USGS
science for a changing world

Worldwide Asbestos Supply and Consumption Trends from 1900 through 2003

Circular 1298

U.S. Department of the Interior
U.S. Geological Survey

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/1

Worldwide Asbestos Supply and Consumption Trends from 1900 through 2003

By Robert L. Virta

This Circular supersedes USGS Open-File Report 03–083

Circular 1298

U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
DIRK KEMPTHORNE, Secretary

U.S. Geological Survey
Mark D. Myers, Director

U.S. Geological Survey, Reston, Virginia: 2006

For product and ordering information:
World Wide Web: http://www.usgs.gov/pubprod
Telephone: 1–888–ASK–USGS

For more information on the USGS—the Federal source for science about the Earth, its natural and living resources, natural hazards, and the environment:
World Wide Web: http://www.usgs.gov
Telephone: 1–888–ASK–USGS

Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Although this report is in the public domain, permission must be secured from the individual copyright owners to reproduce any copyrighted materials contained within this report.

Suggested citation:
Virta, R.L., 2006, Worldwide asbestos supply and consumption trends from 1900 through 2003: U.S. Geological Survey Circular 1298, 80 p., available only online.

ISBN 1-411-31167-1

Contents

Abstract....1
Introduction....1
- Purpose and Scope of Circular....2
- Definitions....2
- History of Asbestos Use....2

Data Sources....4
World Supply, Demand, and Trade....4
- United States....5
- Canada....6
- Other Market-Economy Countries....7
  - Brazil....7
  - Cyprus....7
  - Greece....8
  - Italy....8
  - South Africa....8
  - Swaziland....9
  - Zimbabwe....10
- Countries Currently or Formerly Having Centrally Planned Economies....10
  - China....10
  - Kazakhstan and Russia....11
- Other Producing Countries....12

World Consumption....12
- Introduction....12
- United States....13
- Other Countries in Central and North America....13
- Europe....13
- Asia and the Middle East....14
- Africa....14
- South America....15
- Oceania....15
- General Trends....15

Discussion....16
Conclusions....17
Acknowledgments....17
References Cited....17
Appendix. World Asbestos Production, Trade, and Consumption from 1920 through 2003....35

Figures

[Figures follow References Cited]

1. Bar graph of calculated apparent consumption of asbestos by region, 1920–2003.....24
2–3. Line graphs of calculated apparent consumption of asbestos by major asbestos-consuming countries:
2. 1920–1990.....25
3. 1995–2003.....26

Tables

[Tables follow figures]

1. Early developments of the asbestos industry.....27
2. Salient U.S. statistics for asbestos, 1900 through 2003.....28
3. U.S. end uses for asbestos, 1965 through 2003.....31
4. World production of all types of asbestos, 1900 through 2003.....32
A1–A19. Asbestos production, trade, and consumption in—
A1. 1920.....36
A2. 1930.....37
A3. 1940.....39
A4. 1950.....41
A5. 1960.....43
A6. 1970.....45
A7. 1975.....47
A8. 1980.....50
A9. 1985.....53
A10. 1990.....55
A11. 1995.....57
A12. 1996.....59
A13. 1997.....61
A14. 1998.....63
A15. 1999.....66
A16. 2000.....69
A17. 2001.....72
A18. 2002.....75
A19. 2003.....78

Conversion Factors

Multiply	By	To obtain
square meter	10.76	square foot
square meter	1.196	square yard
metric ton (t, 1,000 kilograms)	1.102	short ton (2,000 pounds)

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/5

Worldwide Asbestos Supply and Consumption Trends from 1900 through 2003

By Robert L. Virta

Abstract

This Circular updates and supersedes U.S. Geological Survey (USGS) Open-File Report 03–083, "Worldwide Asbestos Supply and Consumption Trends from 1900 to 2000," with the addition of supply and consumption estimates and analysis from 2001 through 2003 and revisions to the consumption estimates for 1998 through 2000. The text from Open-File Report 03–083 also has been updated in this Circular to include revisions to and expansion of the time-series coverage.

The use of asbestos is one of the most controversial issues surrounding the industrial minerals industry. Its carcinogenic nature, an overall lack of knowledge of minimum safe exposure levels, its widespread use for more than 100 years, and the long latency for the development of lung cancer and mesothelioma are the main contributing factors to these controversies. Another factor is that, despite decades of research, the mechanisms responsible for its carcinogenic properties are still largely unknown.

The United States produced about 3.29 million metric tons (Mt) of asbestos and used approximately 31.5 Mt between 1900 and 2003. About half of this amount was used after 1960. In 2002, the last asbestos mine in the United States closed, marking the end of more than 110 years of U.S. asbestos production. Cumulative world production from 1900 through 2003 was about 181 Mt. If one assumes that unusually large stocks were not maintained and that world consumption roughly equaled production, then about half of the world production and consumption occurred between the end of 1976 and the end of 2003.

The United States and Western European nations were the largest consumers of asbestos during the first two-thirds of the 20th century. They were surpassed by the collective production and consumption of Kazakhstan and Russia by the 1970s. After the onset of the health issues concerning asbestos in the late 1960s and early 1970s, the decline in world production and consumption began to be evident in the late 1970s and early 1980s. The 1991 breakup of the Soviet Union, a major user of asbestos, resulted in a significant decline in asbestos consumption and production in former Soviet-bloc countries. Consumption and production in Kazakhstan and Russia increased through 2003 from 2001, albeit to a much lower level than in the 1980s.

In 2003, world consumption was estimated to be 2.11 Mt, about 45 percent that of 1980. Relatively few countries in Asia, the Middle East, South America, and the former Soviet Union remained as the leading users of asbestos. China was the leading consuming nation, using an estimated 492,000 metric tons (t) in 2003. China was followed, in decreasing order of consumption, by Russia (429,000 t), India (192,000 t), Kazakhstan (174,000 t), Ukraine (156,000 t), Thailand (133,000 t), Brazil (78,400 t), and Iran (75,800 t). These eight countries accounted for 82 percent of the world's apparent consumption in 2003. Following Iran, in decreasing order of consumption by tonnage, were Uzbekistan (42,400 t), Vietnam (39,400 t), Indonesia (32,300 t), the Republic of Korea (23,800 t), Kyrgyzstan (23,700 t), Japan (23,400 t), and Mexico (20,100 t). Consumption in all other countries was estimated to be less than 15,000 t each in 2003. Sizable consumption increases occurred in Azerbaijan, China, India, Iran, Kazakhstan, Thailand, and Ukraine between 2000 and the end of 2003. Consumption patterns in countries using less than 5,000 t per year were too erratic to ascertain any trends in their use of asbestos.

Introduction

The use of asbestos is one of the most controversial issues surrounding the industrial minerals industry. Its carcinogenic nature, an overall lack of knowledge of minimum safe exposure levels, its widespread use for more than 100 years, and the long latency for the development of lung cancer and mesothelioma are the main contributing factors to these controversies. Another factor is that, despite decades of research, the mechanisms responsible for its carcinogenic properties are still largely unknown.

The United States produced about 3.29 million metric tons (Mt) of asbestos and used approximately 31.5 Mt between

1900 and 2003. In 2002, the last asbestos mine in the United States closed, marking the end of more than 110 years of U.S. asbestos production. Cumulative world production from 1900 through 2003 was about 181 Mt. If one assumes that unsually large stocks were not maintained and that world consumption roughly equaled production, then about half of the world production and consumption occurred between the end of 1976 and the end of 2003.

Purpose and Scope of Circular

Of interest, from a historical and exposure standpoint, is how much asbestos was used in each country over time. This information provides a means by which to determine past, current, and future markets for asbestos and some insight into the potential for past occupational asbestos exposures in various countries. Total and market-specific usage data for asbestos generally are lacking because most countries did not have the resources or feel the need to gather and evaluate that kind of information. Even in the United States, only asbestos production (sales) data have been tracked for more than 100 years; import data were not gathered until 1931, and asbestos consumption by market was not documented until about 1972, with only estimates extending back to 1965. This Circular reviews production and market changes throughout the world and provides some insight into the levels of asbestos use in individual countries over time.

This Circular updates and supersedes U.S. Geological Survey (USGS) Open-File Report 03–083, "Worldwide Asbestos Supply and Consumption Trends from 1900 to 2000," with the addition of supply and consumption estimates and analysis from 2001 through 2003 and revisions to the consumption estimates for 1998 through 2000. The text from Open-File Report 03–083 also has been updated in this Circular to include revisions to and expansion of the time-series coverage.

After the introduction and identification of data sources, this Circular provides information on asbestos trends in two main sections: "World Supply, Demand, and Trade" and "World Consumption." Table 1 summarizes early developments in the asbestos industry; table 2 has salient U.S. statistics for asbestos, table 3 has U.S. end uses for asbestos, and table 4 has world production data for asbestos. Figures 1, 2, and 3 are graphs of apparent consumption of asbestos by region and country; figures and tables follow the "References Cited." The text is supplemented by the appendix, in which tables A1–A19 provide snapshots of world production, trade, and consumption of asbestos at specific times: for 1920–1970, at 10-year intervals; for 1970 through 1995, at 5-year intervals; and for 1996 through 2003, annually.

Data in the appendix tables are presented for individual countries and regions. To form the regions, countries are grouped by continent with a few exceptions. Middle Eastern countries are grouped with Asia. Eastern countries of the former Soviet Union, despite being in Asia, are included in Europe so as to be grouped with Russia and other western countries of the former Soviet Union and to facilitate comparisons of data for the same region at different times.

Definitions

Asbestos is a generic name given to the fibrous variety of six naturally occuring minerals that have been used in commercial products (Virta, 2001). The term "asbestos" is not a mineralogical definition. It is a commercial designation for mineral products that possess high tensile strength, flexibility, resistance to chemical and thermal degradation, and high electrical resistance and that can be woven.

Minerals that can crystallize as asbestos belong to two groups: serpentine and amphibole. The asbestos variety of serpentine is chrysotile. Most of the asbestos used after the late 1800s was chrysotile. The commercial asbestos varieties of amphibole include the following: crocidolite (riebeckite asbestos), amosite (cummingtonite-grunerite asbestos), anthophyllite asbestos, tremolite asbestos, and actinolite asbestos. These types were mined over the long history of asbestos use.

History of Asbestos Use

Asbestos use began about 4,500 years ago. Early evidence of its use to strengthen clay pottery as long ago as 2500 B.C. has been found in Finland (Selikoff and Lee, 1978, p. 6–7; Gross and Braun, 1984, p. 9). Anecdotes about its use have been reported by many, including Pliny the Elder (about 79 B.C.) and Marco Polo (about A.D. 1250) (Bowles, 1946, p. 13–14). Some of the earlier uses were in crematory shrouds, lamp wicks, and incombustible napkins and tablecloths. The tablecloths could be tossed in the fire to be cleaned without fear of damage (Becker & Haag, 1928, p. 14–16; Bowles, 1937, p. 5–7; Sinclair, 1959, p. 1–3; Natural Resources Board of Southern Rhodesia, 1963). Ben Franklin reportedly used an asbestos purse, not to protect his money, but to prevent it from burning the proverbial hole in his pocket (Alleman and Mossman, 1997).

The modern asbestos industry began in the early 1800s when a textile manufacturing industry was established in Italy to produce such items as fabrics, string, and book covers (Bowles, 1946, p. 14; Sinclair, 1959, p. 3, 277; Alleman and Mossman, 1997). Consumption at that stage still was extremely low compared with 20th century usage. With increased industrialization, new uses were developed to take advantage of the strength, heat resistance, and flexibility of asbestos fibers. These uses included packings for steam glands on high-temperature machines, insulation for boilers and steampipes, and fireproof paint and wall materials. Textiles remained a small yet valuable market during this period of expanded use (Sinclair, 1959, p. 278; Alleman and Mossman, 1997).

As the asbestos manufacturing industry grew worldwide in the late 1800s, concerns over supply arose because production in Italy, the world's primary supplier of asbestos,

and other countries totaled only a few thousand tons per year (Bowles, 1934, p. 7–24; Howling, 1937, p. 59; Selikoff and Lee, 1978, p. 14). The discovery and development of large asbestos deposits in Canada, Russia, and South Africa in the late 1800s resolved the supply issue (Sinclair, 1959, p. 3; Selikoff and Lee, 1978, p. 8).

A timeline listing significant developments in the early history of the asbestos industry was published in 1953 (Stover Publishing Co., 1953, p. 4–6). Selikoff and Lee (1978, p. 17–18) presented a historical timeline of significant events regarding the development of the asbestos industry through 1972. Several of the more important of these developments are listed in table 1.

In 1907, the development of the Hatschek machine for making asbestos-cement flat and corrugated panels resulted in a significant increase in demand for asbestos (Rosato, 1959, p. 63; Sinclair, 1959, p. 279). This technology enabled the mass production of inexpensive, fireproof building materials. In 1929, a process was developed for the mass production of asbestos-cement pipe, enabling its widespread use in water-supply and waste lines (Rosato, 1959, p. 79). Simultaneously, the rise of the automobile industry in the early 1900s resulted in an increased demand for asbestos for the manufacture of brakes, clutch components, and engine gaskets (Sinclair, 1959, p. 278). These developments resulted in a rapid increase in the use of asbestos worldwide. By 1910, world production exceeded 109,000 metric tons (t), which was more than three times as much as production in 1900 (table 4). In 1910, the United States was the leading user of asbestos in the world, consuming an estimated 43 percent of world production (tables 2 and 4).

Production and consumption declined during World War I and the Great Depression of the 1930s. Immediately after both events, there was rapid growth in construction and other market sectors, which continued into the 1940s. Sales and use of asbestos increased to meet the demands of these new and expanding markets. In addition to automotive and asbestos-cement products, demand grew for asbestos millboard and paper for electrical panels; textiles for insulating electrical wiring; spray-on asbestos products for protecting steel girders in buildings; reinforcing, heat-resistant fillers for plastics; fire-resistant roofing materials such as asbestos felts, shingles, and asphalt roofing compounds; inexpensive, durable, and dimensionally stable flooring products, such as vinyl asbestos tile and flooring felts; heat- and acid-resistant gaskets and packings; thermal insulation on boiler systems for buildings and homes; fireproof suits for firefighters; reinforcement for plasters and caulking compounds; and filler and reinforcer in paints and asphalt road surfacing (Stover Publishing Co., 1953, p. 9–15; Rosato, 1959, p. 23–27; Selikoff and Lee, 1978, p. 19–20; Cossette and Delvaux, 1979, p. 104–107; Roskill Information Services Ltd., 1990, p. 99–126).

The onset of World War II resulted in declining production in most regions of the globe except Canada, South Africa, and the United States. While asbestos production and use declined worldwide, U.S. war demands absorbed much of the increased production from Canada, South Africa, and the United States. U.S. consumption increased to about 60 percent of world production in 1942 from 37 percent in 1934 (tables 2 and 4). However, postwar reconstruction and recovering economies again resulted in increased world demand for asbestos, and production of asbestos increased to supply these demands.

By 1958, asbestos was used in about 3,000 applications (Quebec Asbestos Information Service, 1959). By this time, asbestos was being honored for its "service to humanity" (Alleman and Mossman, 1997) and called a "boon to humanity" (Bowles, 1946, p. 6) and "faithful servant of mankind" (Bowles, 1946, p. 37), "the most important of the non-metallic mineral products of the world—and certainly one of the most wonderful" (Summers, 1919, p. 10), and even the "magic mineral" (Quebec Asbestos Information Service, 1959).

The myriad uses of asbestos resulted in a continued increase in demand for asbestos after World War II. Peak demand for asbestos was achieved around 1977, when about 25 countries were producing a total of almost 4.8 Mt per year of asbestos, and about 85 countries were manufacturing asbestos products (table 4). In the United States and, to a lesser extent, in many European countries, the use of asbestos waned in the early to late 1970s (Alleman and Mossman, 1997). Health research conducted during the 1920s to 1940s had revealed an association between exposure to asbestos and asbestosis, but in the late 1950s and early 1960s, an association between asbestos exposure and lung cancer was conclusively proven (Selikoff and Lee, 1978, p. 22–23, 31–32; Gross and Braun, 1984, p. 20–21; U.S. Department of Health and Human Services, 1992, p. 33–34). With that finding, public opposition to the use of asbestos increased significantly.

Liability also became a major issue for producers and manufacturers. In the United States, asbestos producers and manufacturers of asbestos products faced an increasing number of class-action lawsuits filed on behalf of those suffering from asbestos-related diseases (Virta, 2002, p. 15). This liability contributed to a shift by many product manufacturers to (1) asbestos substitutes, such as aramid fiber, cellulose fiber, polyvinyl alcohol fibers, or wollastonite, or (2) alternative products, such as fiberglass shingles, mineral wool insulation, ductile iron and polyvinyl chloride pipe, graphite packings, metallic disk brake pads, and aluminum siding (Hodgson, 1989; Virta, 1994). Similar movements toward the use of non-asbestos products followed in many other countries, particularly in Western Europe.

The health and liability factors resulted in a dramatic decline in the use of asbestos in the industrialized countries after the mid-1970s, a movement toward increasingly strict exposure limits for occupational settings, new consumer and environmental regulations, and, by 2003, full or partial bans on the use of asbestos in 16 countries—Argentina, Austria, Belgium, Chile, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Poland, Saudi Arabia, Sweden, Switzerland, and the United Kingdom. Additionally, the European Union (EU) banned the use of asbestos, with some exemp-

tions, in 2005. Despite the bans and restrictions, many countries still consider asbestos use vital to their development, as shown in the appendix.

Data Sources

The data cited in this Circular were extracted from a variety of sources because no single source contains a complete set of all statistics needed. For the United States, annual compilations of mineral data for the last century were published under two titles by the U.S. Geological Survey (USGS) and the U.S. Bureau of Mines (USBM) as responsibilities were periodically reassigned. The two sources used were "Mineral Resources of the United States" (USGS, 1901–1926; USBM, 1927–1933) and "Minerals Yearbook" (USBM, 1933–1996; USGS, 1997–2005). Asbestos chapters in these two sources are cited under the agencies as shown in the previous sentence; in addition, selected asbestos chapters are cited by personal author names when a specific credit is needed. Chapters on mineral industries of other countries were published in international volumes of the USBM and USGS "Minerals Yearbook" for 1963 through 2003; they are cited by personal author names.

Also used in compiling this Circular were asbestos chapters in the "Statistical Summary of the Mineral Industry" and "World Mineral Statistics" and their predecessor reports by the British Geological Survey (BGS) and its forerunners (Great Britain Imperial Mineral Resources Bureau, 1924; Great Britain Imperial Institute, 1932, 1948; Great Britain Colonial Geological Surveys, 1956; Great Britain Institute of Geological Sciences, Overseas Division, 1967; Great Britain Institute of Geological Sciences, 1973, 1981; BGS, 1984, 1991, 1995, 2001, 2002). Other resources include asbestos and chrysotile chapters of the "Canadian Minerals Yearbook" (Vagt, 1975; Hoskin, 1991; Perron, 2001, 2003) and reports on the South African asbestos industry (Gössling, 1977; Griffiths, 1989, p. 21; van der Merwe, 1989; Munzhelele, 2000). International trade data for 1998 through 2003 were obtained from the United Nations (UN) Statistics Division (2005).

In general, revisions to statistical data have not been published in any systematic fashion. As a result, data from various sources frequently do not agree for any given year. Another problem is that data by country were often revised but not published; only the revised total world production data were published. Thus, the sum of production of individual countries may not equal the revised world production for a given year. Another problem is that the data are a mix of ore production, fiber production, and fiber sold or used. Ore production consists of crude rock and asbestos, fiber production consists of asbestos fiber recovered through the processing of crude ore, and fiber sold or used is asbestos fiber entering commerce during the year. Also, data were not available from all countries for all years. When estimates were made in publications, usually there was no indication that data were estimates or any indications of how the estimates were made. There is no way to resolve these problems short of the impossible task of retrieving all of the survey data, and so they will have to be accepted as a limitation of this historical review.

When possible, data were extracted from one source to maintain consistency over the longest period of time. For the next section of the Circular, entitled "World Supply, Demand, and Trade," data extracted from the USBM and USGS "Minerals Yearbook" chapters on asbestos were used as the basis for the evaluation. Many of the data are available in the asbestos chapter on the USGS Web site at http://minerals.usgs.gov/ds/2005/140 (Buckingham and Virta, 2006). Some of the numbers under "World Supply, Demand, and Trade" do not match those of Buckingham and Virta (2006) because estimates for nonresponding survey countries are included in this Circular. These estimates were based on world asbestos market conditions, accounts from other data sources, and long-term production trends within the country. Adjustments also were made for countries reporting crude ore production rather than fiber production.

For the section "World Consumption," data extracted from the publications of the BGS and its predecessor agencies were used to calculate the apparent consumption for each country for 1920 through 1997; see appendix tables A1 through A13. When discrepancies arose or data were not available in the BGS publications, data extracted from the above-mentioned references or estimates that were the most consistent with market conditions at the time were used. After 1997, production data reported in the USGS "Minerals Yearbook" chapters on asbestos (USGS, 1997–2005) and trade data from the UN Statistics Division (2005) were used to estimate world consumption; see appendix tables A14 through A19.

As noted in USGS Open-File Report 03–083 (Virta, 2003b), a calculated trade imbalance began to be evident in 1998, worsening by 2000. This apparent imbalance resulted because trade data for all countries were not available at the time that Open-File Report 03–083 was published. This problem was resolved by using UN Statistics Division (2005) trade data for 1998 onward.

Despite the caveats, the data are deemed sufficiently reliable to make a fairly accurate evaluation of asbestos consumption trends worldwide as well as those of regions and individual countries. The reader should note, however, that the tables in the Circular body and appendix are snapshots of world activities at a particular time. Activities that may have occurred during the intervals are not taken into consideration.

World Supply, Demand, and Trade

The following section includes descriptions of asbestos trends in the United States, Canada, and the following three groups: other market-economy countries (in which countries are discussed alphabetically), countries currently and formerly having centrally planned economies, and other producing

countries. For consistency, data used in this section were extracted from the USBM and USGS "Mineral Resources of the United States" and "Minerals Yearbook" (USGS, 1901–1926, 1997–2005; USBM, 1927–1933, 1933–1996). See the section "Data Sources" for further explanation.

United States

Commercial asbestos production has been recorded in 15 States since 1900: Alaska, Arizona, California, Georgia, Maryland, Massachusetts, Montana, North Carolina, Oregon, Pennsylvania, South Carolina, South Dakota, Vermont, Virginia, and Wyoming. There probably were small amounts of unrecorded production in additional States. The largest producer States were Arizona, California, North Carolina, and Vermont. Most of the asbestos mined in the United States was chrysotile, although much of the early production was of amphibole asbestos. These amphibole asbestos mines generally were short lived. The longest sustained production of amphibole asbestos was from North Carolina, where anthophyllite asbestos was mined from the early 1930s to 1979 (USGS, 1901–1926, 1997–2005; USBM, 1927–1933, 1933–1996; Bowles, 1934, p. 2–7, 1959, p. 6–7).

U.S. asbestos production was relatively low at the start of the 20th century, less than 10,000 tons per year until 1936 (see table 2, column labeled "Domestic sales or use," which is equivalent to production). After the Great Depression of the early 1930s and with the onset of World War II, U.S. production increased through 1942 to meet increased war demands. After 1942 and during the recession following World War II, demand and, consequently, U.S. production declined, not regaining their former levels for another 6 years. It wasn't until 1965 that U.S. production reached 100,000 metric tons per year (t/yr). Annual world production by 1965 had already exceeded 2.8 Mt (table 4). U.S. production exceeded 100,000 t/yr for only 10 years, 1965 to 1973 and in 1976. Peak production was about 136,000 t in 1973, which was 3 percent of the world's asbestos production and only 17 percent of the U.S. demand for that year (see table 2, where demand is equivalent to "Apparent consumption"). After 1973, the asbestos health controversy began to seriously affect demand, causing U.S. production to stagnate and then take a precipitous decline. The production of 5,000 t in 2001 was only 4 percent of the peak in 1973. In 2002, the last asbestos mine in the United States closed, marking the end of more than 110 years of U.S. asbestos production.

