a surplus for export at that time.

Tin imports of the USSR for the year 1938 giving country of origin, were as follows:

Belgium-Luxemburg	2,740 tons
Netherlands	6,719 tons
United Kingdom	2,945 tons

TOTAL	12,404 tons
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As has been stated, the production of tin in the USSR still falls short of requirements. The production record indicates, however, that real progress is being made in developing new properties. The big drawback is the fact that the deposits being developed are for the most part low grade, difficult of access, and will need greatly improved transportation facilities for their economic exploitation. Also, ore reserves, much greater than those reported, will have to be developed before the USSR may be considered to have attained any semblance of self-sufficiency with respect to tin.

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APPENDIX

TABLE A

ESTIMATED TIN ORE RESERVES OF THE WORLD
(Metal Content)

COUNTRY	LONG TONS
Malaya (Malayan Union including Straits Settlements)	1,500,000
China	1,500,000
Netherlands East Indies	1,000,000
Siam (Thailand)	800,000
Bolivia	500,000
Belgian Congo	500,000
Burma	300,000
Nigeria	250,000
Australia	40,000
USSR	30,000
French Indochina	25,000
Portugal	25,000
England (Cornwall)	20,000
Argentina	10,000
Canada	6,000
Brazil	5,000
Others	30,000
TOTAL	6,541,000

Based on prewar rate of consumption the above reserves would supply world needs for only 30 to 40 years, but further developments will undoubtedly yield additional reserves.

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TABLE B—WORLD MINE PRODUCTION OF TIN (CONTENT OF ORE) BY COUNTRIES, IN LONG TONS

Country	1929-35 (average)	1939	1940	1941	1942	1943	1944	1945	1946	1947
Argentina	32	1,655	1,481	921	998	1,070	1,004	700 ¹	600 ¹	500
Australia	2,830	3,067	3,501	3,494	2,931	2,635	2,547	2,282	2,127	2,100
Belgian Congo	967	7,140	12,075	15,751	15,754	17,007	16,858	17,070	14,095	14,630
Bolivia (exports)	37,169	27,211	37,940	42,199	38,293	40,312	38,720	42,487	37,717	33,250
Brazil										120
British Malaya	56,837	46,827	84,082	78,000 ¹	15,748	26,000	9,309	3,152	8,482	27,030
Burma	2,228	8,536	5,500 ¹	5,000 ¹	2	1,000 ¹	500 ¹	200 ¹	2	200
Cameroons, French		243	218	220	233	194	161	112	111	140
Canada				29	553	347	231	379	390	350
China	7,085 ²	15,000 ¹	11,500 ¹	12,000 ¹	7,000 ¹	7,500 ¹	3,000 ¹	1,500 ¹	2,500	1,500
Germany ⁴	98	285	293	303	547	980 ¹	980 ¹	2	2	100
Indochina, French	691	1,467	1,472	1,295	1,029	653	358	100 ¹	2	100
Italy		256	309	230	200	2	2	20 ¹	115 ¹	100
Japan	590	1,473	1,760	2,177	1,894	1,107	374	174	300 ¹	1,200
Mexico	2	289	345	212	365	426	317	174	300 ¹	200
Morocco, French	4	31	20	26	4	11	9	11	12	
Netherlands Indies	32,266	27,755	43,193	51,000 ¹	9,812	17,457	6,719	843	6,535	15,910
Nigeria	8,319	9,567	12,177	12,229	12,574	12,835	12,512	11,224	10,333	9,400
Peru		47	72	47	75	79	73	54	31	30
Portugal	625	1,486	1,721	2,330	2,670	3,460	1,800 ¹	600 ¹	1,000 ¹	500
Portuguese E. Africa	5	7	6	4	10	6	8	2	2	
Rhodesia, Northern			16	10	2	3	6	18	6	
Rhodesia, Southern	15	451	450	231	162	178	123	125	100	120
Siam (Thailand)	8,204	17,325	17,447	15,000 ¹	7,843	5,839	3,194	1,275	500 ¹	1,400
Southwest Africa	149	156	137	120	110	158	123	185	177	150
Spain	145	106	100	103	239	222	483	950	1,300 ¹	750
Swaziland	138	114	103	131	113	109	77	53	37	40
Tanganyika (exports)	22	224	258	247	193	159	124	137	132	110
Uganda (exports)	98	354	334	302	283	296	288	215	201	170
Union of S. Africa	1,174	482	518	463	508	526	506	493	487	790
United Kingdom	2,658	1,633	1,620	1,509	1,363	1,359	1,289	993 ¹	793	950
United States	24	34	49	56	6	6	5			
TOTAL	163,000	173,000	239,000	246,000	122,000	142,000	102,000	86,000	89,000	111,740