Despite having produced 3.29 Mt of asbestos between 1900 and the end of 2003, the United States almost always was dependent on imports to meet most of its demand. Imports supplied 94 percent of the U.S. asbestos needs during 1900 through 2003. For only 8 of those 104 years (1967, 1969–1973, 1975, and 1985) was U.S. import dependence (calculated as imports divided by apparent consumption) less than 90 percent. Canada was the major supplier of asbestos to the United States throughout most of the century, averaging 94 percent from 1910 to 2003. South Africa supplied up to 6 percent of U.S. imports but averaged 4 percent after 1915 (table 2). Swaziland and Zimbabwe were two other lesser, yet important, suppliers of asbestos to the United States.

About 98 percent of the 29.6 Mt of asbestos imported into the United States between 1900 and the end of 2003 was chrysotile, mostly from Canada. Crocidolite imports were 364,000 t (1.2 percent of total asbestos imports) and amosite imports were 282,000 t (1 percent of total imports). About 34,200 t of anthophyllite asbestos were imported from Finland, the major supplier. The United States has not imported amosite since 1985 and has not imported crocidolite since about 1995. Most of the asbestos imports reported as crocidolite after 1995 are believed to be chrysotile on the basis of their sources and customs values (table 2).

Asbestos consumption in the United States was minimal in the 1800s. At that stage, markets primarily were such applications as textiles (fireproof cloth used to manufacture such items as boots, gloves, and theater curtains) and insulation and packings for steam locomotive and other boiler systems (Bowles, 1937, p. 8–10). Consumption did not increase significantly until the early 1900s, when an expanding population and increased industrialization resulted in a demand for a steady supply of cost-effective, mass-produced construction materials. Asbestos products that filled this need included asbestos-cement pipes and sheets, coatings and compounds, flooring, friction materials such as brakes and clutches, and insulation. These were the large tonnage uses for asbestos. Other smaller, but still important, applications were in asbestos paper, asphalt emulsions, gaskets, packings, plastics, roofing felts, shingles, and textiles (Clifton, 1976, 1980b, 1985).

Starting from a rather small apparent consumption of 20,400 t/yr in 1900, U.S. markets expanded to a peak of 803,000 t/yr in 1973. Demand after 1900 was fairly continuous, with a short period of rapid growth in demand during World War I. The end of the Great Depression by the middle 1930s and the onset of World War II in the late 1930s brought about a brief surge in demand to meet U.S. requirements. After 1950, demand increased in step with economic growth in the United States. There was a general flattening of the demand curve in the 1950s during the Korean conflict and later in the early 1970s. The flattening of demand occurred after the early 1970s because the use of asbestos was becoming controversial and markets for asbestos in the United States appear to have matured. After 1973, asbestos consumption declined rapidly. By 2000, consumption was only about 15,000 t, or 1.9 percent of the level in 1973 and equivalent to consumption in the late 1800s. In 2003, U.S. consumption was 4,650 t (table 2).

In relation to overall world consumption, the United States was the largest market economy and world user of asbestos during much of the 20th century. U.S. asbestos use was high because much of the early manufacturing research was conducted in the United States, industrial demand for asbestos grew rapidly in the early 1900s, and a ready supply of asbestos was just across the border in Canada (Sinclair, 1959, p. 279). The United States used about 17 percent of

the world's asbestos production between 1900 and the end of 2003. This long-term percentage is remarkable because after 1980, the U.S. annual share consistently was less than 10 percent. Between 1900 and the end of 1949, U.S. apparent consumption averaged 63 percent of world production and increased in times of war. This average clearly demonstrated the strength of the U.S. asbestos industry in its early history. As more countries developed asbestos-manufacturing industries after World War II, the U.S. share of the world market declined, averaging 13 percent from 1950 through 2003 (tables 2 and 4).

Following World War II, demand for asbestos fiber increased at a faster rate in other parts of the world than in the United States. Much of this growth was spurred by the massive reconstruction efforts in Europe after the war and later by growing economies. Consumption in the United States declined from 51 percent of the world production in 1950 to 19 percent in 1970. With the onset of awareness of the asbestos health issues, U.S. consumption declined even further. By 1975, U.S. consumption was 13 percent of world production; by 1985, 4 percent; and by 2000, less than 1 percent (tables 2 and 4).

About 71 percent of the U.S. consumption of asbestos occurred between 1950 and the end of 2003, about 50 percent occurred between 1960 and the end of 2003, and about 39 percent occurred after 1965, which is the year of the earliest available estimate of U.S. asbestos consumption by market share (tables 2 and 3). Thus, a fair idea of the markets into which a sizable share of the asbestos went throughout most of the history of U.S. asbestos usage can be determined. Table 3 presents the end-use data for asbestos from 1965 through 2003. The totals in table 2 do not match exactly the apparent consumption totals in table 3 because table 2 includes changes in government and industry stocks where available and because table 3 excludes amounts smaller than 500 t. With that caveat, the average percentage breakout of the major U.S. markets between 1965 and the end of 2003 follows: flooring, 21 percent; asbestos-cement pipe, 18 percent; roofing products, 12 percent; friction products, 11 percent; asbestos-cement sheet, 6 percent; packing and gaskets, 4 percent; paper, 3 percent; coatings and compounds, electrical insulation, and textiles, 2 percent each; plastics and thermal insulation, less than 1 percent each; and other, 18 percent (table 3).

Because of the asbestos health issue, markets changed over this time period (table 3). The largest losses were in asbestos-cement pipe and sheet, coatings and compounds, flooring, and insulation. In 1965, before concerns about the asbestos health issue intensified, flooring accounted for 25 percent of the market share, followed by asbestos-cement pipe (19 percent), roofing (10 percent), friction products (8.9 percent), asbestos-cement sheet (6.9 percent), electrical insulation and packing and gaskets (3 percent each), paper and textiles (2 percent each), coatings and compounds and plastics (less than 1 percent each), and other uses (20 percent). By 1980, consumption was 19.5 percent for flooring, followed by friction products (14.5 percent), asbestos-cement pipe (11.7 percent), roofing (6.7 percent), asbestos-cement sheet (6.4 percent), packing and gaskets (3.3 percent), coatings and compounds (3.1 percent), electrical insulation (1.7 percent), thermal insulation (0.8 percent), plastics and textiles (0.6 percent each), paper (0.3 percent), and other uses (30.9 percent) (Clifton, 1976, 1980b, 1985). In 2000, the end-use markets were roofing (60 percent), gaskets (20 percent; packings were no longer being manufactured in the United States), friction products (13.3 percent), coatings and compounds, plastics, and other uses (6.7 percent) (Virta, 2003a). By 2003, coatings and compounds accounted for 25 percent of consumption; roofing products, 60 percent; and other uses, 15 percent (Virta, 2005a).

Some anecdotal information on markets before 1965 is available. Josephson and Marsh (1948) reported that U.S. usage of asbestos grades of shorter length in floor tile began to increase rapidly following the development of suitable production methods. Production of asbestos floor tile increased to 34,681 million square meters (41,479 million square yards) in 1947 from just 4,124 million square meters (4,933 million square yards) in 1939, an 8-fold increase in as many years. Corrugated sheet production increased to 4,258 million square meters (45,839 million square feet) in 1947 from 701 million square meters (7,551 million square feet) in 1939. Less dramatic but still substantial increases were recorded in many other product categories (Josephson and Barsigian, 1950). Kennedy and Foley (1960) reported that 96 percent of the chrysotile used in the United States in 1959 was used principally in asbestos-cement and asbestos-asphalt building materials.

Canada

Chrysotile mining began in Canada around 1878 (Bowles and Barsigian, 1945; Sinclair, 1959, p. 3). By 1920, Canada already was producing about 162,000 t/yr, or 84 percent of the world's production (table 4). Production suffered in the early 1930s because of the Great Depression in the United States (the largest Canadian market) and recessions worldwide that affected the entire asbestos industry. By 1935, the U.S. economic recovery bolstered the Canadian asbestos industry. The onset of World War II slowed production around 1940, but it recovered around 1946. During that time, mines and mill capacities in Canada were being increased rapidly to meet growing world demand (Josephson and Marsh, 1948). Production was slowed briefly by a strike in the Canadian industry in 1949 (Josephson and Barsigian, 1951) but quickly resumed following resolution of the dispute. Despite Russia emerging as a major asbestos-producing republic of the former Soviet Union, Canada still retained 61 percent of global production in 1950 (table 4).

Competition arose as Italy, Russia, South Africa, Swaziland, the United States, and Zimbabwe began to increase their production in the 1940s and 1950s (table 4), soon to be followed by China in the early 1960s and Brazil and Cyprus in the mid-1970s. By 1960, Canada's share of global production

declined to 46 percent despite an increase in its production. Canadian production peaked in the 1970s (table 4), almost coinciding with the peak U.S. consumption (table 2), as would be expected because the United States was the major destination for Canadian asbestos. Then, in 1975, the Canadian asbestos producers suffered from a major mill fire, a landslide in a major mine, strikes, and political and transportation issues, resulting in a sharp (36 percent) decline in production (Vance, 1975). The industry rebounded quickly, however, only to face the asbestos health issue, which began in the United States in the early 1970s and quickly spread to other countries. Two other factors affecting sales were declines in some of the world economies and political instability in some of the developing nations, which were important purchasers of Canadian asbestos in the late 1970s (Roskill Information Services Ltd., 1983, p. 20). Canadian production declined through 2000 as asbestos markets worldwide waned. By 2003, Canadian production was 200,500 t, or 9 percent of world production, down from 43 percent in 1970. Canada produced about 61.2 Mt of asbestos between 1900 and the end of 2003, all of it chrysotile (table 4).

Canada, for the most part, has been a major exporter of asbestos over time. Roughly 77 percent of Canadian production has been exported since 1900, with exports exceeding 80 percent since 1960. The United States was the largest market for exported Canadian asbestos. In 1930, U.S. asbestos imports from Canada were 181,000 t (table 2), or about 83 percent of Canadian production (table 4). U.S. imports declined during the Great Depression in the United States in the early 1930s but picked up again during World War II. The United States imported about 65 percent of Canadian production in 1940. U.S. imports from Canada accounted for 78 percent of Canadian production in 1950, 37 percent in 1970 (as the asbestos health issue was developing), 6 percent in 1990, and about 2.2 percent in 2003 (USBM, 1933–1996; USGS, 1997–2005).

Canadian asbestos producers had developed a broad range of customers before the decline of the U.S. market, and so those countries soon moved ahead of the United States as the major Canadian customers. As U.S. markets changed, the proportions of asbestos grades exported to the United States also changed. In 1973, the U.S shares of all Canadian exports were divided among asbestos grades as follows: 34 percent (11 of 32 t) of crude fiber, 24 percent (203,000 of 837,000 t) of milled fiber (groups 3, 4, and 5), and 59 percent (498,000 of 846,000 t) of short fiber (groups 6 to 9) (Vagt, 1975). Groups are Canadian asbestos product designations with group 3 containing a higher proportion of longer fibers than group 4, group 4 containing a higher proportion of longer fibers than group 5, and so forth. Among Canadian customers in 1973, the United States was followed by Japan for crude fiber, Germany, the United Kingdom, France, and Japan for the milled fiber, and Japan and the United Kingdom for short fiber. In all, Canada exported to more than 70 countries in 1973.

By 1990, among importers of Canadian asbestos, the United States had dropped to second, behind Japan, for the crude fiber (as U.S. imports were 13 percent of 1,469 t), to seventeenth for the milled fiber (8 percent of 378,000 t), and to second, behind Japan, for the short fiber (14 percent of 270,000 t) (Morel-à-l'Huissier and Hoskin, 1992). In 1999, the United States was grouped with other countries for all but the crude fiber because of the low import tonnage (Perron, 2001). In 2003, major export markets for Canadian asbestos were, in decreasing order by tonnage, India, Thailand, the Republic of Korea, Japan, Algeria, Mexico, and Malaysia. Thus, Asian markets were relatively small in the 1970s but grew in dominance as markets shifted away from the United States and European countries in the 1980s. A detailed account of all exports from Canada is beyond the scope of this Circular; the "Canadian Minerals Yearbook" chapters on asbestos contain such information (Perron, 2001, 2003).

Other Market-Economy Countries

Brazil

Brazil is a relative newcomer in the asbestos industry. Although small amounts of asbestos were mined as early as 1932, it wasn't until 1967 that Brazil began significant production of chrysotile (Harben, 1984). Even then, production was only 16,300 t in 1970 (table 4). In 1971, the industry received a boost because of the Brazilian Goals and Bases Program. About $9.2 million was invested by the government to increase production (Clifton, 1973). Within 10 years, production was almost 170,000 t. Production peaked in 1991 at 237,000 t. Following a decline to about 170,000 t in 1995, production increased to about 194,000 t in 2002 and 2003. Markets in Brazil were primarily those dealing with the manufacturing of asbestos-cement products (85 percent of sales for the dominant Brazilian producer) and friction products, including brakes and clutches (O'Driscoll, 1989, p. 34; Kendall, 1996, p. 49).

Export of asbestos began from Brazil in about 1980. In 1986, the major destinations for the largest Brazilian asbestos producer were Argentina, India, and Mexico, and smaller shipments were made to China, Japan, Portugal, and Spain (Roskill Information Services, Ltd., 1986, p. 14). By 1987, exports accounted for 25 to 30 percent of sales, and in the late 1980s, major destinations for exported fiber included Africa, Asia, island nations in the Caribbean, and Latin America (O'Driscoll, 1989, p. 34). In 2003, major export markets were, in decreasing order by tonnage, Thailand, India, Iran, Indonesia, and Mexico (UN Statistics Division, 2005).

Cyprus

Cyprus was a small producer of chrysotile and thus is included under other countries in table 4. Although mention of asbestos products appears in early Greek history, systematic mining of small amounts of asbestos in Cyprus did not occur until around 1907 (Becker & Haag, 1928, p. 39; Howling, 1937, p. 48). Significant commercial production did not begin until about 1950. Before that time, production was less than 15,000 t/yr, and that amount was attained only in the late

1940s. World War II affected production drastically because Cyprus had an export-oriented asbestos industry. The industry recovered after the war. Within 25 years, production peaked at about 38,000 t in 1976 (Maliotis and Ilich, 1986). From there, a rapid decline occurred and production ceased around 1988.

Exports were the key to the asbestos industry's survival in Cyprus. In 1962, about 69 percent of production was exported (May, 1964). By 1980, exports had reached 86 percent of production (table A8). Like Greece and Italy, Cyprus exported asbestos to Europe (Belgium and Luxembourg, Czechoslovakia, Denmark, France, Germany, Greece, Ireland, and the United Kingdom), Africa (Egypt), and Asia and the Middle East (India, Indonesia, Japan, Syria, Taiwan, and Thailand) (Roskill Information Services Ltd., 1990, p. A4). The bulk of the exported asbestos was used by the asbestos-cement industry (Virta, 1987).

Greece

The earliest report of asbestos production in Greece was by Strabo in the 1st century A.D., and later reports were made by Solinus and Plutarch. They indicated that the fiber was carded and woven into handkerchiefs (Evans, 1906). Despite this early start, large-scale production of asbestos (mainly chrysotile) in Greece did not begin until the 20th century, and even then, production was sporadic.

Significant asbestos production in Greece did not begin until the early 1980s (table 4) as production declined in other parts of the world. In 1981, a new mill and mine near Zidani were opened. Production progressed slowly as technical difficulties were encountered and the world asbestos markets were soft (Sassos, 1983). Production increased to 66,000 t in 1990 from 17,000 t in 1982 (table 4). In 1991, the mining operation had one of several financial problems, resulting in a drastic downturn in production. In 1992, the company began operating again under new management (Skillen, 1993, p. 37). Production in Greece peaked at 80,200 t in 1996. Mining ceased in 1998, although fiber recovery from stockpiles and sales from stocks may have continued through 2001.

When the Zidani mine opened, the largest planned market was in asbestos-cement products. About 10 percent of the mine's output was to be used in other products such as floor tiles, asbestos paper products, putties, and paints (Industrial Minerals, 1978). In 1980, 20 to 25 percent of production was used domestically (Clifton, 1981). By 1993, 95 percent of the fiber was exported to Europe, the Far East, the Middle East, and Brazil, predominantly for asbestos-cement and roofing applications (Skillen, 1993, p. 37). Around 1978, Greece was importing about 30,000 t/yr of asbestos for its own asbestos-cement industry (Industrial Minerals, 1978).

Italy

Italy was the second largest producer of asbestos in Europe, behind Russia, for most of the 20th century. Italy was surpassed by Greece in 1989 only with the shutdown of the Italian asbestos industry. Systematic production of Italian deposits began in the middle of the 19th century, although manufacturing had been reported earlier (Howling, 1937, p. 59; Alleman and Mossman, 1997). Production remained below 10,000 t until 1941 (table 4). Prior to the discovery of the Canadian deposits in the late 1800s, Italy supplied much of the world's asbestos needs (Bowles, 1934, p. 19; Howling, 1937, p. 59). Most of that early production was tremolite. After World War I, the Balangero mine near San Vittore opened, and production of chrysotile comparable to Canadian fiber increased (Howling, 1937, p. 62). After a brief decline during World War II, production increased steadily. Around 1968, the only operating mine in Italy upgraded its facilities to increase production (Icke, 1969). Asbestos production peaked at 165,000 t in 1976 and ceased in 1991. The Italian industry collapsed after the passage of government legislation banning the use of asbestos (Loughbrough, 1992, p. 43). Markets for Italian fiber included adhesives, asbestos-cement products, bitumen, electrical insulation, friction products, jointings, paper, and plastics (Mining Magazine, 1987). In 1985, it was estimated that about 70 percent of domestic sales were for asbestos-cement applications (Craynon, 1988, p. 482).

Italy had an active asbestos-manufacturing industry and thus exported less than half of its asbestos production. Exports of 63,818 t accounted for about 40 percent of production in 1980; the remainder was used domestically in asbestos-cement products (Roskill Information Services Ltd., 1983, p. 45). In 1985, Italy's asbestos exports were estimated to be 66,200 t; the leading importers of Italian fiber were West Germany (15,400 t), France (10,000 t), and Japan (7,130 t) (Craynon, 1988, p. 470). Italy imported crude fiber, requiring 41,400 t in 1984 (Sondermayer, 1987, p. 486).

South Africa

South Africa was probably the second most important market-economy producer of asbestos from about 1950 through the mid-1980s. Asbestos production in South Africa began in the late 1800s but had progressed to only a few hundred tons by the start of the 20th century (table 4). Production increased slowly from 1900 to about 25,000 t in the 1940s after a mild downturn in the 1930s.

After World War II, production increased rapidly, undoubtedly aided by major rebuilding efforts worldwide and growing economies starting in the 1950s. The number of mills in the Transvaal area increased from 6 to 27 in 1948–1949, allowing for increased fiber production (South African Mining Journal, 1949). Mining increased from 41,500 t in 1948 to its peak of 380,000 t in 1977 with only minor setbacks (table 4). Around 1956, the amosite and crocidolite producers resolved problems with mine pumping and ventilation, although these problems didn't appear to affect production significantly (Kennedy and Mattila, 1958). Chrysotile production capacity received a boost with the completion of a new mill near Barberton in 1969 (Readling, 1971). As awareness of the

asbestos health issue increased in the early 1970s, sales began to decline and, by 1977, producers were reporting higher than expected stocks, indicating that production was outpacing demand (Clifton, 1980a). After peaking in 1977, production declined rapidly to 135,000 t in 1987, 50,000 t in 1997, and 6,220 t in 2003.

South Africa was unique in that it was the major world supplier for amosite and crocidolite and also produced chrysotile and minor amounts of anthophyllite and tremolite. Production of amosite, crocidolite, and chrysotile each dominated a different time period: amosite between 1938 and 1955, crocidolite from 1956 through 1982, and chrysotile prior to 1938 and after 1982. Production histories differed for the different types of asbestos as summarized below:

- **Amosite**. South African amosite was first mined in the Barberton District in 1907 and in the Pietersburg District in 1914 (Becker & Haag, 1928, p. 30; Kupferburger, 1930). Amosite accounted for the largest share of production between 1938 and 1955. Following an expansion program begun in 1948, amosite production increased through 1973, when it peaked at 106,000 t (Howling, 1937, p. 36; Bowles, 1959, p. 31; van der Merwe, 1989; Roskill Information Services Ltd., 1990, p. 43). Demand for amosite began to decline in the early 1970s, in response to health concerns. Amosite mining ceased around 1992, although stocks were sold after that time (Mining Journal, 1992; Industrial Minerals, 1993; British Geological Survey, 1995, p. 24).
- **Crocidolite**. Crocidolite production in South Africa was reported as early as 1893 (Diller, 1921, p. 555; Becker & Haag, 1928, p. 29; Munzhelele, 2000). Crocidolite production in South Africa peaked in 1977 at 201,000 t and dominated from 1956 through 1982 (Howling, 1937, p. 36; Bowles, 1959, p. 31; van der Merwe, 1989; Roskill Information Services Ltd., 1990, p. 43). Demand for crocidolite began to decline in the late 1970s. Crocidolite mining ended in 1997 (Munzhelele, 2000; British Geological Survey, 2002, p. 25).
- **Chrysotile**. Chrysotile, whose production in South Africa began in 1905, was produced in small amounts in the country's early mining history, with production being less than 1,000 t/yr before 1949 (Becker & Haag, 1928, p. 30; Bowles, 1959, p. 31). Chrysotile accounted for the largest share of asbestos production in South Africa prior to 1938 and after 1982, as amosite and crocidolite production declined in the early 1970s and late 1970s, respectively, in response to health concerns. Chrysotile production peaked in 1989 at about 115,000 t and was 6,000 t in 2003 (Howling, 1937, p. 36; Bowles, 1959, p. 31; van der Merwe, 1989; Roskill Information Services Ltd., 1990, p. 43; USGS, 1997–2005).
- **Anthophyllite and tremolite**. Only small amounts of anthophyllite and tremolite were produced in South Africa, generally on the order of only a few thousand tons annually, combined.

Like Canada, South Africa has been a net exporter of asbestos. More than 75 percent of South African production after 1960 was exported annually (Gössling, 1977, p. 75; Munzhelele, 2000). For most years, exports were between 85 and 95 percent of production (although some of this amount was probably shipped from stocks during some years). Exports went to the Far Eastern countries, Middle Eastern countries, and European markets. Between 1935 and 1955, the United Kingdom and United States were the largest importers of fiber from South Africa (Bowles, 1959, p. 44). These two countries accounted for 27 percent and 23 percent of exports, respectively, in 1954 (Bowles, 1959, p. 44). These countries were followed by various other European countries, Australia, Japan, India and Pakistan, and various Latin American countries in 1954 (Bowles, 1959, p. 44). Total exports from South Africa were 21,500 t in 1935 and 116,000 t in 1954.

By 1970, major importers of South African asbestos were Japan (33 percent), Italy (11.7 percent), the United Kingdom (9.5 percent), Germany (9.3 percent), and France (6 percent) (Gössling, 1977). Only 3 years later, these export markets had changed to Japan (33.7 percent), Spain (15.2 percent), Italy (9.4 percent), the United Kingdom (7.8 percent), Germany (5.8 percent), France (5.6 percent), and the United States (5.6 percent) (Gössling, 1977, p. 74). These same countries continued to be major markets as late as 1985. Other historical destinations included Austria, Belgium, Denmark, Taiwan, and Yugoslavia (Gössling, 1977, p. 74). South African exports peaked around 1975 at 339,000 t, compared to a peak of 1.69 Mt in 1973 for Canadian exports (van der Merwe, 1989, p. 144; Louis Perron, written commun., 2001).

Like exporters elsewhere, South Africa was affected by asbestos health issues (van der Merwe, 1989). Partial or total bans on asbestos use in several European countries in recent years eliminated some former markets for the South African producers. Smaller losses in markets occurred with the downturn of the U.S. market after 1970. The major export market for South Africa in 2003 was Thailand (UN Statistics Division, 2005).

Swaziland

Swaziland was a relatively small producer of chrysotile. Except for some sporadic mining, commercial production didn't really begin until 1939, when production was reported to be about 7,000 t (table 4). That was the year that the Havelock mine began operating (Bowles and Warner, 1940). Within 3 years, production had surpassed 20,000 t/yr. Installation of an aerial ropeway through to the rail lines in 1941 eased a major transportation problem (Bowles and Petron, 1943). Over the next 35 years, demand rose slowly and was interrupted by brief periods of downturns. For a short period in the early 1970s, production suffered because of problems with rock stability in one of the underground mines (Clifton, 1975). Production peaked in 1976 at 41,800 t. Production declined to 12,700 t in 2000, when production ceased.

Like the other asbestos-producing countries in Africa, Swaziland depended on exports to sustain its industries. The bulk of the production was shipped to other African nations, Europe, and the Far East. Most of the asbestos was used to produce asbestos-cement products. Shorter fibers were used for friction applications (Roskill Information Services Ltd., 1990, p. 48).

Zimbabwe

Zimbabwe is renowned for its production of low-iron, long-fiber chrysotile. Mining began around 1908 (Becker & Haag, 1928, p. 35; Natural Resources Board of Southern Rhodesia, 1963). By 1930, Zimbabwe produced 34,000 t of asbestos and was the third largest producer after Canada and the combined production of Kazakhstan and Russia (table 4). The opening of the Shabanie Railway in 1927 helped spur production by eliminating a major transportation issue (Bowles and Stoddard, 1930). Competition from Russia affected Zimbabwean producers in the early 1930s, although this potential problem was resolved by European customers apportioning orders between the two sources (Bowles and Stoddard, 1933). Production began increasing by the mid-1930s. Much of the increase was attributed to increased sales of short chrysotile fiber grades used by the asbestos-cement industry (Bowles and Cornthwaite, 1937).

Despite growing sales, Zimbabwe lost its third place standing to South Africa by 1950 but regained it in 1985 when markets for South Africa's amphibole asbestos declined. Between those times, Zimbabwe declared its independence from the United Kingdom in 1965 and had UN economic sanctions imposed in 1966. Despite the sanctions from 1966 to 1979 and strikes in 1972, the companies continued to upgrade their production facilities, and production and sales increased (British Sulphur Corporation, 1972, p. 3; Clifton, 1974, 1982; Clarke, 1982). Production peaked at 281,000 t in 1976 (table 4). However, market reversals resulted in a decline in sales and buildup of large stocks between 1978 and 1980 (Roskill Information Services Ltd., 1983, p. 68). Production declined to 115,000 t in 1999 but then rebounded to about 147,000 t in 2003 (table 4).

Like South Africa, Zimbabwe depended on export markets to sustain its asbestos industry. About 97 percent of its production was exported to 50 countries by the early 1980s (Clarke, 1982). The United Kingdom was the leading importer from 1935 to 1956 except during World War II, when the United States became the leading importer of Zimbabwean fiber. Other important markets were other European countries and Australia, India, and Latin America (Bowles, 1959, p. 43). In 1980, Southeast Asia was a major market for Zimbabwean fiber because of its use in textiles (Industrial Minerals, 1980). In 1982, it was estimated that Zimbabwe supplied about 50 percent of the world's asbestos fiber for textiles (Clarke, 1982). Another market for the fiber was in asbestos-cement products (Roskill Information Services Ltd., 1983, p. 68). In 2003, major export markets, in decreasing order by tonnage, were Slovakia, Thailand, India, Iran, Brazil, and Japan (UN Statistics Division, 2005).

Countries Currently or Formerly Having Centrally Planned Economies

China

Production of asbestos (mainly chrysotile) in China is difficult to track over time. As with many of the industrial minerals mining industries in China, accurate production and trade data on asbestos are difficult to obtain and frequently are not available. The use of asbestos in China began more than 2,000 years ago, when asbestos was used to make fire insulation, asbestos paper, and fire pots (by mixing lime with asbestos). The most famous and earliest source for asbestos mined in China was Szechuan Province (Wang, 1981, p. 256). Production by individual companies operating in China between 1918 and 1928 was reported to be less than 100 t/yr combined (Becker & Haag, 1928, p. 44). Around 1934, production was estimated to be less than a few hundred tons (Bowles, 1934, p. 22).

China became a moderate-sized producer of asbestos around 1960, when production was estimated to be 81,600 t (table 4). By 1965, 10 new asbestos projects were believed to have been completed in Szechuan Province, after which asbestos production increased fairly rapidly (Wang, 1967, p. 1115–1116). Production was reported to be 209,000 t in 1973. More than 12 up-to-date facilities mining and processing asbestos were online in Szechuan Province by 1975. By that time, Hopeh (Hebei) Province became the second largest producing region in China (Wang, 1978, p. 297–298). Production declined in the mid-1970s and early to mid-1980s. It was about 221,000 t in 1990. Production increased to 350,000 t in 2003 (table 4). Because world markets declined between 1990 and 2003, the increase in Chinese asbestos production probably was used within the country. Market data in China are not routinely published, but in 1985, it was reported that asbestos-cement products accounted for 51 percent of the asbestos usage in China (Chin, 1988, p. 216). Asbestos-cement markets still dominated in 1996, followed by friction products, rubber, textiles, and insulation products (Lu, 1998).

China consumed most of its production internally and cannot be considered a world supplier of asbestos. Exports were mostly to Southeast Asian markets. In 1964, exports were only a few thousand tons, with most exported to Japan and Poland (Wang, 1967, p. 1116). Asbestos exports were reported to be only 1,394 t in 1974; all went to Japan. Exports were 10,430 t in 1979 (Chin, 1983, p. 233). Exports in 1980 (7,397 t) were shipped mainly to Hong Kong, Indonesia, and Thailand (Chin, 1983, p. 233). Despite increased production, exports fell to 553 t in 1986. Hong Kong, Singapore, and Thailand were the major destinations in 1986 (Chin and Wu, 1990, p. 240). Exports were reported as 9,392 t in 1996, with Vietnam being the leading importer of Chinese asbestos (7,763

t) (Lu, 1998). In 2003, exports were only 3,470 t (table A19), and North Korea and Thailand were the leading destinations (UN Statistics Division, 2005).

Imports generally were not reported or import data were not available over much of the history of the asbestos industry in China. Imports were reported to be 179 t in 1973 and 839 t in 1985 (Wang, 1978, p. 291; Chin, 1988, p. 207). By the 1990s, imports had increased, rising from 1,083 t in 1990 (table A10) to 77,959 t in 1996 (table A12). Of significance was the increased importation of long-fiber asbestos. The major source for imported asbestos in 1996 was Russia (77,091 t) (Lu, 1998, p. 19). China imported 145,000 t in 2003 (table A19), and 119,000 t (82 percent) were supplied by Russia (UN Statistics Division, 2005).

Kazakhstan and Russia

Asbestos has been produced in Kazakhstan since the 1960s and in Russia since the late 1800s. These countries are discussed together in this Circular because production data were generally available only for the Soviet Union prior to its dissolution in 1991.

Sinclair (1959, p. 3) reported that deposits in the Ural Mountains were first opened around 1720 and that systematic mining of chrysotile on a commercial scale began in the early 1800s (Becker & Haag, 1928, p. 27; Howling, 1937, p. 62). Production in Russia was initially concentrated in Bajenova in the Ural district, which provided about 85 percent of the supply by the 1920s (Bowles and Stoddard, 1931; RuKeyser, 1933a). Production, however, essentially stopped with federalization of the mines in 1918, World War I, the Russian revolution, and establishment of the Soviet State following the war (Bowles and Stoddard, 1930; Howling, 1937, p. 62).

Completion of a rail line that connected to the Trans-Siberian Railway in 1927 greatly improved access to the Uralasbest chrysotile deposit and made possible intensive development of the mines (RuKeyser, 1933b). By 1927, Russia provided 11 to 15 percent of the world's supply of asbestos. A new line replaced this rail line in 1931. The new line improved efficiency because it conformed to the standard Russian gauge, eliminating the need to transfer equipment and product at the railhead (RuKeyser, 1933b).

In the 1930s, Russia began to develop a large asbestos products industry, making Russia both a major asbestos producer and a major consumer, and thereby reducing its dependence on foreign markets (Bowles and Stoddard, 1933). Bowles (1934, p. 18) noted that exports declined from 51 percent in 1922–1923 to 21 percent in 1934, reflecting the rapidly expanding domestic manufacturing industry. Around 1937, a 5-year plan (one of many) was developed that would increase capacity to 220,000 t/yr (Bowles and Barsigian, 1943). Production increased gradually through 1982, except perhaps for World War II, for which data were not available. Contributing to the increase of production in the Soviet Union was the development of the Tuva asbestos complex in the Tuva Autonomous Republic of Russia in 1964 and the Dzhetygara chrysotile deposit in Kustanay Oblast in Kazakhstan in 1965 (Roskill Information Services Ltd., 1990, p. 57).

By 1975, Kazakhstan and Russia, combined, had surpassed Canada as the world's leading producer of asbestos (table 4). Production in the Ural Mountains of Russia accounted for about 73 percent of asbestos production, followed by Kazakhstan with 24 percent and the Tuva Republic with 3 percent (Sutulov, 1973, p. 176).

The Kiyembay asbestos combine in the Orenburg Oblast of Russia began operating in 1979 and reached full operating capacity in 1985 (Strishkov, 1981b, p. 997; Industrial Minerals, 1985). In 1979, the Uralasbest combine accounted for more than 62 percent of Soviet production; the combines in Kazakhstan, Orenburg, and Tuva accounted for 26, 10.5, and 1.2 percent of Soviet production, respectively (Strishkov, 1981b, p. 996). Uralasbest, however, continued to provide all of the asbestos exported in 1980 (Clifton, 1982, p. 110).

The combined production of Kazakhstan and Russia continued to increase until 1982, when it peaked at about 2.7 Mt (table 4). By then, the health issue had begun to affect some of the export markets. A more serious issue for producers in Kazakhstan and Russia was the breakup of the Soviet Union in 1991. Combined production for Kazakhstan and Russia declined from 2 Mt in 1991 to 744,000 t in 1996 (table 4). Many industries, not just the asbestos industry, were affected by financial difficulties immediately after the breakup. Markets, however, recovered for the asbestos producers, and the combined production in Kazakhstan and Russia rebounded to 1.230 Mt in 2003, accounting for 55 percent of world asbestos production. Between 1992 and 2003, Kazakhstan accounted for 21 percent of production in the former Soviet Union (USBM, 1933–1996; USGS, 1997–2005).

In the early 1960s, more than 80 percent of asbestos consumed in the Soviet Union was used in roof tiles, wall panels, pipes, molded articles, and other building materials. Lower grades were used in manufacturing heat insulations and heat-resistant plastics. Treated mill wastes were used to make reinforced asphalt and roofing paper, filler in portland cement for concrete pipe, plaster, and protective coatings for metallic structures. Untreated asbestos mill wastes were used as railroad ballast and cold asphalt (Tverskoi, 1968). By about 1967, major markets were roof tiles, wall panels, pipes, heat insulations, asphalt, roofing paper, asbestos-cement products, and plasters (Tverskoi, 1968). Asbestos-cement products were the dominant market in some recent years.

The former Soviet Union eventually became a major participant in the world asbestos economy because its production in Kazakhstan and Russia exceeded its domestic needs. In its early history, a significant percentage of production was exported. However, Bowles and Stoddard (1933, p. 751–752) observed that the asbestos-manufacturing industry in the Soviet Union was expanding rapidly in the 1930s and consuming a larger share of domestic production. By 1961, exports from the Soviet Union were 176,800 t (Sokoloff, 1964, p. 760). The bulk of the exports went to Eastern and Western Europe and Japan (8,800 t); the importing European coun-

tries, listed in order of decreasing tonnage, were as follows: West Germany (27,500 t), France (25,500 t), East Germany (14,000 t), Czechoslovakia (12,700 t), Bulgaria (12,000 t), Poland (11,300 t), and Hungary (10,100 t) (Sokoloff, 1964, p. 760). Exports expanded rapidly after that, reaching 385,000 t in 1970 (Strishkov, 1973, p. 832). In 1968, Tverskoi (1968) reported that the Soviet Union exported asbestos fiber to more than 30 countries. By 1970, export destinations, listed in order of decreasing tonnage, were as follows: France (53,000 t), Japan (43,900 t), West Germany (43,100 t), Poland (31,500 t), Bulgaria (21,200 t), Czechoslovakia (21,100 t), Yugoslavia (20,600 t), and Romania (16,300 t) (Strishkov, 1973, p. 832). Exports increased to 613,000 t in 1975 (Strishkov, 1980, p. 1085).

There was a major unexplained decline in exports in 1976, when exports were only 389,000 t compared to 613,000 t in 1975 (Strishkov, 1981a, p. 982). Exports recovered by 1980, when they were reported to be 600,000 t (table A8). In the early 1980s, countries having centrally planned economies accounted for about 50 percent of exports from Kazakhstan and Russia (Roskill Information Services Ltd., 1983, p. 64). Declining asbestos consumption worldwide and possibly internal issues resulted in export declines to 310,000 t in 1985 (table A9) and to 248,000 t in 1990 (table A10). By 2000, export markets had improved, and exports from Kazakhstan and Russia were 495,000 t (tables A10–A16).

In 2003, exports from Kazakhstan were estimated to be 184,000 t (table A19). Major markets, in decreasing order by tonnage, were Ukraine, Uzbekistan, India, Kyrgyzstan, and China (UN Statistics Division, 2005); these countries accounted for 90 percent of exports from Kazakhstan. Exports from Russia in 2003 were 450,000 t (table A19). Major export destinations, in decreasing order by tonnage, were China, Ukraine, India, Iran, Vietnam, and Thailand; these countries accounted for 84 percent of Russian exports (UN Statistics Division, 2005).

Other Producing Countries

While the above-mentioned countries produced the bulk of the asbestos, many other countries produced small amounts of asbestos that filled essential markets. For example, Finland was the world's primary source for anthophyllite asbestos from about 1919 to 1975. Production in Finland was relatively low over time, exceeding 10,000 t/yr for only a few years in the late 1960s (USBM, 1933–1996). After that, production declined and finally stopped in 1975.

Crocidolite was produced in Australia and Bolivia. Australia began producing asbestos around 1916 (table 4). Production increased slowly to 16,700 t in 1962. It declined rapidly to 666 t in 1967 after Australian Blue Asbestos Pty. closed its Wittenoom mine in 1966 (Morrell, 1969, p. 99). Production increased in the early 1970s to meet world demand, peaking at 92,400 t in 1980. No production, however, was reported after 1983 (table 4). Bolivia produced only 1 t of crocidolite in 1968 (Clifton, 1972, p. 201).

India was a source for anthophyllite and tremolite asbestos, as well as chrysotile. Production began around 1917 and eventually reached 44,100 t in 1993 (USGS, 1901–1926; USBM, 1927–1933, 1933–1996). Production was estimated to be about 19,000 t in 2003 (table A19).

Japan and the Republic of Korea also were important sources of mainly chrysotile for Far Eastern asbestos markets during various periods of the 20th century. Production in Japan began by 1920, peaked at 27,000 t in 1967, and finally ceased in 2000 (USGS, 1901–1926, 1997–2005; USBM, 1927–1933, 1933–1996). Production in the Republic of Korea began in the early 1930s. Its production peaked at 15,900 t in 1982. Production was last reported in 1992.

A host of other countries also provided even smaller amounts (less than 5,000 t each) of asbestos for domestic or export markets.

World Consumption

Introduction

The following section includes a description of asbestos consumption in the United States and the following groups: other countries in Central and North America, Europe, Asia and the Middle East, Africa, South America, and Oceania. For consistency, data used in this section were extracted from publications of the British Geological Survey and its predecessors and the United Nations Statistics Division (2005) trade data. Production data used in the above section on "World Supply, Demand, and Trade" were from U.S. Bureau of Mines and U.S. Geological Survey "Mineral Resources of the United States" and "Minerals Yearbook" (USGS, 1901–1926, 1997–2005; USBM, 1927–1933, 1933–1996). See the section "Data Sources" for further explanation.

World consumption patterns for asbestos have evolved over time. Changes have occurred because of technological progress (industrialization and the development of an asbestos-manufacturing industry), availability of asbestos either domestically or through imports, political changes (civil unrest, independence movements, or sanctions), regulatory bans on its use, world conflicts, liability issues, and, foremost in recent years, health issues. By tracking apparent consumption, one can obtain a general idea of the changes that have occurred in the worldwide use of asbestos over time.

Apparent consumption for this Circular is defined as production plus imports minus exports; where possible, the values were adjusted to account for changes in government and industry stocks. Bowles (1955, p. 59, 1959, p. 32) noted that it is much more difficult to determine apparent consumption than production. What applied in the 1950s is still true today. Manufacturing from consumer stocks, sales from producer stocks, and a lack of data on amounts of consumer and producer stocks

that have been held over from year to year complicate the estimation of apparent consumption, as do the limitations of the data as discussed in the "Data Sources" section.

Overcapacity, particularly after the asbestos health issue was raised, resulted in a significant share of production going into stocks for some countries in some years. This accumulation of stocks had a relatively minor effect on apparent consumption calculations for nonproducing countries. It did have an effect on apparent consumption calculations for Canada, South Africa, and Zimbabwe, which were leading producers with relatively small asbestos-product-manufacturing industries. Although calculated apparent consumption for these countries may have been large some years, actual consumption was much less because of indeterminate amounts of asbestos production being placed in stocks. These changes in stocks, as well as incomplete trade reporting, resulted in significant incongruities in asbestos production, trade balance, and apparent consumption calculations between 1998 and 2000, as was noted in USGS Open-File Report 03–083 (Virta, 2003b). More recently available data used for the calculation of apparent consumption for 1998 through 2003 appear to have resolved this imbalance issue, as world production and world consumption estimates are similar. Still, the following discussion should be viewed as an approximate measure of apparent consumption and should be utilized to determine trends in the apparent consumption of asbestos rather than its absolute consumption. A detailed breakout of calculated apparent consumption by country is given in the appendix for specific times: for 1920–1970, at 10-year intervals (tables A1–A6); for 1970–1995 at 5-year intervals (tables A6–A11); and for 1996–2003, at 1-year intervals (tables A12–A19).

United States

Although the modern asbestos industry first began in Asia and Europe, it was the United States that fully embraced its potential, becoming the largest consuming country in the world for much of the 20th century (figs. 1 and 2). The United States offered the greatest opportunities for the relatively new asbestos industry. The country's population centers were expanding rapidly with the surge in immigration in the early 1900s; capital was available for investment in the asbestos industry; there were large demands for construction of housing, public buildings, and roads; and Canada could provide a ready supply of asbestos. To meet these demands, the construction industry not only expanded but also evolved through technological developments, creating an opportunity for the asbestos industry to establish itself. Thus, the use of asbestos exploded in the United States unlike anywhere else in the world. The United States became a world leader in usage within a couple of decades of having begun its asbestos industry and held that position through the 1960s.

From 1920 through the 1960s, the United States accounted for 30 to 83 percent of world apparent consumption for the 10-year intervals examined. In the late 1960s, the United States was replaced by the Soviet Union as the leading consuming country (fig. 2). The next nearest competitor was Japan, which had attained a consumption of 319,000 t in 1970 (table A6). A detailed discussion of U.S. consumption of asbestos is presented above in the section "World Supply, Demand, and Trade."

Other Countries in Central and North America

Other countries in Central and North America consumed relatively small amounts of asbestos. These included Canada, Costa Rica, Cuba, the Dominican Republic, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, and Panama. Most of these countries were small consumers, using only a few thousand tons annually.

Canada was primarily an exporter but its calculated apparent consumption was 106,000 t of asbestos in 1980 (table A8). Canada probably had an oversupply as world markets began to decline. A large part of the 106,000 t probably went into stocks rather than Canadian commerce. Consumption of around 45,000 t annually probably would have been the norm from 1940 to 1970 and much less after the 1980s.

Consumption in Mexico gradually built up to 79,000 t in 1980 from an annual consumption of only 390 t in 1930 (tables A2 and A8). After 1980, consumption declined, eventually reaching 20,000 t in 2003 (table A19).

In 2003, Cuba, the Dominican Republic, El Salvador, Guatemala, and Panama were other Central and North American countries consuming asbestos. Only Cuba and El Salvador increased their consumption of asbestos between the late 1990s and 2003.

Europe

After the United States, Europe was the next region to develop an asbestos-manufacturing industry. The United Kingdom, receiving its asbestos from other parts of its world empire, was the major European consumer during the early part of the 20th century (fig. 2, table A1). Many other European countries soon followed the United Kingdom. By 1930, Belgium and Luxembourg, Germany, and the United Kingdom were major suppliers of asbestos products throughout Asia and Europe. The former Soviet Union was the next largest producer and consumer of asbestos with its need to supply itself and other countries having centrally planned economies. Apparent consumption in the Soviet Union exceeded that of the United Kingdom by 1950 and that of the United States by 1970 because of large construction demands.

There were 17 European countries consuming a total of 40,900 t of asbestos in 1920 (table A1). By 1930, estimated consumption had increased to 127,500 t (table A2). Belgium and Luxembourg, Czechoslovakia, France, Germany, Italy, the Soviet Union, and the United Kingdom experienced the largest growth in consumption between 1940 and 1950 (tables A3 and A4). Between 1950 and 1960, the asbestos industry

in Europe experienced its greatest expansion up to this time, increasing to 1.17 Mt (table A5) from 507,000 t in 1950. During the decade of the 1950s, consumption in Austria, Belgium and Luxembourg, Czechoslovakia, Denmark, France, Italy, the Netherlands, Poland, the Soviet Union, Spain, Sweden, Switzerland, the United Kingdom, West Germany, and Yugoslavia increased considerably. The largest gains were in the Soviet Union (317,000 t), the United Kingdom (55,400 t), and West Germany (52,400 t). Much of the growth in consumption in the late 1940s and a large portion of the 1950s can be attributed to the massive reconstruction efforts in Europe following World War II. Estimated consumption in Europe increased to 1.8 Mt in 1970 and 2.8 Mt in 1980 (tables A6 and A8). The largest growth was in the Soviet Union, increasing by slightly more than 1 Mt between 1960 and 1980.

The asbestos health issue, which affected U.S. markets by the mid-1970s, also began to affect asbestos in Europe. After 1980, demand in all large consuming European countries, except the Soviet Union, began to decline (figs. 1 and 2). This pattern continued through 1990, with only the Soviet Union maintaining its consumption levels. In 1990, consumption in Europe was 2.58 Mt (table A10).

Between 1990 and the end of 2003, the European asbestos manufacturing industry experienced many changes. During that time, the Soviet Union was restructured, and many European countries banned the use of asbestos; in 2005, the EU voted to ban the use of asbestos except for a few exemptions. From a tonnage standpoint, the restructuring of the Soviet Union had the biggest effect. By 1995, estimated consumption in Europe had declined to 927,000 t, and by 1998, to 682,000 t (tables A11 and A14). However, consumption increased after that to 704,000 t in 2000 and 857,000 t in 2003 (tables A16 and A19). Kazakhstan and Ukraine accounted for much of the increase. The leading consumers of asbestos in Europe and the former Soviet Union in 2003 were Azerbaijan, Kazakhstan, Kyrgyzstan, Romania, Russia, Ukraine, and Uzbekistan (fig. 3, table A19).