¹ Estimates.² Data not available; estimate included in total.³ Exports.⁴ Data include Sudetenland.

NOTE: The USSR is not included as reliable figures are not available.

SOURCE: 1925-46 Bureau of Mines; 1947 preliminary estimates by the U.S. Section of the International Tin Study Group. The Statistical Sub-Committee of the International Tin Study Group (Conference 19-24 April 1948) has estimated the production of Burma and China for 1947 at 900 and 4,000 long tons, respectively. Other sources consider these estimates to be high because of the unsettled conditions in these countries.

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TABLE C—WORLD MINE PRODUCTION OF TIN BY PRINCIPAL COUNTRIES,
1900, 1910, 1929 to 1947 *
(Tin Content in Long Tons)

Year	Malaya	Netherlands East Indies	Siam (Thai- land)	Burma	China	Bolivia	Belgian Congo	Nigeria	Other	Total World
1900	43,111	17,619	3,900	73	2,932	9,053	0	0	8,712	85,400
1910	45,918	21,404	4,896	137	6,407	22,764	0	573	14,301	116,400
1920	36,927	21,566	6,201	1,648	10,566	29,075	396	5,167	10,754	122,300
1929	69,366	35,920	9,939	2,402	6,776	46,338	1,011	10,734	10,114	192,600
1930	63,974	34,903	11,060	2,749	6,860	38,146	840	8,569	8,899	176,000
1931	54,908	27,480	12,447	2,006	5,948	30,742	188	7,772	7,409	148,900
1932	29,742	15,683	9,261	2,534	7,406	20,583	677	4,263	9,051	99,200
1933	24,904	14,406	10,324	2,399	8,104	14,725	2,225	3,762	10,151	91,000
1934	34,059	18,678	10,587	2,487	8,145	20,634	4,602	4,996	11,012	115,200
1935	45,955	24,719	9,779	2,991	9,398	27,168	6,481	7,029	13,580	147,100
1936	66,806	31,684	12,678	3,108	10,664	24,074	7,310	9,634	14,242	180,200
1937	77,542	39,825	16,494	4,023	10,457	25,024	8,856	10,468	15,511	208,200
1938	43,361	27,299	14,704	7,100	11,605	25,484	8,820	8,977	15,650	163,000
1939	46,827	27,755	17,325	8,536	15,000 ¹	27,211	7,140	9,567	13,639	173,000
1940	84,082	43,193	17,447	5,500	11,500 ¹	37,940	12,075	12,177	15,086	239,000
1941	78,000 ¹	51,000 ¹	15,000 ¹	5,000	12,000 ¹	42,199	15,751	12,229	14,821	246,000
1942	15,748	9,812	7,843	500 ¹	7,000 ¹	38,293	15,754	12,574	14,476	122,000
1943	26,000	17,457	5,839	1,000 ¹	7,500 ¹	40,312	17,007	12,835	14,050	142,000
1944	9,309	6,719	3,194	500 ¹	3,000 ¹	38,720	16,858	12,512	11,188	102,000
1945	3,152	843	1,275	200 ¹	1,500 ¹	42,487	17,070	11,224	8,249	86,000
1946	8,432	6,535	500	500 ¹	2,500 ¹	37,717	14,095	10,333	8,483	91,000
1947	27,030	15,910	1,400	200	1,500	33,250	14,630	9,400	8,420	111,740

* Source: International Tin Research and Development Council 1900-37, inclusive. Bureau of Mines 1938-46, inclusive. Preliminary estimates for 1947 made by U.S. Section of International Tin Study Group. The Statistical Sub-Committee of the International Tin Study Group (Conference 19-24 April 1948) has estimated the production of Burma and China for 1947 at 900 and 4,000 long tons, respectively. Other sources consider these estimates to be high because of the unsettled conditions in these countries.