Asia and the Middle East

Asia and the Middle East were combined in this Circular for statistical purposes. The lack of asbestos production and limited number of countries using asbestos in the Middle East did not warrant separate treatment.

Growth in the Asian and the Middle Eastern asbestos-manufacturing markets lagged behind growth of those markets in Europe and the United States. This difference can be partially attributed to less initial industrial development in most Asian and Middle Eastern countries in the early 20th century; cultural differences guiding infrastructure and technological development; government policies regarding industrial development; and fiscal constraints affecting the startup of new industries or importation of new products.

Very little asbestos was used in Asia and the Middle East in 1920, only 6,810 t by two consuming nations (table A1). It wasn't until the 1950s that a serious manufacturing industry developed (figs. 1 and 2). Estimated consumption in 1960 was 222,000 t in 16 countries, a dramatic increase from only 25,400 t in 1950 (tables A4 and A5). China and Japan accounted for the bulk of this increase in consumption. Asbestos consumption in Asia and the Middle East increased to 669,000 t in 1970 (table A6) from 222,000 t in 1960. Again, China and Japan accounted for the largest increases in consumption. Smaller increases occurred in India, Iran, the Republic of Korea, Malaysia, Thailand, and Turkey. Japan was the most consistent leading user of asbestos in this region from 1920 to 1970 (fig. 2). Estimated consumption in Asia and the Middle East increased to 1.07 Mt in 1980 (table A8). By this time, more countries in the region were manufacturing asbestos products, and considerable gains were made in China, India, Indonesia, Iran, Japan, the Republic of Korea, Malaysia, Saudi Arabia (a one-time occurrence), Taiwan, Thailand, and Turkey.

The early 1980s brought about a shift in manufacturing in Asia and the Middle East. Estimated consumption declined in China, Japan, Malaysia, Saudi Arabia, and Taiwan but increased in India, Indonesia, the Republic of Korea and Thailand (tables A8 and A9). There was an increase in consumption through 1995 to 1.26 Mt from 976,000 t in 1990 (tables A10 and A11). China accounted for the bulk of the increase and was followed by, in decreasing order by tonnage, Thailand, Indonesia, the Republic of Korea, and Malaysia (fig. 3).

In 2003, China accounted for 46 percent of the apparent asbestos consumption in Asia and the Middle East, mainly to satisfy its own domestic needs. India was the next leading consumer with 18 percent of the market, followed by Thailand (12 percent) and Iran (7 percent). Indonesia, Japan, the Republic of Korea, and Vietnam were smaller but still significant users of asbestos (table A19). Sixteen other countries in Asia and the Middle East still maintained a small presence in the asbestos-manufacturing sector.

Africa

Consumption in Africa was rather low throughout most of the 20th century, peaking in the 1990s. Slow population growth, limitations on land amenable for development, slow dissemination of technological developments, government policies toward development, and fiscal constraints influenced the development of the asbestos industry in Africa. Even the asbestos-producing African nations, despite having manufacturing facilities, exported the bulk of their fiber production to foreign manufacturing markets.

Only a few African countries used asbestos in the 1920s. Estimated consumption was about 2,200 t in 1920 (table A1). Egypt, Madagascar, and Zimbabwe, and probably South Africa, had small manufacturing industries. This situation did not change significantly until the 1950s. In 1950, consumption had risen to about 9,600 t, excluding South Africa and Zimbabwe, which apparently exported a large amount of asbestos from stocks and had a net negative apparent consumption

(table A4). Algeria, Congo (Kinshasa), Egypt, Morocco, and Swaziland were the largest consumers.

Estimated consumption in Africa increased to 90,300 t in 1970 from 28,600 t (excluding South Africa's negative calculated apparent consumption) in 1960 (tables A5 and A6). The largest increases in consumption in 1970 were for two countries that had no reported consumption in 1960: Nigeria, where consumption increased to 34,400 t, and Zambia, where consumption increased to 15,600 t. Nigerian and Zambian imports varied considerably over time, suggesting that asbestos was stockpiled during one year and used over several years.

After the 1970s, consumption in most countries in Africa began to decline. The notable exception was Algeria, whose consumption was erratic but still was 21,300 t in 1980, 17,400 t in 1990, 7,610 t in 2000, and 10,756 t in 2003 (tables A8, A10, A16, and A19). In 2003, several other African countries had small manufacturing industries (table A19).

Consumption in South Africa and Zimbabwe is largely ignored in the above discussion on Africa. Stockpiling of asbestos during times of overcapacity resulted in excessively high values for calculated apparent consumption for South Africa in 1985 (table A9) and Zimbabwe in 2000 to 2002 (tables A16, A17, and A18). Conversely, large shipments from stocks during periods of high demand resulted in excessively large negative values for calculated apparent consumption in South Africa in 1960, 1980, and 1998 (tables A5, A8, and A14). Including these values would have resulted in incorrect interpretations of consumption for all of Africa during those years.

South America

The asbestos industry in South America did not begin to have significance in the world markets until the 1960s. Before that time, there was little asbestos production or consumption (fig. 1). What little production there was existed to fill niche markets rather than to meet growing world demands. Argentina, Brazil, Chile, Peru, Uruguay, and Venezuela were the major South American consumers of asbestos during the early part of the 20th century. In 1960, consumption in South America was about 38,100 t (table A5). Brazil had just begun production to supply its own markets, but South America was dependent on imports for about 65 percent of its fiber consumption.

By 1970, Argentina, Brazil, and Colombia had the most active of the asbestos-manufacturing industries in South America. Even at that, consumption was estimated to be only 99,200 t (table A6).

By the mid-1970s, though, Brazilian production had expanded to meet the country's demands, and Brazil soon became the dominant South American producer and consumer of asbestos (table A7). In 1980, Brazil accounted for about 73 percent of the continent's asbestos usage of 267,000 t (table A8). Brazil was followed by Colombia with 27,100 t, Argentina with 21,400 t, and Venezuela with 9,100 t. Ecuador, Peru, and Uruguay used lesser amounts.

With the onset of the asbestos health issue, consumption in most South American countries declined. Even that of Brazil declined to 78,400 t in 2003 from 173,000 t in 2000, although its exports of asbestos increased from 63,100 t in 2000 to 144,300 t in 2003 (tables A16 and A19).

Oceania

Oceania includes Australia and New Zealand and other nations in the region. Australia and New Zealand produced and consumed asbestos in the early part of the 20th century. Consumption rose gradually through the mid-1970s (fig. 1) and peaked at 85,700 t in 1975 (table A7). Australia accounted for 73,200 t of this total. With the asbestos health issue of the 1970s, production and consumption declined rapidly. By 1990, New Zealand had stopped using asbestos, and in 2003, Australia's estimated consumption was 19 t (tables A10 and A19).

General Trends

In general, economic, political, and social agendas, different philosophies on how to meet those agendas, and different asbestos resources available guided the development of the asbestos-manufacturing industry in any given country in terms of the size of its industry and the types of products manufactured. If countries required an asbestos industry to meet their expansion needs, then the industry developed. The growth was logical in that demand for asbestos products, most notably asbestos-cement products, was greatest in countries undergoing extensive infrastructure development.

Few historical data on asbestos markets are available. Even in the United States, an annual survey of consumption was not developed until 1972, although data were projected back in time to estimate values for 1965–1971 (table 3; Clifton, 1976). From the qualitative descriptions by Bowles (1937, p. 82–87) of the asbestos-manufacturing industries in major producing countries, one can infer that asbestos-cement corrugated and flat sheet, pipe, and roofing tile were the major markets for asbestos around 1930. The low cost of asbestos-cement products, their durability and effectiveness, and the relatively unsophisticated technology required to produce asbestos-cement products were major factors leading to the widespread use of asbestos cement, particularly for developing countries with limited mineral and monetary resources. In regions where there were alternative construction materials, the demand for asbestos-cement products was proportionally smaller, and a much wider variety of other asbestos products were developed.

In 1980, asbestos-cement products accounted for approximately 66 percent of the world consumption of asbestos according to estimates by Roskill Information Services Ltd. (1983, p. 86). The United States and Western European coun-

tries were less dependent on asbestos-cement products than other regions. In the United States, asbestos-cement products accounted for 18 percent of apparent consumption of asbestos in 1980 (table 3). Estimated asbestos-cement consumption as a percentage of total asbestos consumption in 1980 follows for each region: Africa, 80 percent; Asia, 77 percent; Eastern Europe, 76 percent; South America, 76 percent; Oceania, 60 percent; North America, including the United States, 45 percent; and Western Europe, 43 percent (Roskill Information Services Ltd., 1983, p. 85–86).

With the decline in the use of asbestos in the 1980s and 1990s, markets shifted even more to favor asbestos-cement products. In 2003, asbestos-cement products were thought to account for more than 85 percent of the world's consumption of asbestos (Moore, 2004, p. 59; Virta, 2005b, p. 16).

Discussion

Asbestos has had a long and, until the 1960s, illustrious role in modern society. Over the course of its history, asbestos has been used in thousands of products for a vast number of applications. These applications ranged from roofing shingles to water-supply lines to fire blankets to plastics fillers to medical packings (Rosato, 1959). It was used commonly by industry and the general public. A glance at almost any home repair book written before about 1955 will show that the home handyman used asbestos as just another tool (Cobb, 1948, p. 129–130). That it was so widely accepted is a tribute not only to its versatility, but also to a lack of knowledge about the risks posed by exposure to high levels of airborne asbestos dust.

The British first raised health concerns in the early part of the 20th century, but it was not until the late 1950s and early 1960s that a correlation between excess exposure to asbestos fibers and respiratory cancer diseases was established (Selikoff and Lee, 1978, p. 22–23, 31–32; Gross and Braun, 1984, p. 20–21; U.S. Department of Health and Human Services, 1992, p. 33–34). Thus, the asbestos health issue did not arise until asbestos had been used by society for a long period of time. Asbestos is not alone in this respect. The discovery of adverse health effects after a material has been used for decades or even centuries is not unusual. A few examples are arsenic, beryllium, lead, mercury, uranium, and some fertilizers and insecticides. Extended use before the recognition of adverse health risks was a natural result of the long latency period (10 to 40 years) for the development of asbestos-related cancers (Agency for Toxic Substances and Disease Registry, 2001, 2005).

With these concerns over the health risk, many ask why and how the asbestos industry developed in the first place and why it continues to operate. One has to consider the knowledge of health risks throughout history and the state of technological development. As mentioned above, the connection between excessive exposure and lung cancer was not firmly established until the late 1950s and early 1960s; the industry was more than 100 years old before the lung cancer and mesothelioma issues were fully recognized and addressed. Further complicating the matter were disagreements among health researchers over the health risks posed by excessive exposure to asbestos. Some researchers have suggested that chrysotile is not as carcinogenic as amphibole asbestos varieties (Ross, 1984, p. 51; Agency for Toxic Substances and Disease Registry, 2001; Hoskins, 2001).

There is evidence of non-occupational risks associated with exposure to amphibole asbestos. Health researchers reported the occurrence of asbestos disease in the general public in Libby, Montana, where vermiculite contaminated with amphibole asbestos was mined, and near some exfoliation plants that processed the vermiculite ore (Peipins and others, 2003; Agency for Toxic Substances and Disease Registry, 2005).

Natural occurrences of asbestos have become an issue in California. In the past 5 to 10 years, development has moved into areas of serpentinite outcrops. These outcrops contain veins of chrysotile and some tremolite asbestos. New residents are now concerned about the risk to themselves and their children. This concern has resulted in a massive effort to map potential asbestos-bearing rock outcrops in California and elsewhere and to analyze the health risk that exposure to the chrysotile may pose (Churchill and Hill, 2000; California Air Resources Board, 2004; Van Gosen, 2005).

From a technological standpoint, asbestos was and still is the best choice for some applications; it is the only choice for a few products. Had the asbestos industry not been developed in the late 1800s, solutions to problems that were readily solved by using asbestos would have been more complex. The reason is that many substitute materials or substitute products on the market today were not available or were not practical to use until late in the 20th century; some substitutes are discussed below:

- **Wollastonite.** Although wollastonite is now a substitute for asbestos in some applications, it was not even considered as a substitute for asbestos until the 1960s, and supplies were not available until large-scale wollastonite mining began in the 1950s.
- **Cast-iron and plastic**. Cast-iron water-supply pipe was not the best choice for use in alkaline soils, as in the southwestern United States, because it corroded and failed. Asbestos-cement pipe was the solution to that problem. Plastic pipe, another possible solution to the alkaline soil problem, was not developed until the later part of the 20th century.
- **Wood**. In the 1800s, wooden structures were still commonplace, and a fire could be devastating for a city. Hence, a demand for asbestos textiles and asbestos board developed.
- **Aramid fiber**. One substitute for asbestos in textiles, the fire-resistant aramid fiber, was not commercialized until the 1970s.

The historical lack of substitutes and the technological benefits of asbestos were just a few of the reasons why the industry was established and thrived. Although a health risk was posed by excessive exposure to airborne asbestos, the use of asbestos solved many health and safety problems (reducing fire risks and improving component performance), energy conservation problems (in thermal insulations), and construction problems (as a building material that helped to further the development of society). Its use continues today in many parts of the world because of a need for inexpensive and durable (primarily asbestos-cement) products that require simple technology to make and do not require large capital investments.

Despite its continued use, the overall worldwide trend in asbestos consumption is downward because of the health issue. The largest declines have been in the United States, Western Europe, Oceania, and a few of the Asian countries, where there have been concerted efforts to ban the use of asbestos and where asbestos substitutes have become widely available and affordable. Declines have occurred in several other countries and regions because of situations including political unrest or economic instability.

For those countries that continue to use asbestos in large tonnages, other factors, such as internal needs for inexpensive construction materials, national economics, or government policy toward the use of asbestos, have overridden the asbestos health issue. The bulk of the consumption in 2003 was in Brazil, several former Soviet-bloc countries (Kazakhstan, Russia, and Ukraine), China, India, Iran, and Thailand (fig. 3, table A19). Consumption increased in most of these countries between 2000 and 2003. Except for Thailand, a major exporter of manufactured asbestos products, the increase probably resulted primarily from growing national demand for inexpensive construction materials.

In summary, world consumption declined during the 23 years between 1980 and 2003 (fig. 1). Those countries and regions experiencing the largest declines or gains in consumption over time are evident in figures 1–3 and the appendix. Where low-level asbestos-manufacturing industries remain, they appear mainly to be remnants of a past industrial capacity. In a few countries with small manufacturing industries, though, consumption has increased, possibly owing to the loss of foreign sources for some asbestos products. The industries in these countries are not likely to expand much beyond their current capacity because of the negative atmosphere regarding the use of asbestos worldwide and the greater availability of asbestos substitutes (many of whose potential long-term health risks, ironically, are unknown) and alternative materials.

Conclusions

Asbestos, despite being a carcinogen, was widely used by society. Without asbestos, the development of many products would have been delayed and, ironically, without many of the asbestos-containing products, health and safety could have been jeopardized. That asbestos is more versatile than many of its contemporary competitors cannot be denied. Following World War II, there was a large effort to synthesize asbestos and to develop asbestos substitutes because of strategic goals, not because of health concerns. Neither the synthesis nor the substitutes were immediately successful. An additional 20 years elapsed before substitutes made inroads into the asbestos market. It has taken a plethora of materials to substitute for asbestos in manufacturing.

The adverse publicity about asbestos and lawsuits have taken their toll on asbestos markets, despite much stricter asbestos regulation. Worldwide consumption declined from an estimated 4.73 Mt in 1980 to about 2.11 Mt in 2003 (tables A8 and A19). Public pressure and liability issues have forced most companies to stop manufacturing asbestos-containing products and have forced many companies into bankruptcy. Consumption has fallen off dramatically in most countries. The leading consumers of asbestos in 2003 were Brazil, China, India, Iran, Kazakhstan, Russia, Thailand, and Ukraine; each consumed more than 75,000 t. These eight countries accounted for more than 82 percent of the world's apparent consumption in 2003 (table A19). Sizable consumption increases occurred in Azerbaijan, China, India, Iran, Kazakhstan, Thailand, and Ukraine between 2000 and 2003 (tables A16 and A19).

Acknowledgments

I thank Mike Potter and Thomas Dolley, U.S. Geological Survey (USGS) mineral commodity specialists, who reviewed this Circular. I thank Linder Roberts of the USGS for compiling the data from the British Geological Survey world mineral production reports that were used in the apparent consumption estimates from 1920 to 1997. I offer my gratitude to the following four people for helpful reviews of the USGS Open-File Report 03–083, which was expanded and updated to become this Circular: Mike Potter, USGS mineral commodity specialist; Greg Meeker, USGS geologist; Louis Perron, former asbestos specialist with Natural Resources Canada; and Bob Pigg, president of the Asbestos Information Association/North America.

References Cited

Agency for Toxic Substances and Disease Registry, 2001, Toxicological profile for asbestos: Agency for Toxic Substances and Disease Registry Web site at http://www.atsdr.cdc.gov/toxprofiles/tp61.html. (Accessed July 27, 2005.)

Agency for Toxic Substances and Disease Registry, 2005, Asbestos exposure in Libby, Montana: Agency for Toxic Substances and Disease Registry Web site at http://www.atsdr.cdc.gov/asbestos/asbestos_study.html. (Accessed September 27, 2005.)

Alleman, J.E., and Mossman, B.T., 1997, Asbestos revisited: Scientific American, v. 277, no. 1, p. 70–75.

Becker & Haag, 1928, Asbestos—Its sources, extraction, preparation, manufacture and uses in industry and engineering: Berlin, Becker & Haag, 88 p.

Bowles, Oliver, 1934, Asbestos—Domestic and foreign deposits: U.S. Bureau of Mines Information Circular 6790, 24 p.

Bowles, Oliver, 1937, Asbestos: U.S. Bureau of Mines Bulletin 403, 92 p.

Bowles, Oliver, 1946, Asbestos—The silk of the mineral kingdom: New York, Ruberoid Co., 39 p.

Bowles, Oliver, 1955, The asbestos industry: U.S. Bureau of Mines Bulletin 552, 122 p. (Revision of USBM Bulletin 403 (Bowles, 1937).)

Bowles, Oliver, 1959, Asbestos—A materials survey: U.S. Bureau of Mines Information Circular 7880, 94 p.

Bowles, Oliver, and Barsigian, F.M., 1943, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1942, p. 1423–1434. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Bowles, Oliver, and Barsigian, F.M., 1945, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1943, p. 1473–1483. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Bowles, Oliver, and Cornthwaite, M.A., 1937, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1937, p. 1363–1370. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Bowles, Oliver, and Petron, A.C., 1943, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1941, p. 1427–1438. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Bowles, Oliver, and Stoddard, B.H., 1930, Asbestos: U.S. Bureau of Mines Mineral Resources of the United States 1927, v. II, p. 299–311.

Bowles, Oliver, and Stoddard, B.H., 1931, Asbestos: U.S. Bureau of Mines Mineral Resources of the United States 1928, v. II, p. 97–111.

Bowles, Oliver, and Stoddard, B.H., 1933, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1932–33, p. 745–752. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Bowles, Oliver, and Warner, K.G., 1940, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1940, p. 1363–1372. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

British Geological Survey, 1984, Asbestos, *in* World mineral statistics 1978–82; Production, exports, imports: London, Her Majesty's Stationery Office, p. 21–24.

British Geological Survey, 1991, Asbestos, *in* World mineral statistics 1985–89: Keyworth, Nottingham, U.K., British Geological Survey, p. 26–29.

British Geological Survey, 1995, Asbestos, *in* World mineral statistics 1990–94; Production, exports, imports: Keyworth, Nottingham, U.K., British Geological Survey, p. 24–27.

British Geological Survey, 2001, Asbestos, *in* World mineral statistics 1995–99; Production, exports, imports: Keyworth, Nottingham, U.K., British Geological Survey, p. 26–29.

British Geological Survey, 2002, Asbestos, *in* World mineral statistics 1996–2000: Keyworth, Nottingham, U.K., British Geological Survey, p. 25–28.

British Sulphur Corporation, 1972, Rhodesia—A special survey of the mining industry: London, British Sulphur Corporation, 95 p.

Buckingham, D.A., and Virta, R.L., 2006, Asbestos statistics; last modification April 14, 2004, *in* Kelly, Thomas, and Matos, Grecia, Historical statistics for mineral and material commodities in the United States: U.S. Geological Survey Data Series 140, available only online at http://minerals.usgs.gov/ds/2005/140. (Accessed May 15, 2006.)

California Air Resources Board, 2004, Naturally occurring asbestos—General information: California Air Resources Board Web site at http://www.arb.ca.gov/toxics/asbestos/geninfo.htm. (Accessed November 9, 2004.)

Chin, Edmond, 1983, The mineral industry of China: U.S. Bureau of Mines Minerals Yearbook Centennial Edition 1981, v. III, p. 225–249. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Chin, Edmond, 1988, The mineral industry of China: U.S. Bureau of Mines Minerals Yearbook 1986, v. III, p. 197–221. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Chin, Edmond, and Wu, J.C., 1990, The mineral industries of China, Hong Kong, Mongolia, and Taiwan: U.S. Bureau of Mines Minerals Yearbook 1988, v. III, p. 231–286. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Churchill, R.K., and Hill, R.L., comps., 2000, A general location guide for ultramafic rocks in California—Areas more likely to contain naturally occurring asbestos: California Department of Conservation, Division of Mines and Geology, Open-File Report 2000–19, 7 p., map, scale 1:1,100,000. (Also available online at http://www.arb.ca.gov/toxics/asbestos/geninfo.htm as "Map of California showing principal asbestos deposits.")

Clarke, G.M., 1982, Zimbabwe's industrial minerals—Optimism for the future: Industrial Minerals, no. 172 (January 1982), p. 19–31.

Clifton, R.A., 1972, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1970, v. I, p. 195–203. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Clifton, R.A., 1973, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1971, v. I, p. 181–189. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Clifton, R.A., 1974, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1972, v. I, p. 169–180. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Clifton, R.A., 1975, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1973, v. I, p. 171–179. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Clifton, R.A., 1976, Asbestos, *in* Mineral facts and problems, 1975 edition: U.S. Bureau of Mines Bulletin 667, p. 107–121.

Clifton, R.A., 1980a, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1977, v. I, p. 145–157. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Clifton, R.A., 1980b, Asbestos, *in* Mineral facts and problems, 1980 edition: U.S. Bureau of Mines Bulletin 671, p. 55–71.

Clifton, R.A., 1981, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1980, v. I, p. 91–101. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Clifton, R.A., 1982, Asbestos: U.S. Bureau of Mines Minerals Yearbook Centennial Edition 1981, v. I, p. 103–112. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Clifton, R.A., 1985, Asbestos, *in* Mineral facts and problems, 1985 edition: U.S. Bureau of Mines Bulletin 675, p. 53–64.

Cobb, H.H., 1948, The complete home handyman's guide: New York, William H. Wise and Co., Inc., 500 p.

Cossette, M., and Delvaux, P., 1979, Technical evaluation of chrysotile ore bodies, *in* Ledoux, R.L., ed., Short course in mineralogical techniques of asbestos determination: Mineralogical Association of Canada Short Course Handbook, v. 4, p. 79–110.

Craynon, J.R., 1988, The mineral industry of Italy: U.S. Bureau of Mines Minerals Yearbook 1986, v. III, p. 463–483. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Diller, J.S., 1921, Asbestos: U.S. Geological Survey Mineral Resources of the United States 1918, pt. II, p. 545–556.

Evans, J.W., 1906, The identity of the amiantos or Karystian stone of the ancients with chrysotile: Mineralogical Magazine, v. 14, no. 65 (May 1906), p. 143–148.

Gössling, H.H., 1977, Asbestos—A commodity study: South Africa Department of Mines, Minerals Bureau, Internal Report No. 5, 82 p.

[Great Britain] Colonial Geological Surveys, 1956, Asbestos, *in* Statistical summary of the mineral industry—Production, exports and imports, 1949–1954: London, Her Majesty's Stationery Office, p. 31–37.

[Great Britain] Imperial Institute, 1932, Asbestos, *in* The mineral industry of the British Empire and foreign countries—Statistical summary (production, imports and exports), 1929–1931: London, His Majesty's Stationery Office, p. 34–40.

[Great Britain] Imperial Institute, 1948, Asbestos, *in* The mineral industry of the British Empire and foreign countries—Statistical summary (production, imports and exports), 1938–1944: London, His Majesty's Stationery Office, p. 30–36.

[Great Britain] Imperial Mineral Resources Bureau, 1924, Asbestos, *in* The mineral industry of the British Empire and foreign countries—Statistical summary (production, imports and exports), 1920–1922: London, His Majesty's Stationery Office, p. 23–26.

[Great Britain] Institute of Geological Sciences, 1973, Asbestos, *in* Statistical summary of the mineral industry—World production, exports and imports, 1967–1971: London, Her Majesty's Stationery Office, p. 34–42.

[Great Britain] Institute of Geological Sciences, 1981, Asbestos, *in* World mineral statistics 1975–79—Production, exports, imports: London, Her Majesty's Stationery Office, p. 19–22.

[Great Britain] Institute of Geological Sciences, Overseas Division, 1967, Asbestos, *in* Statistical summary of the mineral industry—World production, exports and imports, 1960–1965: London, Her Majesty's Stationery Office, p. 33–41.

Griffiths, Joyce, 1989, South Africa's minerals; Diversity in adversity: Industrial Minerals, no. 263 (August 1989), p. 18–53.

Gross, Paul, and Braun, D.C., 1984, Toxic and biomedical effects of fibers—Asbestos, talc, inorganic fibers, man-made vitreous fibers, and organic fibers: Park Ridge, N.J., Noyes Publications, 257 p.

Harben, Peter, 1984, A profile of SA Mineração de Amianto—Brazil's asbestos producer: Industrial Minerals, no. 198 (March 1984), p. 63–65.

Hodgson, A.A., 1989, Asbestos; Alternatives, *in* Carr, D.D., and Herz, Norman, eds., Concise encyclopedia of mineral resources: New York, Pergamon Press, p. 15–20.

Hoskin, W.M.A., 1991, Asbestos, *in* Canadian minerals yearbook 1990: Ottawa, Canada, Energy, Mines and Resources Canada, p. 10.1–10.11. (Also available online at http://www.nrcan.gc.ca/mms/cmy/archive/1990-e.pdf.)

Hoskins, J.A., 2001, Toxicological insight into low-level exposure to chrysotile, *in* Nolan, R.P., Langer, A.M., Ross, M., Wicks, F.J., and Martin, R.F., eds., The health effects of chrysotile asbestos: Mineralogical Association of Canada Special Publication 5, p. 251–259.

Howling, G.E., 1937, Asbestos (2d ed.): London, [Great Britain] Imperial Institute, 88 p.

Icke, P.W., 1969, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1968, v. I–II, p. 179–188. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Industrial Minerals, 1978, Greek asbestos breaks ground: Industrial Minerals, no. 129 (June 1978), p. 47, 49.

Industrial Minerals, 1980, Rhodesian mineral musings: Industrial Minerals, no. 148 (January 1980), p. 7, 15.

Industrial Minerals, 1985, Company news & mineral notes: Industrial Minerals, no. 212 (May 1985), p. 67.

Industrial Minerals, 1993, Amosite asbestos era ends: Industrial Minerals, no. 306 (March 1993), p. 12.

Josephson, G.W., and Barsigian, F.M., 1950, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1948, p. 144–155. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Josephson, G.W., and Barsigian, F.M., 1951, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1949, p. 139–148. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Josephson, G.W., and Marsh, D.I., 1948, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1946, p. 143–151. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Kendall, Tom, 1996, Brazil—Dancing to a new tune: Industrial Minerals, no. 350 (November 1996), p. 21–51.

Kennedy, D.O., and Foley, J.M., 1960, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1959, v. I, p. 199–209. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Kennedy, D.O., and Mattila, A.L., 1958, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1957, v. I, p. 209–221. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Kupferburger, W., 1930, Mining amosite asbestos in the Pietersburg District, South Africa: Engineering and Mining Journal, v. 130, no. 11 (December 8, 1930), p. 571–574.

Loughbrough, Roger, 1992, Italy's industrial minerals; A fistful of feldspar: Industrial Minerals, no. 301 (October 1992), p. 35–57.

Lu, Wen, 1998, Chinese industrial minerals: Worcester Park, Surrey, U.K., Industrial Minerals Information Ltd., 210 p.

Maliotis, G., and Ilich, M., 1986, The nonmetallic minerals industry of Cyprus—Its present state and future prospects, *in* Clarke, G.M., and Griffiths, J.B., eds., 7th Industrial Minerals International Congress, Monte Carlo, Monaco, April 1–4, 1986, Proceedings: London, Metal Bulletin, p. 1–12.

May, T.C., 1964, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1963, v. I, p. 251–265. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

May, T.C., 1965, Asbestos, *in* Mineral facts and problems, 1965 edition: U.S. Bureau of Mines Bulletin 630, p. 81–90.

May, T.C., and Lewis, R.W., 1970, Asbestos, *in* Mineral facts and problems, 1970 edition: U.S. Bureau of Mines Bulletin 650, p. 851–863.

Mining Journal, 1992, Gefco announces closure: Mining Journal, v. 318, no. 8173 (May 15, 1992), p. 354.

Mining Magazine, 1987, Balangero [mine in northern Italy]: Mining Magazine, v. 157, no. 1 (July 1987), p. 20–25.

Moore, Paul, 2004, Chrysotile in crisis: Industrial Minerals, no. 439 (April 2004), p. 56, 57, 59, 61.

Morel-à-l'Huissier, Patrick, and Hoskin, W.M.A., 1992, Asbestos, *in* Canadian minerals yearbook 1991: Ottawa, Canada, Energy, Mines and Resources Canada, p. 10.1–10.13. (Also available online at http://www.nrcan.gc.ca/mms/cmy/archive/1991-e.pdf.)

Morrell, L.G., 1969, The mineral industry of Australia: U.S. Bureau of Mines Minerals Yearbook 1967, v. IV, p. 83–102. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Munzhelele, N.N., 2000, Asbestos, *in* South Africa's mineral industry 1998/99: Pretoria, South Africa Department of Minerals and Energy, Mineral Economics Directorate (Minerals Bureau), p. 193–198.

Natural Resources Board of Southern Rhodesia, 1963, Asbestos: Natural Resources Board of Southern Rhodesia, Minerals of Southern Rhodesia—Minerals Year 1963, p. 14–17.

O'Driscoll, Mike, 1989, Brazil's industrial minerals; Seeking success against all odds: Industrial Minerals, no. 266 (November 1989), p. 23–69.

Peipins, L.A., Lewin, Michael, Campolucci, Sharon, Lybarger, J.A., Miller, Aubrey, Middleton, Dan, Weis, Christopher, Spence, Michael, Black, Brad, and Kapil, Vikas, 2003, Radiographic abnormalities and exposure to asbestos-contaminated vermiculite in the community of Libby, Montana, USA: Environmental Health Perspectives, v. 111, no. 14 (November 2003), p. 1753–1759. (Also available online at http://ehp.niehs.nih.gov/members/2003/6346/6346.pdf.)

Perron, Louis, 2001, Chrysotile, *in* Canadian minerals yearbook 1999: Ottawa, Canada, Natural Resources Canada, p. 17.1–17.13. (Also available online at http://www.nrcan.gc.ca/mms/cmy/content/1999/20.pdf.)

Perron, Louis, 2003, Chrysotile, *in* Canadian minerals yearbook 2003: Ottawa, Canada, Natural Resources Canada, p. 18.1–18.11. (Also available online at http://www.nrcan.gc.ca/mms/cmy/content/2003/20.pdf.)

Quebec Asbestos Information Service, 1959, The strangest mineral ever known (3d ed.): Montreal, Quebec Asbestos Information Service, unpaginated.

Readling, C.L., 1971, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1969, v. I–II, p. 183–191. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Rosato, D.V., 1959, Asbestos—Its industrial applications: New York, Reinhold Publishing Corp., 214 p.

Roskill Information Services Ltd., 1983, The economics of asbestos (4th ed.): London, Roskill Information Services Ltd., 188 p.

Roskill Information Services Ltd., 1986, The economics of asbestos (5th ed.): London, Roskill Information Services Ltd., 181 p.

Roskill Information Services Ltd., 1990, The economics of asbestos (6th ed.): London, Roskill Information Services Ltd., 190 p.

Ross, Malcolm, 1984, A survey of asbestos-related disease in trades and mining occupations and in factory and mining communities as a means of predicting health risks of nonoccupational exposure to fibrous minerals, *in* Levadie, Benjamin, ed., Definitions for asbestos and other health-related silicates; A symposium: American Society for Testing and Materials Special Technical Publication 834, p. 51–104.

RuKeyser, W.A., 1933a, Chrysotile asbestos in the Bajenova District, U.S.S.R.: Engineering and Mining Journal, v. 134, no. 8 (August 1933), p. 335–339.

RuKeyser, W.A., 1933b, Mining asbestos in U.S.S.R.: Engineering and Mining Journal, v. 134, no. 9 (September 1933), p. 375–381.

Sassos, M.P., 1983, Greece gears for a 100000 mt/yr rate from its first asbestos complex: Engineering and Mining Journal, v. 184, no. 4 (April 1983), p. 66–67.

Selikoff, I.J., and Lee, D.H.K., 1978, Asbestos and disease: New York, Academic Press, 549 p.

Sinclair, W.E., 1959, Asbestos—Its origin, production, and utilization (2d ed.): London, Mining Publications, 512 p.

Skillen, Andy, 1993, Greek minerals outlook; Privatisation a key issue: Industrial Minerals, no. 313 (October 1993), p. 31–49.

Sokoloff, V.P., 1964, The mineral industry of the U.S.S.R.: U.S. Bureau of Mines Minerals Yearbook 1963, v. IV, p. 749–778. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Sondermayer, R.V., 1987, The mineral industry of Italy: U.S. Bureau of Mines Minerals Yearbook 1985, v. III, p. 473–490. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

South African Mining Journal, 1949, Mining in N. Transvaal: South African Mining Journal, v. 60, no. 2956 (October 8, 1949), p. 153.

Stover Publishing Co., 1953, The asbestos fact book (3d ed.): Willow Grove, Pa., Stover Publishing Co., 19 p.

Strishkov, V.V., 1973, The mineral industry of the U.S.S.R.: U.S. Bureau of Mines Minerals Yearbook 1971, v. III, p. 821–871. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Strishkov, V.V., 1980, The mineral industry of the U.S.S.R.: U.S. Bureau of Mines Minerals Yearbook 1976, v. III, p. 1065–1134. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Strishkov, V.V., 1981a, The mineral industry of the U.S.S.R: U.S. Bureau of Mines Minerals Yearbook 1977, v. III, p. 959–1026. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Strishkov, V.V., 1981b, The mineral industry of the U.S.S.R: U.S. Bureau of Mines Minerals Yearbook 1978–1979, v. III, p. 957–1005. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Summers, A.L., [1919], Asbestos and the asbestos industry—The world's most wonderful mineral and other fireproof materials: New York, Sir Isaac Pitman & Sons, Ltd., 107 p.

Sutulov, Alexander, 1973, Mineral resources and the economy of the USSR: New York, Engineering and Mining Journal, 192 p.

Tverskoi, Igor, 1968, Asbestos in the U.S.S.R.: Mining in Canada, v. 41, no. 6 (June 1968), p. 31–32.

United Nations Statistics Division, 2005, United Nations commodity trade statistics database (UN Comtrade): United Nations Statistics Division Web site at http://unstats.un.org/unsd/comtrade/. (Accessed June 8, 2005.)

U.S. Bureau of Mines, 1927–1933, Asbestos: U.S. Bureau of Mines Mineral Resources of the United States 1924–1931, variously paginated. (Asbestos chapter authors: B.H. Stoddard, in volumes for 1924–1926; Oliver Bowles and B.H. Stoddard, 1927–1931.)

U.S. Bureau of Mines, 1933–1996, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1932–33 to 1994, variously paginated. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.) (Some of these chapters are also cited by personal authors; see Bowles and Stoddard, 1933; Bowles and Cornthwaite, 1937; Bowles and Warner, 1940; Bowles and Barsigian, 1943, 1945; Bowles and Petron, 1943; Josephson and Marsh, 1948; Josephson and Barsigian, 1950, 1951; Kennedy and Mattila, 1958; Kennedy and Foley, 1960; May, 1964; Icke, 1969; Readling, 1971; Clifton, 1972, 1973, 1974, 1975, 1980a, 1981, 1982; Virta, 1987.)

U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health (NIOSH), 1992, Asbestos publications: Cincinnati, U.S. Department of Health and Human Services, NIOSH, 190 p.

U.S. Geological Survey, 1901–1926, Asbestos: U.S. Geological Survey Mineral Resources of the United States 1900–1923, pt. II, variously paginated. (Asbestos chapter authors: J.H. Pratt, in volumes for 1900–1904; G.O. Smith, 1905; J.S. Diller, 1906–1919; Edward Sampson, 1920–1923.)

U.S. Geological Survey, 1997–2005, Asbestos: U.S. Geological Survey Minerals Yearbook 1995–2003, variously paginated. (Also available online at http://minerals.usgs.gov/minerals/pubs/commodity/asbestos/.) (These asbestos chapters were by R.L. Virta; some are also cited by the personal author.)

U.S. International Trade Commission, 2006, Interactive Tariff and Trade Dataweb: U.S. International Trade Commission Web site at http://dataweb.usitc.gov/. (Accessed May 22, 2006.)

Vagt, G.O., 1975, Asbestos, *in* Canadian minerals yearbook 1973: Ottawa, Canada, Energy, Mines and Resources Canada, p. 41–49. (Also available online at http://www.nrcan.gc.ca/mms/cmy/archive/1973-e.pdf.)

van der Merwe, C.J., 1989, Asbestos, *in* South Africa's mineral industry 1988: Braamfontein, South Africa Department of Mineral and Energy Affairs, Minerals Bureau, p. 141–145.

Van Gosen, B.S., 2005, Reported historic asbestos mines, historic asbestos prospects, and natural asbestos occurrences in the eastern United States: U.S. Geological Survey Open-File Report 2005–1189, database and map [scale about 1:2,000,000], available only online at http://pubs.usgs.gov/of/2005/1189. (Accessed September 27, 2005.)

Vance, A.G., 1975, Asbestos industry suffers through troubled year: The Northern Miner, v. 61, no. 37 (November 27, 1975), p. B12, B13, B26.

Virta, R.L., 1987, Asbestos: U.S. Bureau of Mines Minerals Yearbook 1985, v. I, p. 143–149. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Virta, R.L., 1994, Asbestos substitutes, *in* Carr, D.D., ed., Industrial minerals and rocks (6th ed.): Littleton, Colo., Society for Mining, Metallurgy, and Exploration, Inc., p. 429–434.

Virta, R.L., 2001, Some facts about asbestos: U.S. Geological Survey Fact Sheet FS–012–01, 4 p. (Also available online at http://pubs.usgs.gov/fs/fs012-01/.)

Virta, R.L., 2002, Asbestos—Geology, mineralogy, mining, and uses: U.S. Geological Survey Open-File Report 02–149, 35 p., available only online at http://pubs.usgs.gov/of/2002/of02-149/.)

Virta, R.L, 2003a, Asbestos: U.S. Geological Survey Minerals Yearbook 2001, v. I, p. 8.1–8.6. (Also available online at http://minerals.usgs.gov/minerals/pubs/commodity/asbestos/index.html.)

Virta, R.L., 2003b, Worldwide asbestos supply and consumption trends from 1900 to 2000: U.S. Geological Survey Open-File Report 03–083, 59 p. (Also available online at http://pubs.usgs.gov/of/2003/of03-083/.)

Virta, R.L, 2005a, Asbestos: U.S. Geological Survey Minerals Yearbook 2004, v. I, p. 8.1–8.11, available only online at http://minerals.usgs.gov/minerals/pubs/commodity/asbestos/index.html. (Accessed October 15, 2005.)

Virta, R.L., 2005b, Mineral commodity profiles—Asbestos: U.S. Geological Survey Circular 1255–KK, 56 p., available only online at http://pubs.usgs.gov/circ/2005/1255/kk.

Wang, K.P., 1967, The mineral industry of mainland China: U.S. Bureau of Mines Minerals Yearbook 1965, v. IV, p. 1107–1120. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Wang, K.P., 1978, The mineral industry of the People's Republic of China: U.S. Bureau of Mines Minerals Yearbook 1975, v. III, p. 285–304. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Wang, K.P., 1981, The mineral industry of China: U.S. Bureau of Mines Minerals Yearbook 1978–79, v. III, p. 233–269. (Also available online at http://minerals.usgs.gov/minerals/pubs/usbmmyb.html.)

Figures 1–3 and tables 1–4

[The appendix follows table 4]

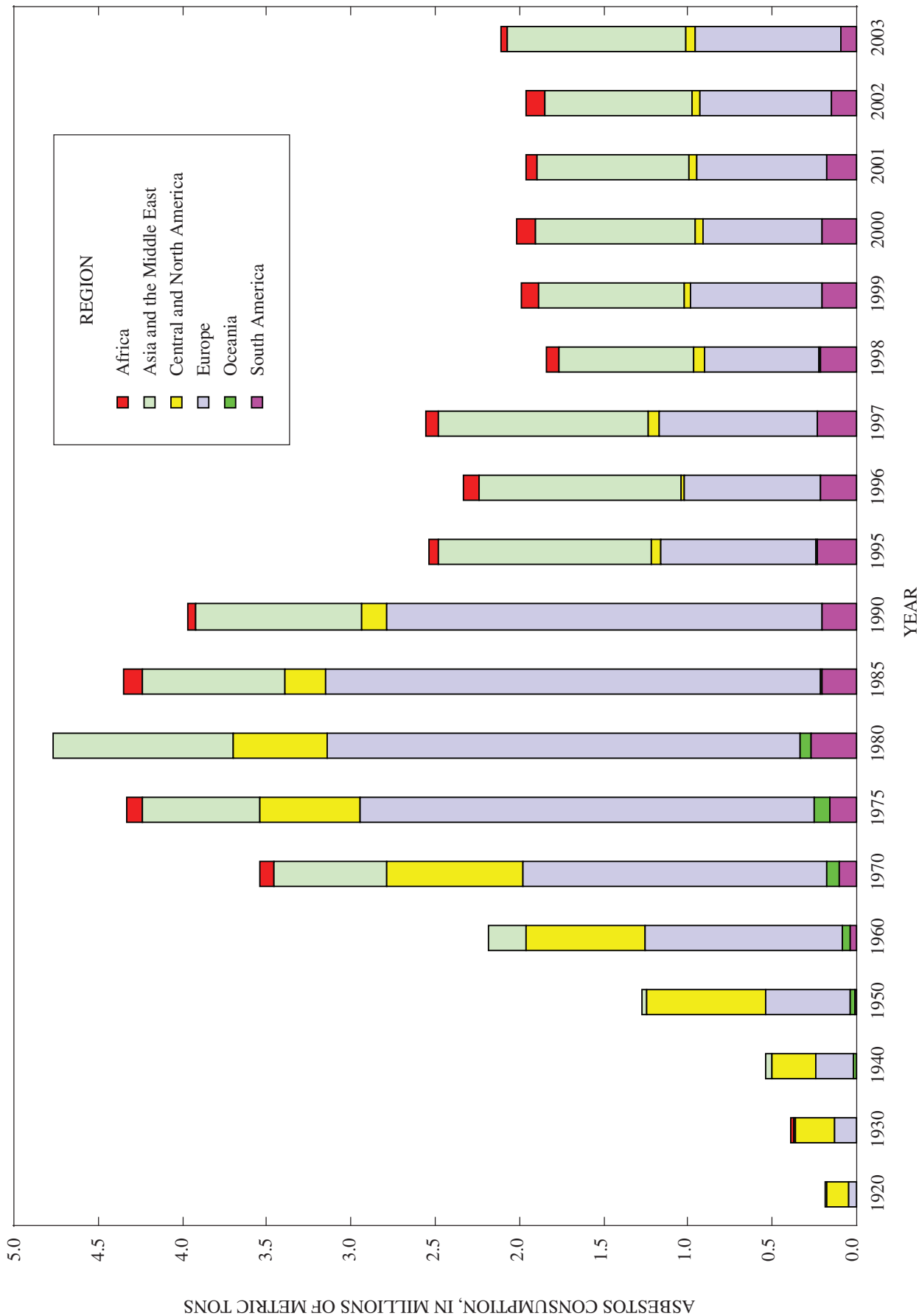


Figure 1. Bar graph of calculated apparent consumption of asbestos by region, 1920–2003. Data from tables A1–A19.

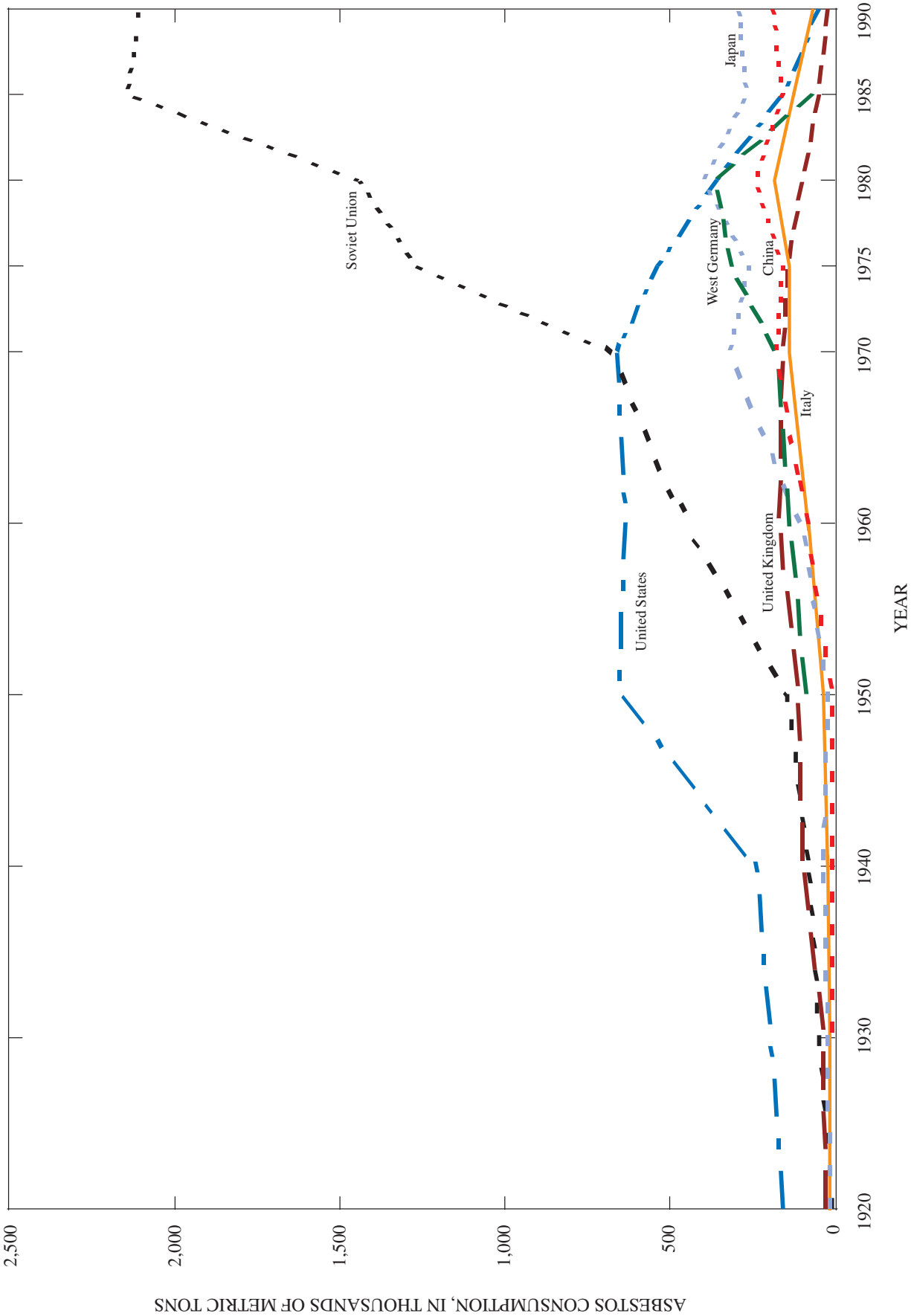


Figure 2. Line graph of calculated apparent consumption of asbestos by major asbestos-consuming countries, 1920–1990. Data from tables A1–A10.