¹ Estimated.

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TABLE D—MAJOR TIN SMELTERS OF THE WORLD¹

Country	Name (Annual capacity) (In long tons of tin)	Location	Ownership
Argentina	Pichetti (1,800)	Buenos Aires	Sociedad Minera Pirquitas, Pichetti y Cia.
Belgium	Hoboken (10,000)	Hoboken	Societe General Metallurgique de Hoboken
China	Kochiu (8,000) PKMA (2,500)	Kochiu, Yunnan Papu, Kwangsi	Yunnan Tin Corporation Ping Kwei Mining Administration
Malayan Union	Eastern (35,000) Pulau Brani (40,000)	Penang Isle Pulau Brani (adj. to Singapore)	Eastern Smelting Co., Ltd. Straits Trading Co.
	Butterworth (40,000)	Penang Isle	Straits Trading Co.
Netherlands	Arnhem (40,000)	Arnhem	N. V. Hollandsche Metallurgische Bedrijven
Netherlands East Indies	Muntok (20,000) Pangkalpinang (20,000)	Banka Isle Banka Isle	Banka Tin Mining Administration Banka Tin Mining Administration
United Kingdom	Williams, Harvey & Co. (40,000)	Bootle	Cons. Tin Smelting Co., Ltd.
	Cornish Tin Smelting Co. (10,000)	Redruth	Cons. Tin Smelters Ltd.
	British Tin Smelting Co. (8,000)	Litherland	Cons. Tin Smelting Co., Ltd.
	Penpoll Tin Smelting Co. (8,000)	Bootle	Cons. Tin Smelting Co., Ltd.
	Capper Pass & Son, Ltd. (2,500)	Bristol and Hull	Capper Pass & Son, Ltd.
Belgian Congo	Manono (10,500)	Manono	Geomines
Australia	Lempriere (6,500)	Alexandria (Sydney)	D. T. Lempriere & Co., Pty, Ltd.
Union of South Africa	Zaaipplaats (2,400)	Potgietersrust	Zaaipplaats Tin Mining Co., Ltd.
United States	Longhorn (74,000)	Texas City, Texas	Tin Processing Corporation

¹ Nationality of the principal owner is the same as the country in which the smelters are located except in the case of the colonies where the nationality is the country which controls such colonies.

The companies are incorporated in the country in which they are located, except those in the colonies which are incorporated in the countries which control those colonies.

The Longhorn smelter (United States) is owned by the United States Government but is operated by the Billiton interests which are Dutch.

NOTE: The minor tin smelters are not listed, but information as to their capacities and locations is available in the Central Intelligence Agency.

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TABLE E—INDEX TO WORLD MAP OF PRINCIPAL

TIN MINES AND MAJOR DEPOSITS

CANADA

1. Sullivan

MEXICO

2. Aguascalientes region
3. Durango region

PERU

4. Oroya Smelter

BOLIVIA

5. Fabulosa (Fabulosa Mines Cons.)
6. Chojlla (Intl. Min. Corp.)
7. Mocaya (Intl. Min. Corp.)
8. Araca (Patiño)
9. Caracoles (Aramayo)
10. Colquiri (Hochschild)
11. Oruro (Hochschild)
12. Santa Fe (Empresa Minera Santa Fe)
13. Morocalla (Hochschild)
14. Playa Verde (Bol. Intl. Min.)
15. Huanuni (Patiño)
16. Monserrat (Empresa Minera Monserrat)
17. Totoral (Sociedad Estanifera Totoral)
18. Llallagua (Patino)
19. Vila Apecheta (Min. Dev. & Inv. Co.)
20. Ocuri (Cia. Estanifera de Ocuri)
21. Potosí (Hochschild)
22. Telemayu-Animas (Aramayo)
23. Oploca (Patiño)
24. Chorolque (Aramayo)