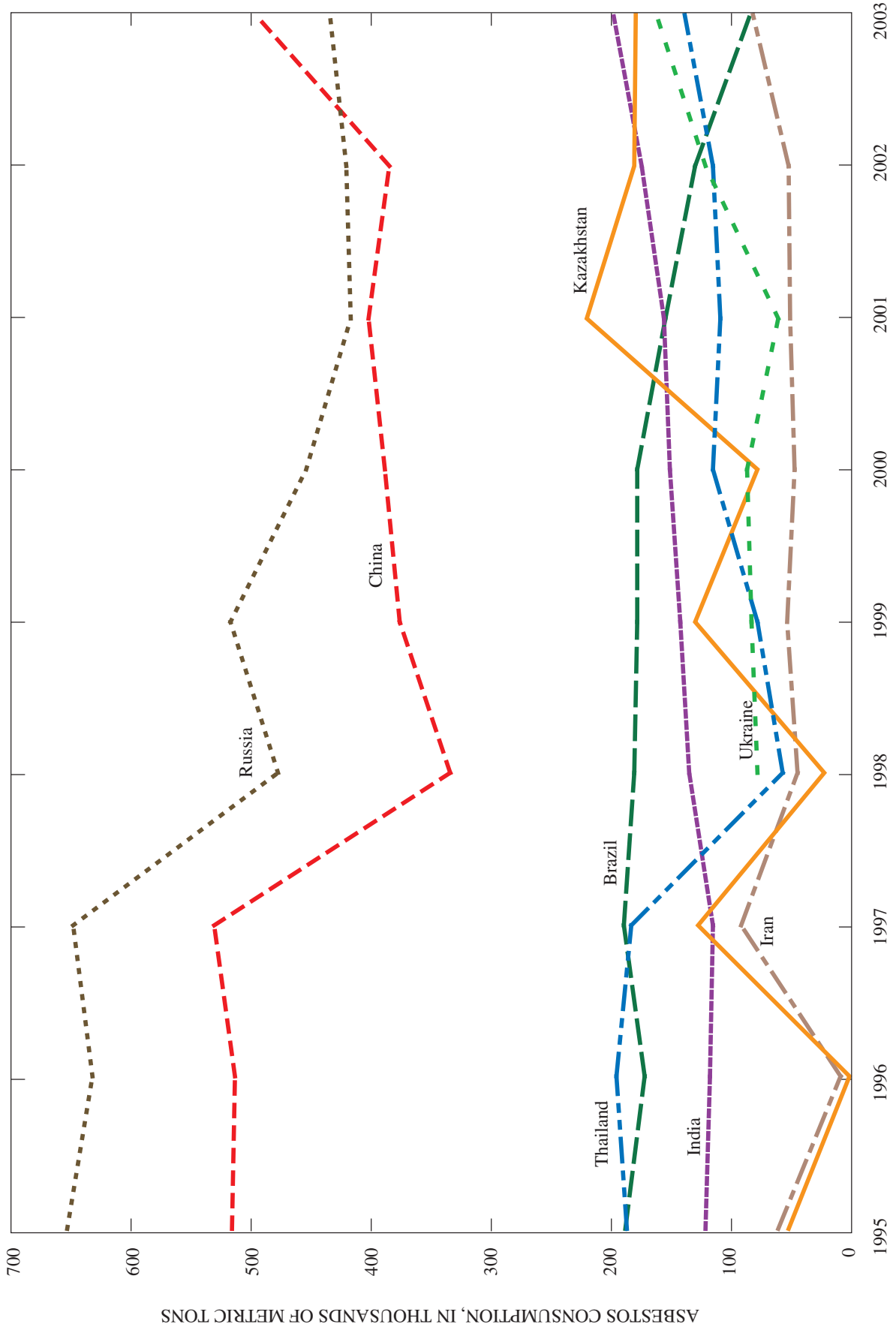


Figure 3. Line graph of calculated apparent consumption of asbestos by major asbestos-consuming countries, 1995–2003. Data from tables A11–A19. The vertical scale differs from that in figure 2 because asbestos consumption generally decreased after 1990.

Table 1. Early developments of the asbestos industry.

[Information from Stover Publishing Co., 1953, p. 4–6; Selikoff and Lee, 1978, p. 17–18]

1857–1880	First packings and flat seals using asbestos.
1866	First bonded and molded asbestos product for heat insulation.
1866–1876	Start of systematic asbestos textile processing in Italy.
1868–1869	First U.S. use of asbestos in roofing felt and cement.
1878	Asbestos paper first made in the United States.
1882	Concept of asbestos-containing magnesia insulation developed.
1890	Asbestos textile processing began in Canada.
1893	First spinning of crocidolite in Republic of South Africa.
1896	First asbestos-containing woven brake bands made in England.
1899	Wet machine process of making asbestos cement developed.
1900	Method for manufacturing asbestos-cement panels developed.
1904	Flat asbestos-cement board manufactured in the United States.
1906	Asbestos first used as brake lining.
1918	Asbestos-containing molded clutch facing developed.
1929	Asbestos-cement pipe industry began in the United States.
1931	Technique for spraying asbestos developed in England.
1940s	Asbestos-cement pipe introduced into England.
1944	Spraying asbestos on deckheads and bulkheads began in British naval ships.

Table 2. Salient U.S. statistics for asbestos, 1900 through 2003.

[Data in metric tons. Terms used: ᵉestimated; NA, not available; W, withheld to avoid revealing company proprietary data; —, zero. Data from U.S. Geological Survey, 1901–1926, 1997–2005; U.S. Bureau of Mines, 1927–1933, 1933–1996]

Year	Domestic sales or use[1]	Total asbestos imports	Imports from Canada	Imports from South Africa	Crocidolite imports	Amosite imports	Asbestos exports	Apparent consumption[2]
1900.....	956	ᵉ19,500	NA	NA	NA	NA	NA	ᵉ20,400
1901.....	678	ᵉ33,500	NA	NA	NA	NA	NA	ᵉ34,200
1902.....	912	ᵉ41,100	NA	NA	NA	NA	NA	ᵉ42,000
1903.....	805	ᵉ31,500	NA	NA	NA	NA	NA	ᵉ32,400
1904.....	1,343	ᵉ36,500	NA	NA	NA	NA	NA	ᵉ37,900
1905.....	2,820	ᵉ51,000	NA	NA	NA	NA	NA	ᵉ53,800
1906.....	1,538	ᵉ54,000	NA	NA	NA	NA	NA	ᵉ55,900
1907.....	592	ᵉ55,000	NA	NA	NA	NA	NA	ᵉ55,600
1908.....	849	ᵉ46,200	NA	NA	NA	NA	NA	ᵉ47,100
1909.....	2,799	ᵉ44,400	NA	NA	NA	NA	NA	ᵉ47,200
1910.....	3,350	48,270	48,079	NA	NA	NA	NA	46,400
1911.....	6,898	58,038	57,861	NA	NA	NA	NA	58,700
1912.....	3,994	64,900	64,797	NA	NA	NA	NA	68,900
1913.....	905	88,100	87,953	NA	NA	NA	NA	89,100
1914.....	1,026	65,200	65,119	NA	NA	NA	NA	66,300
1915.....	1,424	84,900	84,881	NA	NA	NA	NA	86,500
1916.....	1,217	105,000	104,306	102	NA	NA	NA	107,000
1917.....	1,385	122,000	119,318	1,624	NA	NA	NA	123,000
1918.....	825	125,000	122,300	759	NA	NA	NA	125,000
1919.....	955	123,000	121,256	816	NA	NA	NA	123,000
1920.....	1,356	152,000	147,615	2,025	NA	NA	NA	153,000
1921.....	754	65,700	64,784	457	NA	NA	NA	66,000
1922.....	61	136,000	133,897	373	NA	NA	NA	135,000
1923.....	206	193,000	188,929	254	NA	NA	NA	192,000
1924.....	272	166,000	163,340	943	NA	NA	NA	165,000
1925.....	1,141	209,000	204,968	382	NA	NA	NA	209,000
1926.....	1,232	234,000	229,054	2,182	NA	NA	NA	234,000
1927.....	2,704	203,000	195,753	3,156	NA	NA	NA	205,000
1928.....	2,031	209,000	200,796	2,920	NA	NA	NA	210,000
1929.....	2,862	238,000	228,672	3,338	NA	NA	NA	240,000
1930.....	3,848	189,000	181,499	1,730	NA	NA	NA	192,000
1931.....	2,928	123,705	118,031	747	NA	NA	1,555	125,000
1932.....	3,229	87,774	85,883	192	NA	NA	1,549	89,500
1933.....	4,305	108,447	102,435	211	NA	NA	1,250	112,000
1934.....	4,615	109,165	102,566	540	NA	NA	1,514	112,000
1935.....	8,092	151,124	139,921	857	NA	NA	771	158,000
1936.....	10,037	220,992	205,095	1,887	NA	NA	3,397	228,000
1937.....	10,958	278,677	250,392	3,854	NA	NA	2,725	287,000
1938.....	9,471	162,831	150,657	3,336	NA	NA	2,522	170,000
1939.....	14,024	220,048	203,064	5,769	NA	NA	2,243	232,000

Table 2. Salient U.S. statistics for asbestos, 1900 through 2003.—Continued

[Data in metric tons. Terms used: ᵉestimated; NA, not available; W, withheld to avoid revealing company proprietary data; —, zero. Data from U.S. Geological Survey, 1901–1926, 1997–2005; U.S. Bureau of Mines, 1927–1933, 1933–1996]

Year	Domestic sales or use[1]	Total asbestos imports	Imports from Canada	Imports from South Africa	Crocidolite imports	Amosite imports	Asbestos exports	Apparent consumption[2]
1940.....	18,198	223,724	204,893	7,940	NA	NA	4,059	238,000
1941.....	22,127	380,289	353,250	19,456	NA	NA	4,396	398,000
1942.....	14,044	380,330	350,737	18,396	NA	NA	702	394,000
1943.....	5,456	399,393	349,861	21,781	NA	NA	333	405,000
1944.....	6,048	347,497	320,461	17,414	NA	NA	431	353,000
1945.....	11,091	339,609	322,775	12,017	NA	NA	7,756	343,000
1946.....	12,769	413,371	401,042	5,737	NA	NA	9,989	416,000
1947.....	21,804	539,630	507,370	18,175	NA	NA	2,431	559,000
1948.....	33,649	587,748	546,322	17,109	NA	NA	8,371	613,000
1949.....	39,360	462,090	427,088	20,611	NA	NA	18,185	483,000
1950.....	38,496	639,981	615,703	13,523	NA	NA	18,951	660,000
1951.....	46,852	691,160	659,315	21,394	NA	NA	14,992	723,000
1952.....	48,865	643,602	606,817	24,405	NA	NA	9,729	683,000
1953.....	49,402	627,995	591,591	23,977	NA	NA	2,791	675,000
1954.....	43,201	615,425	580,855	24,857	NA	NA	1,718	657,000
1955.....	40,431	671,701	634,202	26,036	NA	NA	2,528	709,000
1956.....	37,478	625,877	574,925	28,982	16,641	10,372	2,676	660,000
1957.....	39,601	619,364	568,034	32,152	16,166	12,879	2,624	656,000
1958.....	39,897	584,528	531,088	36,652	17,862	15,417	2,745	622,000
1959.....	41,240	646,866	593,776	35,124	16,335	15,072	4,047	684,000
1960.....	41,026	607,357	559,553	37,008	13,516	17,764	5,012	643,000
1961.....	47,912	559,742	517,144	32,123	14,062	13,588	3,446	604,000
1962.....	48,253	613,215	565,912	31,445	8,701	18,347	3,575	659,000
1963.....	60,234	605,873	561,314	33,524	9,903	19,907	9,112	657,000
1964.....	91,709	670,738	605,068	45,841	22,551	21,711	24,627	738,000
1965.....	107,297	652,774	596,973	37,134	19,201	15,460	39,123	721,000
1966.....	114,240	659,033	593,398	56,763	24,489	21,713	42,634	731,000
1967.....	111,755	585,236	546,110	27,773	13,532	11,392	43,289	654,000
1968.....	109,488	669,421	625,398	34,915	12,669	18,567	37,409	741,000
1969.....	114,247	630,093	594,598	26,934	9,578	13,261	32,816	712,000
1970.....	113,683	589,128	556,386	24,247	8,923	12,937	42,261	665,000
1971.....	118,734	618,126	588,439	22,690	6,308	13,227	48,696	699,000
1972.....	119,443	667,249	647,635	14,864	4,875	6,464	53,183	734,000
1973.....	136,111	718,920	693,674	22,738	11,387	7,114	60,275	803,000
1974.....	98,966	695,053	670,511	21,468	10,253	7,274	55,994	768,000
1975.....	89,498	488,521	456,809	16,308	10,496	3,533	33,061	552,000
1976.....	104,873	596,737	560,237	18,229	9,232	1,428	42,564	659,000
1977.....	92,256	550,693	516,085	20,397	10,921	529	34,896	610,000
1978.....	93,097	570,020	543,233	24,908	16,865	1,170	41,783	619,000
1979.....	93,354	513,084	495,914	16,328	13,827	461	43,291	564,000

Table 2. Salient U.S. statistics for asbestos, 1900 through 2003.—Continued

[Data in metric tons. Terms used: ᵉestimated; NA, not available; W, withheld to avoid revealing company proprietary data; —, zero. Data from U.S. Geological Survey, 1901–1926, 1997–2005; U.S. Bureau of Mines, 1927–1933, 1933–1996]

Year	Domestic sales or use[1]	Total asbestos imports	Imports from Canada	Imports from South Africa	Crocidolite imports	Amosite imports	Asbestos exports	Apparent consumption[2]
1980.....	80,079	327,296	315,540	10,261	7,597	364	48,671	356,000
1981.....	75,618	337,618	318,367	17,112	7,376	680	64,419	349,000
1982.....	63,515	241,737	229,079	11,390	7,904	389	58,771	247,000
1983.....	69,906	196,387	184,303	11,754	6,177	609	54,634	217,000
1984.....	57,422	209,963	195,651	13,912	5,656	715	39,919	226,000
1985.....	57,457	142,431	131,119	10,985	4,794	121	45,656	162,000
1986.....	51,437	108,352	103,517	4,455	1,988	—	47,281	120,000
1987.....	50,600	93,763	90,224	3,246	1,113	—	60,084	84,000
1988.....	18,233	85,326	79,690	4,288	1,252	—	31,544	71,000
1989.....	17,427	55,306	53,572	1,040	593	—	27,004	55,000
1990.....	W	41,348	40,380	835	835	—	27,965	41,000
1991.....	20,061	34,765	34,480	209	282	—	25,636	35,000
1992.....	15,573	31,602	30,870	104	472	—	24,860	33,000
1993.....	13,704	30,840	30,709	—	18	—	27,643	32,000
1994.....	10,100	25,800	25,700	—	—	—	17,500	27,000
1995.....	9,000	21,900	21,800	—	192	—	14,600	22,000
1996.....	9,550	21,600	21,400	15	[3]197	—	15,400	21,700
1997.....	6,890	20,900	20,700	14	[3]238	—	20,300	21,000
1998.....	5,760	15,800	15,700	10	[3]228	—	18,100	15,800
1999.....	7,190	15,800	14,300	293	[3]—	—	21,700	15,800
2000.....	5,260	14,600	14,500	53	[3]67	—	18,800	14,600
2001.....	5,260	13,100	12,700	183	[3]—	—	21,700	13,100
2002.....	2,720	6,850	6,630	176	[3]—	—	6,550	6,850
2003.....	—	4,650	4,510	55	[3]—	—	2,820	4,650
Total ...	3,288,343	29,556,948	27,405,418	1,120,340	364,350	282,465	1,577,164	31,505,850

[1]Domestic sales or use is equivalent to U.S. production.

[2]Apparent consumption for this Circular is defined as production plus imports minus exports; in this table, most apparent consumption values for 1910–2002 are from Buckingham and Virta (2006), who included changes to government and industry stocks when available. Apparent consumption is also called "demand" in the text. After 1988, apparent consumption was assumed to be approximately equal to total asbestos imports.

[3]Number reported by the U.S. International Trade Commission (2006). Crocidolite imports for 1995, 1996, 1997, 1998, and 2000 are estimated to have been less than 5 t. Most of the asbestos imports reported as crocidolite after 1995 are believed to have been chrysotile on the basis of their sources and customs values.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/36

Table 3. U.S. end uses for asbestos, 1965 through 2003.

[Data in thousands of metric tons. Terms used: [e]estimated; —, zero. All data for 1965–1971 are estimated, as indicated by the letter following the year (1965[e]). Data from U.S. Bureau of Mines, 1933–1996; May, 1965; May and Lewis, 1970; Clifton, 1976, 1980b, p. 63, 1985; U.S. Geological Survey, 1997–2005]

Year	Asbestos cement		Coatings and compounds	Flooring	Friction products	Insulation		Packing and gaskets	Paper	Plastics	Roofing	Textiles	Other[1]	Unknown[2]	Total[3,4]
	Pipe	Sheet				Electrical	Thermal								
1965[e].....	137	50	([5])	181	64	22	([6])	22	15	([5])	72	15	144	—	721
1966[e].....	139	51	([5])	183	65	22	([6])	22	14	([5])	73	15	147	—	730
1967[e].....	122	46	([5])	162	59	20	([6])	20	13	([5])	64	13	132	—	650
1968[e].....	141	52	([5])	185	67	23	([6])	23	15	([5])	74	15	148	—	741
1969[e].....	135	50	([5])	178	64	22	([6])	22	14	([5])	72	14	140	—	711
1970[e].....	126	46	([5])	167	60	20	([6])	20	14	([5])	66	14	133	—	666
1971[e].....	131	48	([5])	173	62	21	([6])	21	14	([5])	69	13	137	—	689
1972.....	140	52	([5])	183	66	22	([6])	22	15	([5])	73	14	147	—	733
1973.....	151	58	([5])	198	72	23	([6])	24	16	([5])	79	16	158	—	795
1974.....	202	86	([5])	139	73	13	([6])	26	57	([5])	69	18	85	—	768
1975.....	139	40	([5])	123	60	6	([6])	15	60	([5])	42	5	62	—	552
1976.....	127	21	([5])	104	58	8	([6])	18	28	([5])	231	6	59	—	659
1977.....	145	39	32	140	83	3	15	25	22	7	58	9	30	—	609
1978.....	106	25	33	138	53	15	4	25	7	7	64	9	133	—	619
1979.....	96	22	30	125	48	14	3	23	6	7	58	8	121	—	561
1980.....	42	23	11	70	52	6	3	12	1	2	24	2	111	—	359
1981.....	42	20	13	67	51	6	1	19	2	1	16	2	109	—	349
1982.....	38	11	25	49	53	—	1	14	2	—	7	1	46	—	247
1983.....	26	10	23	45	48	—	1	12	2	1	6	1	42	—	217
1984.....	37	12	22	46	48	([7])	2	13	2	1	7	2	33	—	226
1985.....	28	7	23	7	34	([7])	([7])	6	17	([7])	26	1	5	7	162
1986.....	20	5	17	5	26	([7])	([7])	5	13	([7])	20	([7])	4	4	120
1987.....	11	4	3	—	21	([7])	—	10	5	1	23	1	2	4	84
1988.....	12	4	4	([7])	15	([7])	([7])	10	1	([7])	20	([7])	([7])	5	71
1989.....	8	3	4	—	12	—	—	4	1	1	18	([7])	1	4	55
1990.....	5	2	2	—	9	—	—	3	([7])	([7])	13	—	1	7	41
1991.....	4	2	1	—	10	—	—	3	([7])	([7])	15	—	1	1	35
1992.....	2	([7])	1	—	10	—	—	3	([7])	([7])	16	—	1	([7])	33
1993.....	1	—	1	—	10	—	—	3	([7])	([7])	16	—	1	([7])	32
1994.....	—	—	([7])	—	9	—	—	3	([7])	([7])	13	—	1	([7])	27
1995.....	—	—	([7])	—	7	—	—	3	([7])	([7])	11	—	1	([7])	22
1996.....	—	—	([7])	—	7	—	—	3	([7])	([7])	11	—	1	([7])	22
1997.....	—	—	([7])	—	6	—	—	4	([7])	([7])	10	—	1	([7])	21
1998.....	—	—	([7])	—	3	—	—	2	1	([7])	9	—	1	—	16
1999.....	—	—	([7])	—	2	—	—	3	—	([7])	10	—	1	—	16
2000.....	—	—	([7])	—	2	—	([7])	3	—	([7])	9	—	1	—	15
2001.....	—	—	([7])	—	1	—	—	2	—	([7])	9	—	1	—	13
2002.....	—	—	1	—	([7])	—	([7])	1	—	—	3	—	([7])	—	7
2003.....	—	—	1	—	—	—	—	—	—	—	3	—	([7])	—	5
Total[3] ..	2,311	788	247	2,669	1,391	265	30	467	354	28	1,481	192	2,141	32	12,396

[1]"Other" includes known end uses not falling into specified end-use categories.

[2]"Unknown" means undetermined end uses.

[3]Entries in column or row may not add to the total shown because of independent rounding and because data are rounded to no more than three significant digits.

[4]The total U.S. end uses in this table 3 are not exactly equivalent to the U.S. apparent consumption totals in table 2 because table 2 includes changes in government and industry stocks where available and because table 3 excludes amounts smaller than 500 t.

[5]The end use was included with "Other" for this year.

[6]"Thermal insulation" was included with "Electrical insulation" for this year.

[7]No value is shown for this end use because the amount was less than 500 t.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/37

Table 4. World production of all types of asbestos, 1900 through 2003.

[Data in metric tons. Production data include all types of asbestos. Terms used: ᵉestimated; NA, not available; W, withheld to avoid disclosing company proprietary data; —, zero. Data from U.S. Geological Survey, 1901–1926, 1997–2005; U.S. Bureau of Mines, 1927–1933, 1933–1996]

Year	Australia	Brazil	Canada	China	Greece	Italy	Kazakhstan and Russia	South Africa	Swaziland	United States	Zimbabwe	Other	World production[1]
1900.....	—	—	26,436	NA	—	NA	NA	158	—	956	NA	3,937	31,487
1901.....	—	—	36,484	NA	—	NA	NA	90	—	678	NA	4,517	41,769
1902.....	—	—	36,665	NA	—	NA	NA	41	—	912	NA	4,506	42,124
1903.....	—	—	37,809	NA	—	NA	5,248	277	—	805	NA	16	44,155
1904.....	—	—	43,967	NA	—	NA	7,479	373	—	1,343	NA	186	53,348
1905.....	—	—	61,927	NA	—	NA	7,244	455	—	2,820	NA	22	72,468
1906.....	—	—	74,557	NA	—	NA	7,997	474	—	1,538	NA	1,223	85,789
1907.....	—	—	82,033	NA	—	NA	8,837	548	—	592	NA	1,683	93,693
1908.....	—	—	82,348	NA	—	NA	10,827	1,149	—	849	NA	1,647	96,820
1909.....	—	—	79,197	NA	—	NA	13,294	1,519	—	2,799	NA	405	97,214
1910.....	—	—	92,728	NA	—	NA	11,070	1,346	—	3,350	NA	611	109,105
1911.....	—	—	115,588	NA	—	167	15,487	1,149	—	6,898	NA	1,191	140,479
1912.....	—	—	119,077	NA	—	169	16,455	2,115	—	3,994	NA	6,574	148,383
1913.....	—	—	124,239	NA	—	175	17,494	873	—	905	263	93	144,042
1914.....	—	—	87,580	NA	—	171	15,691	1,079	—	1,026	442	11	106,000
1915.....	—	—	100,826	NA	—	163	9,779	1,940	—	1,424	1,823	1,045	117,000
1916.....	37	—	121,053	NA	—	82	8,192	4,224	—	1,217	5,586	4,875	145,229
1917.....	280	—	122,925	378	—	85	—	5,643	—	1,385	8,675	1,909	141,000
1918.....	2,900	—	128,331	243	—	60	NA	3,333	—	825	7,778	530	144,000
1919.....	106	—	124,070	69	—	98	NA	3,567	—	955	8,889	2,647	140,295
1920.....	839	—	162,038	5	—	165	1,478	6,452	—	1,356	17,076	4,430	193,000
1921.....	1,201	—	61,083	169	—	420	2,604	4,647	—	754	17,716	2,506	91,100
1922.....	754	—	109,128	197	—	540	3,215	3,982	—	61	12,926	5,951	136,000
1923.....	331	—	164,014	128	—	1,538	4,780	7,614	—	206	18,474	4,246	201,000
1924.....	79	—	150,768	127	—	2,160	8,456	6,569	—	272	23,715	5,933	198,000
1925.....	51	—	248,136	213	—	2,105	12,330	9,224	—	1,141	31,161	7,690	312,000
1926.....	112	—	253,469	NA	—	2,900	18,334	12,789	—	1,232	30,249	10,027	329,000
1927.....	11	—	249,273	241	—	3,840	21,156	20,106	—	2,704	30,097	14,583	342,000
1928.....	12	—	247,690	NA	NA	4,950	26,492	21,821	—	2,031	36,251	14,765	354,000
1929.....	260	—	277,647	277	NA	2,847	29,520	29,971	—	2,862	38,677	17,913	399,714
1930.....	144	—	219,641	315	2	851	54,083	17,491	—	3,848	34,260	7,572	338,063
1931.....	130	—	149,047	264	10	632	64,674	14,221	—	2,928	21,810	5,849	259,435
1932.....	132	112	111,562	250	9	1,284	59,800	10,950	5	3,229	14,303	3,895	205,399
1933.....	283	99	143,667	239	14	3,267	71,700	14,412	NA	4,305	27,381	8,991	274,075
1934.....	157	NA	141,502	290	30	2,252	92,200	15,960	NA	4,615	29,224	13,140	299,213
1935.....	179	NA	190,931	70	2	4,320	95,500	20,600	NA	8,092	38,644	13,871	372,030

Worldwide Asbestos Supply and Consumption Trends from 1900 through 2003
ACL Doc 11054 · Page 38 of 87
Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/38

Table 4. World production of all types of asbestos, 1900 through 2003.—Continued

[Data in metric tons. Production data include all types of asbestos. Terms used: ᵉestimated; NA, not available; W, withheld to avoid disclosing company proprietary data; —, zero. Data from U.S. Geological Survey, 1901–1926, 1997–2005; U.S. Bureau of Mines, 1927–1933, 1933–1996]

Year	Australia	Brazil	Canada	China	Greece	Italy	Kazakhstan and Russia	South Africa	Swaziland	United States	Zimbabwe	Other	World production[1]
1936.....	243	NA	273,322	69	1	6,113	125,117	22,894	NA	10,037	51,116	18,291	506,960
1937.....	168	NA	371,967	NA	2	6,393	125,000	25,975	NA	10,958	51,722	20,925	612,942
1938.....	176	120	262,894	700	85	6,860	86,000	21,025	NA	9,471	53,352	14,839	455,346
1939.....	325	45	330,642	18,015	2	6,765	ᵉ95,000	20,003	7,233	14,024	52,900	18,388	563,017
1940.....	498	500	313,504	20,015	NA	8,271	ᵉ102,000	24,850	18,873	18,198	50,809	17,098	573,728
1941.....	256	13	433,492	20,515	NA	10,766	ᵉ95,000	25,655	19,166	22,127	40,037	9,786	676,557
1942.....	334	NA	398,669	20,615	NA	11,695	ᵉ95,000	31,351	23,219	14,044	50,623	11,298	656,514
1943.....	699	NA	423,831	20,000	NA	8,459	ᵉ100,000	32,347	17,179	5,456	52,749	72,979	733,000
1944.....	3,022	NA	380,349	NA	NA	7,238	ᵉ110,000	31,372	29,628	6,048	52,882	91,461	712,000
1945.....	4,071	2,723	423,559	NA	NA	5,222	ᵉ120,000	25,597	21,243	11,091	51,068	87,426	752,000
1946.....	629	1,214	506,371	NA	4	8,814	ᵉ140,000	25,597	29,155	12,769	50,686	114,761	890,000
1947.....	1,399	2,631	600,391	NA	40	10,719	ᵉ160,000	27,344	25,360	21,804	49,073	161,239	1,060,000
1948.....	1,348	1,499	650,239	NA	9	13,044	ᵉ180,000	41,490	29,421	33,649	62,502	191,799	1,205,000
1949.....	1,671	1,415	521,543	NA	9	15,877	191,000	64,335	30,814	39,360	72,246	36,730	975,000
1950.....	1,811	844	794,100	NA	30	21,433	217,725	79,301	29,635	38,496	64,888	44,478	1,292,740
1951.....	2,865	1,321	882,871	NA	34	22,612	217,725	97,403	31,719	46,852	70,456	50,426	1,424,282
1952.....	4,546	1,305	843,083	NA	24	23,938	217,725	121,417	31,542	48,865	76,961	45,805	1,415,210
1953.....	5,567	1,231	826,651	NA	1	20,397	272,156	86,017	27,309	49,402	79,597	51,418	1,419,746
1954.....	4,789	2,555	838,345	13,608	2	23,784	340,195	99,020	27,344	43,201	72,542	49,616	1,515,000
1955.....	5,437	2,834	965,066	20,865	3	32,101	408,234	108,421	29,586	40,431	95,491	60,543	1,769,012
1956.....	8,808	3,392	920,112	10,886	5	35,785	453,593	123,849	27,102	37,478	107,932	76,358	1,805,300
1957.....	13,308	2,408	948,994	29,937	8	36,615	453,593	142,858	27,875	39,601	119,863	71,887	1,886,947
1958.....	14,125	3,462	839,447	58,967	—	38,555	498,952	159,342	22,916	39,897	115,319	73,284	1,864,267
1959.....	16,216	3,357	952,934	81,647	—	47,662	544,311	165,475	22,504	41,240	108,591	66,304	2,050,240
1960.....	14,164	3,538	1,014,647	81,647	—	54,914	598,743	159,540	29,054	41,026	121,529	94,731	2,213,533
1961.....	15,192	3,084	1,064,759	90,719	—	56,975	798,324	176,687	27,934	47,912	146,613	84,707	2,512,905
1962.....	16,707	4,445	1,102,969	90,719	—	55,211	644,102	200,762	29,783	48,253	128,999	86,628	2,408,578
1963.....	12,133	1,306	1,157,143	99,790	67	57,167	684,925	186,648	30,255	60,234	129,053	86,727	2,505,449
1964.....	12,288	1,297	1,288,069	117,934	63	68,556	734,821	195,582	36,162	91,709	139,210	82,042	2,767,733
1965.....	10,493	1,092	1,259,366	127,006	—	71,928	745,000	218,407	37,089	107,297	159,802	76,604	2,814,085
1966.....	12,217	1,651	1,350,850	136,078	—	82,325	755,000	250,925	32,788	114,240	160,003	75,194	2,971,271
1967.....	666	2,256	1,317,328	149,686	—	101,062	769,000	243,563	36,427	111,755	97,302	81,201	2,909,580
1968.....	812	4,360	1,369,578	154,222	—	103,437	816,467	236,350	38,960	109,488	86,184	88,550	3,007,596
1969.....	838	12,701	1,430,520	158,758	—	112,526	961,617	258,174	39,079	114,247	79,832	97,619	3,265,073

Worldwide Asbestos Supply and Consumption Trends from 1900 through 2003
ACL Doc 11054 · Page 39 of 87
Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/39

Table 4. World production of all types of asbestos, 1900 through 2003.—Continued

[Data in metric tons. Production data include all types of asbestos. Terms used: ᵉestimated; NA, not available; W, withheld to avoid disclosing company proprietary data; —, zero. Data from U.S. Geological Survey, 1901–1926, 1997–2005; U.S. Bureau of Mines, 1927–1933, 1933–1996]

Year	Australia	Brazil	Canada	China	Greece	Italy	Kazakhstan and Russia	South Africa	Swaziland	United States	Zimbabwe	Other	World production[1]
1970.....	739	16,329	1,507,420	172,365	—	118,536	1,065,943	287,416	33,057	113,683	79,832	99,219	3,493,800
1971.....	756	19,958	1,482,867	158,758	—	119,568	1,152,126	319,296	35,484	118,734	79,834	98,074	3,584,698
1972.....	16,838	32,883	1,530,469	199,581	—	131,272	1,220,165	320,628	33,400	119,443	79,834	92,715	3,777,227
1973.....	43,529	44,868	1,690,065	208,653	—	150,256	1,279,132	332,650	36,900	136,111	163,293	100,043	4,185,499
1974.....	30,863	61,871	1,643,790	149,686	—	148,099	1,360,779	333,272	37,917	98,966	163,293	128,481	4,157,016
1975.....	47,922	73,978	1,055,668	149,686	—	146,995	1,896,018	354,710	41,219	89,498	163,293	119,770	4,138,756
1976.....	60,642	92,703	1,536,091	150,000	NA	164,788	1,850,000	369,840	41,847	104,873	281,000	115,287	4,767,071
1977.....	50,601	92,773	1,517,360	200,000	NA	149,327	1,900,000	380,164	38,046	92,256	273,194	99,730	4,793,451
1978.....	62,744	122,815	1,421,808	250,000	NA	135,402	1,945,000	257,325	36,957	93,097	248,861	119,208	4,693,217
1979.....	79,721	138,457	1,492,719	140,000	NA	143,931	2,020,000	249,187	34,294	93,354	259,891	106,468	4,758,022
1980.....	92,418	169,173	1,323,000	131,700	NA	157,794	2,070,000	277,734	32,833	80,079	250,949	113,620	4,699,300
1981.....	45,494	138,417	1,121,845	106,000	457	137,086	2,105,000	235,943	35,264	75,618	247,600	100,742	4,349,466
1982.....	18,587	145,998	834,249	110,000	17,016	116,410	2,700,000	211,860	30,145	63,515	197,682	114,033	4,559,495
1983.....	3,909	158,885	857,504	160,000	31,811	139,054	2,500,000	221,111	26,287	69,906	153,221	107,179	4,428,867
1984.....	—	134,788	836,654	135,000	45,376	147,272	2,500,000	167,389	25,832	57,422	165,385	96,724	4,311,842
1985.....	—	165,446	750,190	150,000	46,811	136,006	2,500,000	164,247	25,130	57,457	173,580	80,121	4,248,988
1986.....	—	204,460	662,381	150,712	51,355	115,208	2,400,000	138,862	24,475	51,437	163,984	66,490	4,029,364
1987.....	—	212,807	664,546	144,673	60,134	118,352	2,554,600	135,074	25,925	50,600	193,295	77,116	4,237,122
1988.....	—	227,653	710,357	150,000	71,114	94,549	2,600,000	145,678	22,804	18,233	186,581	84,020	4,310,989
1989.....	—	206,195	732,192	181,000	73,300	44,348	2,600,000	156,594	27,291	17,427	187,006	65,011	4,290,364
1990.....	—	205,000	725,000	221,000	66,000	3,860	2,400,000	146,000	35,900	W	161,000	50,495	4,014,255
1991.....	—	237,000	639,000	200,000	4,730	15,000	2,000,000	148,525	13,900	20,061	142,000	67,735	3,487,951
1992.....	—	170,000	590,641	240,000	30,000	—	1,900,000	133,268	32,301	15,573	150,158	9,549	3,271,490
1993.....	—	185,000	522,967	240,000	56,945	—	1,130,000	103,994	33,860	13,704	156,881	331,844	2,775,195
1994.....	—	192,050	531,000	303,000	55,502	—	830,000	92,130	26,720	10,100	151,905	57,593	2,250,000
1995.....	—	170,000	515,587	263,000	76,003	—	808,400	88,642	28,570	9,000	169,256	51,542	2,180,000
1996.....	—	170,000	506,000	293,000	80,213	—	743,700	57,120	26,014	9,550	165,494	48,909	2,100,000
1997.....	—	170,000	455,000	288,000	63,294	—	892,000	49,986	25,888	6,890	144,959	53,983	2,150,000
1998.....	—	198,332	309,000	314,000	50,000	—	755,400	27,195	27,693	5,760	123,295	169,325	1,980,000
1999.....	—	188,386	337,366	329,000	—	—	814,300	18,836	22,912	7,190	115,000	107,010	1,940,000
2000.....	—	209,332	309,719	315,000	—	—	983,200	18,782	12,690	5,260	152,000	104,017	2,110,000
2001.....	—	172,695	276,790	310,000	—	—	1,021,300	13,393	—	5,260	136,327	144,235	2,080,000
2002.....	—	194,750	240,500	270,000	—	—	1,066,100	—	—	2,720	168,000	107,930	2,050,000
2003.....	—	194,350	200,500	350,000	—	—	1,232,500	6,218	—	—	147,000	99,432	2,230,000
Total ...	750,582	5,186,162	61,165,286	8,659,684	880,516	3,861,573	70,373,401	9,939,807	1,797,914	3,288,343	9,152,235	5,866,983	180,922,485

[1]Some data are rounded to no more than three significant digits and may not add to total shown.

Worldwide Asbestos Supply and Consumption Trends from 1900 through 2003
ACL Doc 11054 · Page 40 of 87
Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/40

Appendix. World Asbestos Production, Trade, and Consumption from 1920 through 2003

The appendix consists of tables A1–A19, which provide estimates of consumption by country and region for selected years from 1920 through 2003. For consistency, the export, import, and production data for 1920–1997 (tables A1–A13) were taken from the "Statistical Summary of the Mineral Industry" and "World Mineral Statistics" and their predecessor reports by the British Geological Survey and its forerunners. After 1997, some production and trade data were not available in these publications, and so production data were taken from the U.S. Geological Survey "Minerals Yearbook 2004" chapter on asbestos (Virta, 2005a), and trade data were taken from the United Nations Statistics Division (2005) for tables A14–A19. Headnotes indicate the data sources for each table.

Apparent consumption was estimated as production plus imports minus exports. Changes in government and industry stocks were not included in the calculation because they were not available for most countries during most of this time period.

Data in the appendix tables are presented for individual countries and regions. To form the regions, countries are grouped by continent with a few exceptions. Middle Eastern countries are grouped with Asia. Eastern countries of the former Soviet Union, despite being in Asia, are included in Europe so as to be grouped with Russia and other western countries of the former Soviet Union and to facilitate comparisons of data for the same region at different times.

Many country names changed between 1920 and 2003. With only a few exceptions, the country name corresponding to the table year was used. For clarification, name changes for countries that appear in the appendix are given in footnotes in the first table after the change took place. Country name changes noted in the appendix are also summarized below chronologically:

- Netherlands East Indies and Dutch Indies became Indonesia after 1945.
- Germany was divided into East and West Germany from 1949 to 1990.
- Belgian Congo became Zaire between 1960 and 1998 and the Democratic Republic of the Congo [or Congo (Kinshasa)] after 1998.
- Bechuanaland became Botswana after 1966.
- Dutch Guiana and Netherlands Guiana became Suriname after 1975.
- Southern Rhodesia became Zimbabwe after 1980.
- The Soviet Union was dissolved in 1991. After 1991, asbestos trade data became available for the following countries that formerly were part of the Soviet Union: Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan. Both Asian and European countries of the former Soviet Union are listed in tables A11–A19 under Europe to facilitate comparison of regional totals for different time periods. Kazakhstan and Russia accounted for all asbestos production and most of the asbestos trade for the Soviet Union before 1995 (tables A1–A10).
- Yugoslavia was divided into Bosnia, Croatia, Herzegovina, Macedonia, Serbia, and Slovenia in 1991.
- Czechoslovakia was divided into the Czech Republic and Slovakia in 1993.

Table A1. Asbestos production, trade, and consumption in 1920.

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from Great Britain Imperial Mineral Resources Bureau, 1924]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Egypt	—	297	—	297
Madagascar	1	—	—	1
South Africa	6,244	—	7,567	-1,323
Southern Rhodesia	17,075	—	13,845	3,230
Total	23,320	297	21,412	2,205
Asia and the Middle East:				
China	5	—	5	—
India	1,847	—	—	1,847
Japan	—	4,965	—	4,965
Total	1,852	4,965	5	6,812
Central and North America:				
Canada	153,712	—	173,536	-19,824
United States.	1,495	150,829	558	151,766
Total	155,206	150,829	174,094	131,942
Europe:				
Austria	—	941	—	941
Cyprus	925	—	910	15
Czechoslovakia	—	517	1	516
Denmark	—	133	—	133
Finland	—	24	—	24
France	445	—	—	445
Germany	28	6,828	209	6,647
Italy	166	3,966	294	3,838
Netherlands	—	1,270	111	1,159
Norway	—	381	—	381
Poland	—	241	—	241
Romania	—	14	—	14
Soviet Union[2]	1,629	—	—	1,629
Spain	—	1,137	—	1,137
Sweden	—	425	88	336
Switzerland	—	2,265	15	2,249
United Kingdom	—	21,291	92	21,199
Total	3,193	39,433	1,721	40,905
Oceania:				
Australia	839	—	—	839
New Zealand	2	—	—	2
Total	841	—	—	841
South America:				
Argentina	—	708	—	708
Brazil	1	205	1	205
Chile	—	252	2	250
Total	1	1,165	3	1,163
Grand total	184,413	196,689	197,235	183,868

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Combined production of Kazakhstan and Russia.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/42

Table A2. Asbestos production, trade, and consumption in 1930.

[Data in metric tons. Terms used: NA, not available; —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from Great Britain Imperial Institute, 1932]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Mozambique	16	—	—	16
South Africa	23,452	—	10,928	12,524
Southern Rhodesia	34,260	—	32,048	2,212
Total	57,728	—	42,976	14,752
Asia and the Middle East:				
China	315	—	—	315
India	34	—	—	34
Iraq	—	34	—	34
Japan	1,016	10,177	NA	11,193
Netherlands East Indies	—	6	—	6
Total	1,364	10,217	—	11,581
Central and North America:				
Canada	255,066	—	213,632	41,433
Mexico	—	390	—	390
Panama	—	25	—	25
United States.	3,849	189,304	699	192,454
Total	258,914	189,720	214,331	234,303
Europe:				
Austria	—	5,111	116	4,996
Belgium and Luxembourg	—	19,050	241	18,809
Cyprus	7,372	4,855	5,485	6,742
Czechoslovakia	—	—	268	-268
Denmark	—	1,029	—	1,029
Finland	1,078	344	—	1,422
Germany	—	14,107	398	13,709
Italy	721	6,576	355	6,942
Latvia	—	108	—	108
Lithuania	—	74	—	74
Netherlands	—	252	231	21
Norway	—	1,453	—	1,453
Poland	—	1,235	—	1,235
Portugal	—	59	—	59
Romania	—	68	—	68
Soviet Union[2]	54,080	—	15,748	38,332
Spain	—	6,652	30	6,621
Sweden	—	1,062	1	1,061
Switzerland	—	813	8	805
United Kingdom	—	23,938	721	23,217
Yugoslavia	—	1,045	—	1,045
Total	63,251	87,832	23,603	127,481
Oceania: Australia	83	NA	—	83

Table A2. Asbestos production, trade, and consumption in 1930.—Continued

[Data in metric tons. Terms used: NA, not available; —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from Great Britain Imperial Institute, 1932]

Region and country	Production	Imports	Exports	Apparent consumption[1]
South America:				
Brazil	—	136	—	136
Chile	—	127	—	127
Colombia	—	77	—	77
Total	—	340	—	340
Grand total	381,341	288,109	280,910	388,541

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Combined production and exports of Kazakhstan and Russia.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/44

Table A3. Asbestos production, trade, and consumption in 1940.

[Data in metric tons. Terms used: NA, not available; —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from Great Britain Imperial Institute, 1948]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Algeria	—	5	—	5
Egypt	—	120	—	120
Morocco	203	—	—	203
South Africa	24,851	—	39,448	-14,597
Southern Rhodesia	50,812	—	52,520	-1,708
Swaziland	18,874	—	17,782	1,092
Total	94,740	125	109,750	-14,885
Asia and the Middle East:				
China	102	39	—	140
India	297	5,257	—	5,554
Japan	1,524	25,403	254	26,673
Korea, Republic of	508	5,081	—	5,589
Netherlands East Indies	—	287	—	287
Turkey	88	—	—	88
Total	2,519	36,065	254	38,330
Central and North America:				
Canada	320,514	—	305,351	15,162
Costa Rica	—	20	—	20
Mexico	—	947	—	947
United States	17,396	223,735	4,059	237,071
Total	337,909	224,702	309,411	253,201
Europe:				
Austria	—	508	5	503
Belgium and Luxembourg	—	254	508	-254
Bulgaria	—	5	—	5
Cyprus	7,967	—	8,637	-670
Czechoslovakia	NA	5,081	508	4,572
Denmark	—	512	—	512
Estonia	—	102	—	102
Finland	5,338	51	1,563	3,826
France	5,081	14,050	—	19,130
Germany	—	11,555	374	11,181
Greece	20	71	—	91
Hungary	—	508	NA	508
Iceland	—	15	—	15
Italy	8,269	5,748	546	13,471
Latvia	—	102	—	102
Lithuania	—	51	—	51
Netherlands	—	1,040	—	1,040
Norway	—	155	—	155
Poland	—	1,016	20	996
Portugal	102	501	20	582
Romania	—	61	—	61
Soviet Union[2]	101,610	—	30,483	71,127
Spain	—	1,793	5	1,788
Sweden	—	2,880	2	2,878
Switzerland	—	2,086	9	2,077

Table A3. Asbestos production, trade, and consumption in 1940.—Continued

[Data in metric tons. Terms used: NA, not available; —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from Great Britain Imperial Institute, 1948]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Europe (continued):				
United Kingdom	—	95,392	384	95,008
Yugoslavia	—	102	20	81
Total	128,386	143,639	43,085	228,941
Oceania:				
Australia	497	14,324	NA	14,821
New Zealand	3	795	3	795
Total	500	15,119	3	15,615
South America:				
Argentina	150	—	—	150
Bolivia	70	70	70	70
Brazil	508	51	—	559
Colombia	—	79	—	79
Uruguay	—	192	—	192
Venezuela	20	28	20	28
Total	749	421	90	1,079
Grand total	564,803	420,071	462,593	522,282

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Combined production and exports of Kazakhstan and Russia.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/46

Table A4. Asbestos production, trade, and consumption in 1950.