ARGENTINA

25. Sociedad Minera Pirquitas (Pichetti y Cia.)

CORNWALL

26. Geevor
27. East Pool and Agar
28. South Crofty

PORTUGAL

29. Tuella Tin Mines, Ltd.
30. Emp. Port de Estanhas, Ltd.
31. Portuguese American Tin Co.

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SPAIN

32. Galicia Prov.

GERMANY

33. Altenberg deposit

ITALY

34. Monte Valerio
35. Canale Seres

NIGERIA

36. United Tin Areas of Nigeria, Ltd.
37. Naraguta Extended Areas, Ltd.
38. Naraguta Tin Mines, Ltd.
39. Jantar Nigeria, Ltd.
40. Nigerian Cons. Mining Co., Ltd.
41. Amalgamated Tin Mines of Nigeria, Ltd.
42. Ribbon Valley Tin Fields, Ltd.
43. Nigerian Tin & Exploration Co., Ltd.
44. Bisichi Tin Co., Ltd.
45. Kaduna Syndicate, Ltd.
46. Gold and Base Metals of Nigeria, Ltd.
47. Keffi Tin Co., Ltd.
48. Naraguta Karama Areas, Ltd.
49. Ex-lands Nigeria, Ltd.
50. Jos Tin Areas, Ltd.

FRENCH CAMEROONS

51. Mayo Darle
52. Obau Mountains

BELGIAN CONGO

STANLEYVILLE PROV.

53. Punia area (Syntain)
54. Kima area (Cobelmin)
55. Kasesa area (Cobelmin)

RUANDA URUNDI

56. Gatumba area (Minetain)
57. Rutongo area (Somuki)
58. Lugarama area (Minetain)

COSTERMANSVILLE PROV.

59. Kabunga (MCL-C.N.Ki.)
60. Kailo area (Cobelmin)
61. Kalima area (Syntain)
62. Shabunda (Cobelmin)
63. Kamituga (MGL)

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64. Kampene (Cobelmin)

ELIZABETHVILLE PROV.

65. Manono (Geomines)

66. Mitwaba (Sermikat)

67. Kikole (UMHK)

68. Busanga Mine (UMHK)

UGANDA

69. Ankole Tin Fields, Ltd.

70. Kagera Uganda Tin Fields, Ltd.

71. Central Africa Exploration Co.

SOUTHERN RHODESIA

72. Kapata Syndicate

UNION OF SOUTH AFRICA

73. Zaaiplaats Tin Mining Co.

74. Mutue Fides Tin Mining Co.

75. McCreedy Tin Ltd.

76. Leeuwpoort Tin Mines Ltd.

77. Rooiberg Tin Mines Ltd.

78. Nieuwpoort Tin Mines Ltd.

USSR

79. Altai

80. Naryn (Kazakstan)

81. Khapcheranga

82. Onon deposit

83. Sherlovaya

84. Verkhoyansk

BURMA

85. Peinnedaik

86. Mawchi

87. Känbauk

88. Heinze basin

89. Kabamaunghla

90. Hermyingyi

91. Kyaukmedaung

92. Heinda

93. Bwabin

94. Theindaw

95. Yemon

96. Thabawleik

97. Karathuri

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THAILAND (SIAM)

98. Renong Tin Dredging, Ltd.
99. Bangrin Tin Dredging Co., Ltd.
100. Talerng Tin Dredging Co., Ltd.
101. Kamra Tin Dredging, Ltd.
102. Pungah Tin Dredging, Ltd.
103. Thai Tin Syndicate, Ltd.
104. Tongkah Harbour Tin Dredging, Ltd.

MALAYA

105. Kamungting Tin Dredging, Ltd.
106. Larut Tin Fields Dredging, Ltd.
107. Austral Amalgamated Tin, Ltd.
108. Takka Taiping Tin Dredging, Ltd.
109. Southern Kinta Cons.
110. Karamat Tin Dredging, Ltd.
111. Southern Malayan Tin
112. Pengkalen Ltd.
113. Malayan Tin Dredging Co.
114. Pacific Tin Co., Ltd.
115. Kinta Tin Mines, Ltd.
116. Ipoh Tin Dredging, Ltd.
117. Gopeng Consolidated
118. Tronah Mines, Ltd.
119. Kampong Lanjut Tin Dredging, Ltd.
120. Southern Tronoh Tin Dredging Co.
121. Renong Tin Dredging Co., Ltd.
122. Rawang Concessions, Ltd.
123. Rawang Tin Fields, Ltd.
124. Pahang Consolidated Co.
125. Petaling Tin Ltd.
126. Killingham Tin Dredging Ltd.
127. Ampat Tin Dredging Co., Ltd.
128. Sungei Besi Mines (Hong Fatt) Ltd.
129. Kuala Kampur Tin Fields, Ltd.
130. Hong Kong Tin Dredging Ltd.
131. Sungei Way Dredging
132. Kuchai Tin Dredging Co., Ltd.
133. Ayer Hitam Tin
134. Rantau Tin Dredging, Ltd.
135. Pelapah Tin Dredging

NETHERLANDS EAST INDIES

136. Singkep
137. Banka

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138. Billiton

CHINA

YUNNAN PROV.

KOCHIU DISTRICT

139. Malaka (e) (Shing Chang)

140. Li Tao

141. Wa Feng

142. Lao Chang

KWANGSI PROV.

143. Ping Lo

144. Fu Ho Chung

145. Kung Chung

HUNAN PROV.

146. Kiang Hua

147. Chang Ning

148. Lin Wu

KWANGTUNG PROV.

149. Tien Pai

KIANGSI PROV.

150. Tayu

151. Kong Shui Tsei

152. Nan Kong

INDOCHINA

153. Tinh-Tuc ravine (Pia-Ouac)

154. Nam-Pathene ravine (Kham-Mon)

JAPAN

155. Suzunoyama Mine

156. Mitate Mine (Toyo Mining Co., Ltd.)

157. Kurauchi Ohira

158. Ueda-Ohira Mine

159. Ikuno Mine

160. Akenobe Mine (Mitsubishi)

161. Ashio Mine

AUSTRALIA

162. Herberton District, Queensland

163. Mt. Garnet, Queensland

164. Gibsonvale District, New South Wales

165. Mt. Bischoff, Tasmania

166. Rennison Bell, Tasmania

167. Briseis Mines, Tasmania

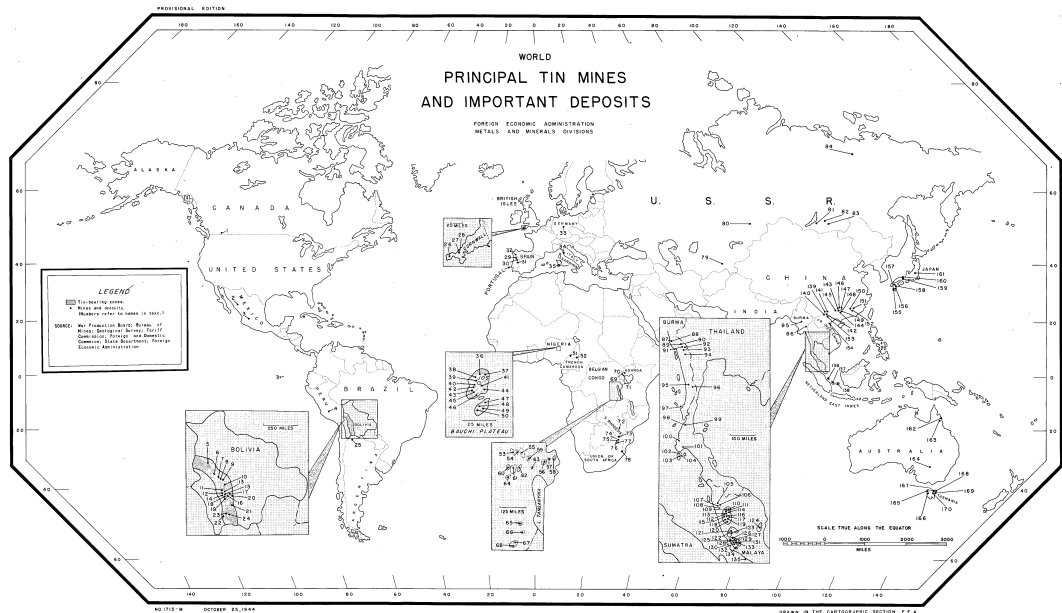
168. Gladstone Field, Tasmania

169. Aberfoyle Mine, Tasmania

170. Storey's Creek Mine, Tasmania

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