[Data in metric tons. Terms used: NA, not available; —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from Great Britain Colonial Geological Surveys, 1956]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Algeria	—	1,552	—	1,552
Angola	—	49	—	49
Belgian Congo	—	1,344	—	1,344
Egypt	260	868	44	1,084
Kenya	229	—	NA	229
Madagascar	—	—	1	-1
Morocco	511	475	156	829
Mozambique	—	276	—	276
South Africa	79,305	—	92,155	-12,851
Southern Rhodesia	64,891	—	66,935	-2,043
Swaziland	29,637	—	25,403	4,234
Total	174,832	4,563	184,693	-5,298
Asia and the Middle East:				
China	102	—	—	102
India	211	10,957	8	11,160
Indonesia[2]	—	39	—	39
Iraq	—	23	—	23
Japan	5,665	6,690	110	12,245
Korea, Republic of	610	—	—	610
Philippines	—	657	—	657
Taiwan (Formosa)	218	102	—	320
Turkey	245	10	28	227
Total	7,051	18,478	146	25,383
Central and North America:				
Canada	794,140	—	752,983	41,157
Mexico	—	5,429	—	5,429
United States	37,522	639,755	17,148	660,129
Total	831,662	645,184	770,131	706,715
Europe:				
Austria	—	3,496	21	3,475
Belgium and Luxembourg	—	21,856	636	21,220
Cyprus	14,990	—	15,720	-731
Czechoslovakia	NA	15,242	—	15,242
Denmark	—	9,986	—	9,986
Finland	10,949	988	2,300	9,637
France	7,456	33,560	2,095	38,921
Germany, East[3]	—	13,858	15	13,842
Germany, West[3]	—	80,000	—	80,000
Greece	30	178	—	208
Hungary	—	5,081	—	5,081
Iceland	—	31	—	31
Italy	21,434	6,265	2,886	24,813
Netherlands	—	6,935	8	6,927
Norway	—	2,676	—	2,676
Poland	—	5,081	—	5,081
Portugal	257	2,323	169	2,411
Soviet Union[4]	217,746	NA	81,288	136,458

Table A4. Asbestos production, trade, and consumption in 1950.—Continued

[Data in metric tons. Terms used: NA, not available; —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from Great Britain Colonial Geological Surveys, 1956]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Europe (continued):				
Spain	42	4,384	2	4,424
Sweden	—	10,246	244	10,002
Switzerland	—	4,298	92	4,206
United Kingdom	—	111,261	3,655	107,606
Yugoslavia	958	3,956	35	4,879
Total	273,862	341,701	109,167	506,396
Oceania:				
Australia	1,643	16,824	285	18,182
New Zealand	42	3,846	—	3,888
Total	1,685	20,670	285	22,070
South America:				
Argentina	NA	—	—	NA
Bolivia	166	—	166	—
Brazil	844	8,435	—	9,279
Chile	172	234	—	405
Colombia	—	NA	—	NA
Dutch Guiana	—	NA	—	NA
Ecuador	—	NA	—	NA
Peru	—	811	—	811
Venezuela	190	999	20	1,169
Total	1,372	10,478	186	11,664
Grand total	1,290,463	1,041,073	1,064,608	1,266,929

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Netherlands East Indies and Dutch Indies became Indonesia after 1945.

[3]Germany was divided into East and West Germany from 1949 to 1990.

[4]Combined production and exports of Kazakhstan and Russia.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/48

Table A5. Asbestos production, trade, and consumption in 1960.

[Data in metric tons. Terms used: NA, not available; —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from Great Britain Institute of Geological Sciences, Overseas Division, 1967]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Algeria	—	6,189	—	6,189
Angola	—	819	—	819
Bechuanaland	1,163	—	—	1,163
Egypt	450	6,583	—	7,033
Kenya	106	—	29	76
Morocco	—	2,676	—	2,676
Mozambique	20	720	80	660
South Africa	159,551	NA	193,696	-34,145
Southern Rhodesia	121,537	—	116,060	5,477
Swaziland	29,055	—	25,403	3,653
Tunisia	—	2	—	2
Uganda	—	830	—	830
Total	311,883	17,820	335,268	-5,565
Asia and the Middle East:				
Burma	—	468	—	468
China	81,288	—	—	81,288
Hong Kong	—	22	—	22
India	1,711	21,967	26	23,652
Indonesia	—	588	—	588
Iran	—	1,246	—	1,246
Iraq	—	450	—	450
Israel	—	6,615	—	6,615
Japan	15,461	77,059	37	92,483
Korea, Republic of	631	—	—	631
Lebanon	—	2,258	—	2,258
Malaysia	—	2,868	—	2,868
Philippines	33	1,236	—	1,268
Taiwan	440	1,047	—	1,487
Thailand	—	6,433	—	6,433
Turkey	216	470	5	682
Total	99,780	122,728	68	222,440
Central and North America:				
Canada	1,014,699	NA	969,372	45,327
El Salvador	—	227	—	227
Guatemala	—	226	—	226
Jamaica	—	35	—	35
Mexico	—	13,421	—	13,421
United States	41,028	607,388	4,955	643,462
Total	1,055,727	621,295	974,326	702,696
Europe:				
Austria	60	12,767	63	12,764
Belgium and Luxembourg	—	53,990	297	53,694
Bulgaria	1,118	—	—	1,118
Cyprus	21,153	—	15,575	5,578
Czechoslovakia	—	27,422	—	27,422
Denmark	—	17,440	26	17,414

Table A5. Asbestos production, trade, and consumption in 1960.—Continued

[Data in metric tons. Terms used: NA, not available; —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from Great Britain Institute of Geological Sciences, Overseas Division, 1967]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Europe (continued):				
Finland	9,556	4,446	5,551	8,452
France	25,583	68,592	10,790	83,385
Germany, East	—	35,000	—	35,000
Germany, West	—	132,634	226	132,408
Greece	—	48	—	48
Hungary	—	9,804	—	9,804
Iceland	—	37	—	37
Italy	51,123	29,607	7,409	73,322
Netherlands	—	21,725	36	21,690
Norway	—	6,918	—	6,918
Poland	—	15,245	—	15,245
Portugal	131	2,346	35	2,443
Soviet Union[2]	599,499	—	146,115	453,384
Spain	4	14,453	—	14,457
Sweden	—	17,107	28	17,079
Switzerland	—	8,695	—	8,695
United Kingdom	—	170,893	7,874	163,019
Yugoslavia	5,416	8,727	5,217	8,926
Total	713,644	657,896	199,240	1,172,300
Oceania:				
Australia	14,164	37,198	7,529	43,834
New Zealand	289	4,585	—	4,873
Total	14,453	41,783	7,529	48,707
South America:				
Bolivia	170	—	170	—
Brazil	13,237	13,670	—	26,906
Colombia	—	6,836	—	6,836
Peru	—	1,813	—	1,813
Venezuela	3,932	2,277	3,661	2,548
Total	17,339	24,596	3,831	38,104
Grand total	2,212,825	1,486,118	1,520,263	2,178,681

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Combined production and exports of Kazakhstan and Russia.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/50

Table A6. Asbestos production, trade, and consumption in 1970.

[Data in metric tons. Terms used: NA, not available; —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from Great Britain Institute of Geological Sciences, 1973]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Algeria	—	2,285	—	2,285
Angola	—	1,076	—	1,076
Egypt	449	6,609	—	7,058
Kenya	—	206	—	206
Libya	—	540	—	540
Morocco	—	3,551	—	3,551
Mozambique	228	753	316	665
Nigeria	—	34,443	—	34,443
Senegal	—	799	—	799
South Africa	287,431	17,191	290,381	14,241
Southern Rhodesia	81,288	—	76,208	5,080
Swaziland	33,059	—	32,515	544
Tunisia	—	1,766	—	1,766
Uganda	—	2,468	—	2,468
Zambia	—	15,607	—	15,607
Total	402,455	87,294	399,420	90,329
Asia and the Middle East:				
Burma	—	1,465	—	1,465
China	172,737	—	—	172,737
Hong Kong	—	90	—	90
India	10,056	39,766	30	49,792
Iran	—	11,197	—	11,197
Iraq	—	2,000	—	2,000
Israel	—	7,589	—	7,589
Japan	21,389	298,253	169	319,473
Korea, Republic of	1,372	35,292	—	36,664
Lebanon	—	6,418	—	6,418
Malaysia	—	14,321	—	14,321
Philippines	1,213	3,303	—	4,516
Singapore	—	3,150	—	3,150
Taiwan	2,842	6,589	151	9,280
Thailand	—	21,272	—	21,272
Turkey	1,685	7,546	—	9,231
Total	211,294	458,251	350	669,195
Central and North America:				
Canada	1,507,497	5,292	1,417,415	95,374
Costa Rica	—	736	—	736
El Salvador	—	963	—	963
Guatemala	—	457	—	457
Jamaica	—	1,910	—	1,910
Mexico	—	40,460	—	40,460
Netherlands Antilles	—	335	—	335
Nicaragua	—	316	—	316
Panama	—	146	—	146
United States.	113,688	589,127	34,686	668,129
Total	1,621,186	639,742	1,452,101	808,827

Table A6. Asbestos production, trade, and consumption in 1970.—Continued

[Data in metric tons. Terms used: NA, not available; —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from Great Britain Institute of Geological Sciences, 1973]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Europe:				
Austria	—	34,155	29	34,126
Belgium and Luxembourg	—	54,839	953	53,886
Bulgaria	3,046	—	—	3,046
Cyprus	28,708	—	24,133	4,575
Czechoslovakia	NA	39,017	—	39,017
Denmark	—	28,633	6	28,627
Finland	13,626	7,744	9,335	12,035
France	710	151,848	201	152,357
Germany, East	—	52,015	—	52,015
Germany, West	—	175,612	924	174,688
Greece	—	17,811	NA	17,811
Hungary	—	15,236	—	15,236
Iceland	—	1,028	—	1,028
Italy	118,618	62,402	48,662	132,358
Netherlands	—	20,063	275	19,788
Norway	—	7,982	—	7,982
Poland	—	64,385	—	64,385
Portugal	202	6,509	180	6,531
Soviet Union[2]	1,065,889	—	385,300	680,589
Spain	—	77,677	875	76,802
Sweden	—	18,830	184	18,646
Switzerland	—	17,721	66	17,655
United Kingdom	—	154,636	4,741	149,895
Yugoslavia	12,105	28,552	4,666	35,991
Total	1,242,904	1,036,695	480,530	1,799,069
Oceania:				
Australia	740	68,605	443	68,902
New Zealand	—	8,662	—	8,662
Total	740	77,267	443	77,564
South America:				
Argentina	35	21,106	—	21,141
Bolivia	—	508	—	508
Brazil	16,329	23,413	2,032	37,710
Chile	—	8,800	—	8,800
Colombia	—	16,763	—	16,763
Peru	—	1,828	—	1,828
Uruguay	—	1,996	—	1,996
Venezuela	—	10,161	—	10,161
Total	16,363	84,575	2,032	98,906
Grand total	3,494,941	2,383,824	2,334,876	3,543,889

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks.

[2]Combined production and exports of Kazakhstan and Russia.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/52

Table A7. Asbestos production, trade, and consumption in 1975.

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from Great Britain Institute of Geological Sciences, 1981]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Algeria	—	4,582	—	4,582
Egypt	479	5,477	—	5,956
Ghana	—	13,188	—	13,188
Kenya	—	743	—	743
Libya	—	1,335	—	1,335
Morocco	—	7,160	—	7,160
Mozambique	—	740	1,148	-408
Nigeria	—	29,024	—	29,024
Senegal	—	1,132	—	1,132
South Africa	354,710	28,560	368,000	15,270
Southern Rhodesia	261,542	—	260,000	1,542
Swaziland	37,601	—	41,219	-3,618
Tunisia	—	1,619	—	1,619
Uganda	—	28	—	28
Zaire[2]	—	672	—	672
Zambia	—	2,765	—	2,765
Total	654,332	97,025	670,367	80,990
Asia and the Middle East:				
China	150,000	—	—	150,000
Hong Kong	—	907	705	202
India	20,312	41,514	—	61,826
Indonesia	—	4,845	—	4,845
Iran	—	24,814	—	24,814
Iraq	—	1,482	—	1,482
Israel	—	856	—	856
Japan	4,612	253,097	2,158	255,551
Korea, North	—	3,300	—	3,300
Korea, Republic of	4,345	56,960	—	61,305
Kuwait	—	5,666	—	5,666
Malaysia	—	19,932	—	19,932
Pakistan	—	7,000	—	7,000
Philippines	—	1,899	—	1,899
Saudi Arabia	—	10,405	—	10,405
Singapore	—	10,341	1,670	8,671
Sri Lanka	—	789	—	789
Syria	—	3,391	—	3,391
Taiwan	1,737	13,363	—	15,100
Thailand	—	42,521	—	42,521
Turkey	15,496	16,357	—	31,853
United Arab Emirates	—	2,000	—	2,000
Total	196,502	521,439	4,533	713,408
Central and North America:				
Canada	1,055,667	5,166	1,085,610	-24,777
Costa Rica	—	2,974	—	2,974
El Salvador	—	3,866	—	3,866
Guatemala	—	1,808	—	1,808
Jamaica	—	1,307	—	1,307

Table A7. Asbestos production, trade, and consumption in 1975.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from Great Britain Institute of Geological Sciences, 1981]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Central and North America (continued):				
Mexico	—	60,395	—	60,395
Nicaragua	—	1,207	—	1,207
Panama	—	83	—	83
United States	89,497	488,567	33,064	545,000
Total	1,145,164	565,373	1,118,674	591,863
Europe:				
Austria	—	34,343	183	34,160
Belgium and Luxembourg	—	60,549	1,721	58,828
Bulgaria	—	28,812	—	28,812
Canary Islands	—	288	—	288
Cyprus	31,602	—	28,378	3,224
Czechoslovakia	—	43,494	—	43,494
Denmark	—	24,388	112	24,276
Finland	2,791	10,132	3,512	9,411
France	—	138,637	2,050	136,587
Germany, East	—	65,725	—	65,725
Germany, West	—	386,188	73,770	312,418
Greece	—	13,306	—	13,306
Hungary	—	32,604	—	32,604
Iceland	—	7	—	7
Ireland	—	6,848	—	6,848
Italy	146,984	66,273	81,073	132,184
Netherlands	—	35,852	189	35,663
Norway	—	5,629	—	5,629
Poland	—	94,412	—	94,412
Portugal	—	5,778	—	5,778
Romania	—	41,299	—	41,299
Soviet Union[3]	1,900,000	—	613,303	1,286,697
Spain	—	94,114	—	94,114
Sweden	—	15,529	173	15,356
Switzerland	—	17,262	82	17,180
United Kingdom	—	139,185	1,698	137,487
Yugoslavia	12,336	52,138	3,170	61,304
Total	2,093,713	1,412,792	809,414	2,697,091
Oceania:				
Australia	47,922	49,794	24,524	73,192
New Zealand	—	12,484	—	12,484
Total	47,922	62,278	24,524	85,676
South America:				
Argentina	1,130	15,548	—	16,678
Bolivia	—	750	—	750
Brazil	73,978	29,800	—	103,778
Chile	—	2,000	—	2,000
Colombia	—	15,000	—	15,000
Ecuador	—	3,000	—	3,000
Peru	—	3,500	—	3,500

Table A7. Asbestos production, trade, and consumption in 1975.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from Great Britain Institute of Geological Sciences, 1981]

Region and country	Production	Imports	Exports	Apparent consumption[1]
South America (continued):				
Uruguay	—	1,927	—	1,927
Venezuela	—	15,548	—	15,548
Total	75,108	87,073	—	162,181
Grand total	4,212,741	2,745,980	2,627,512	4,331,209

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Belgian Congo became Zaire between 1960 and 1998 and the Democratic Republic of the Congo [or Congo (Kinshasa)] after 1998.

[3]Combined production and exports of Kazakhstan and Russia.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/55

Table A8. Asbestos production, trade, and consumption in 1980.

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from British Geological Survey, 1984]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Algeria	—	21,305	—	21,305
Burundi	—	125	—	125
Egypt	316	4,387	—	4,703
Kenya	—	1,403	—	1,403
Libya	—	307	—	307
Morocco	—	6,770	—	6,770
Mozambique	800	1,082	—	1,882
Nigeria	—	22,000	—	22,000
Senegal	—	1,177	—	1,177
South Africa	277,734	19,518	381,000	-83,748
Southern Rhodesia	250,949	—	274,258	-23,309
Swaziland	32,833	—	31,435	1,398
Tunisia	—	5,838	—	5,838
Uganda	—	132	—	132
Zaire	—	118	—	118
Total	562,632	84,162	686,693	-39,899
Asia and the Middle East:				
Burma	—	1,825	—	1,825
China	250,000	—	9,000	241,000
Hong Kong	—	8,776	8,492	284
India	33,716	63,176	—	96,892
Indonesia	—	23,047	—	23,047
Iran	—	23,392	—	23,392
Israel	—	3,050	—	3,050
Japan	3,897	395,408	428	398,877
Korea, Republic of	9,854	36,787	—	46,641
Kuwait	—	2,084	—	2,084
Malaysia	—	32,242	—	32,242
Pakistan	—	10,679	—	10,679
Philippines	—	4,467	—	4,467
Saudi Arabia	—	52,225	—	52,225
Singapore	—	16,661	10,461	6,200
Sri Lanka	—	6,188	—	6,188
Syria	—	4,076	—	4,076
Taiwan	683	31,247	—	31,930
Thailand	—	58,756	—	58,756
Turkey	8,882	16,671	—	25,553
United Arab Emirates	—	4,631	—	4,631
Total	307,032	795,388	28,381	1,074,039
Central and North America:				
Canada	1,323,053	1,156	1,217,840	106,369
Costa Rica	—	1,318	—	1,318
El Salvador	—	3,324	—	3,324
Guatemala	—	1,825	—	1,825
Honduras	—	2,102	—	2,102

Table A8. Asbestos production, trade, and consumption in 1980.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from British Geological Survey, 1984]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Central and North America (continued):				
Jamaica	—	4	—	4
Mexico	—	79,014	—	79,014
Nicaragua	—	848	—	848
Panama	—	283	—	283
United States	80,079	327,295	48,666	358,708
Total	1,403,132	417,169	1,266,506	553,795
Europe:				
Albania	—	2,400	—	2,400
Austria	—	20,241	—	20,241
Belgium and Luxembourg	—	47,880	57	47,823
Bulgaria	650	500	—	1,150
Canary Islands	—	131	—	131
Cyprus	35,535	—	30,446	5,089
Czechoslovakia	617	46,197	—	46,814
Denmark	—	13,713	48	13,665
Finland	—	5,040	—	5,040
France	—	127,123	1,574	125,549
Germany, East	—	74,400	—	74,400
Germany, West	—	392,978	27,333	365,645
Greece	—	14,180	—	14,180
Hungary	—	48,402	5,300	43,102
Iceland	—	5	—	5
Ireland	—	8,413	—	8,413
Italy	157,794	86,550	63,815	180,529
Netherlands	—	19,042	36	19,006
Norway	—	103	—	103
Poland	—	83,272	—	83,272
Portugal	—	19,953	—	19,953
Romania	—	4,900	—	4,900
Soviet Union[2]	2,070,000	—	600,000	1,470,000
Spain	—	66,944	—	66,944
Sweden	—	1,195	14	1,181
Switzerland	—	21,029	43	20,986
United Kingdom	—	94,640	1,114	93,526
Yugoslavia	10,468	60,023	2,506	67,985
Total	2,275,064	1,259,254	732,286	2,802,032
Oceania:				
Australia	92,418	25,239	51,172	66,485
New Zealand	—	4,952	—	4,952
Total	92,418	30,191	51,172	71,437
South America:				
Argentina	1,261	20,149	—	21,410
Brazil	170,403	24,799	—	195,202
Colombia	—	27,057	—	27,057
Ecuador	—	7,138	—	7,138

Table A8. Asbestos production, trade, and consumption in 1980.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from British Geological Survey, 1984]

Region and country	Production	Imports	Exports	Apparent consumption[1]
South America (continued):				
Peru	—	4,870	—	4,870
Uruguay	—	2,427	—	2,427
Venezuela	—	9,111	—	9,111
Total	171,664	95,551	—	267,215
Grand total	4,811,942	2,681,715	2,765,038	4,728,619

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Combined production and exports of Kazakhstan and Russia.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/58

Table A9. Asbestos production, trade, and consumption in 1985.

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from British Geological Survey, 1991]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Algeria	—	31,752	—	31,752
Burundi	—	422	—	422
Egypt	229	13,090	—	13,319
Ghana	—	1,760	—	1,760
Kenya	—	766	—	766
Morocco	—	1,110	—	1,110
Mozambique	55	3	—	58
Nigeria	—	10,778	—	10,778
Senegal	—	708	—	708
South Africa	194,905	11,528	175,929	30,504
Swaziland	25,130	—	24,791	339
Tunisia	—	5,852	—	5,852
Zaire	—	200	—	200
Zimbabwe[2]	173,500	—	158,633	14,867
Total	393,819	77,969	359,353	112,435
Asia and the Middle East:				
Burma	—	1,348	—	1,348
China	150,000	1,700	1,700	150,000
India	29,450	78,075	—	107,525
Indonesia	25,000	8,149	—	33,149
Iran	—	20,451	—	20,451
Israel	—	3,621	—	3,621
Japan	2,971	261,648	292	264,327
Korea, Republic of	4,703	57,143	—	61,846
Malaysia	—	19,064	—	19,064
Pakistan	—	2,028	—	2,028
Philippines	—	1,190	—	1,190
Saudi Arabia	—	4,547	985	3,562
Singapore	—	6,078	7,117	-1,039
Sri Lanka	—	8,590	—	8,590
Syria	—	5,928	—	5,928
Taiwan	625	24,519	—	25,144
Thailand	—	71,516	—	71,516
Turkey	29,039	25,544	—	54,583
United Arab Emirates	—	6,624	—	6,624
Total	241,788	607,763	10,094	839,457
Central and North America:				
Canada	750,190	374	721,560	29,004
Cuba	—	1,658	—	1,658
Dominican Republic	—	641	—	641
El Salvador	—	1,769	—	1,769
Guatemala	—	1,101	—	1,101
Honduras	—	1,902	—	1,902
Mexico	—	54,868	—	54,868
Nicaragua	—	3,676	—	3,676
Panama	—	225	—	225
United States	57,457	142,429	45,656	154,230
Total	807,647	208,643	767,216	249,074

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/59

Table A9. Asbestos production, trade, and consumption in 1985.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from British Geological Survey, 1991]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Europe:				
Albania	—	1,500	—	1,500
Austria	—	21,595	—	21,595
Belgium and Luxembourg	—	25,138	254	24,884
Bulgaria	400	35,472	—	35,872
Cyprus	16,360	462	16,948	-126
Czechoslovakia	—	46,783	—	46,783
Denmark	—	10,362	—	10,362
Finland	—	2,479	—	2,479
France	—	63,873	979	62,894
Germany, East	—	54,600	—	54,600
Germany, West	—	63,172	3,064	60,108
Greece	46,811	4,653	29,387	22,077
Hungary	—	33,596	—	33,596
Ireland	—	5,243	—	5,243
Italy	136,006	47,952	66,244	117,714
Netherlands	—	5,625	50	5,575
Poland	—	81,690	—	81,690
Portugal	—	9,932	—	9,932
Romania	—	4,700	—	4,700
Soviet Union[3]	2,500,000	—	309,800	2,190,200
Spain	—	38,022	189	37,833
Sweden	—	1,042	—	1,042
Switzerland	—	5,058	—	5,058
United Kingdom	—	37,639	308	37,331
Yugoslavia	6,918	54,373	2,018	59,273
Total	2,706,495	654,961	429,241	2,932,215
Oceania:				
Australia	—	12,194	—	12,194
New Zealand	—	1,304	—	1,304
Total	—	13,498	—	13,498
South America:				
Argentina	1,244	5,864	—	7,108
Brazil	165,446	2,591	23,248	144,789
Chile	—	8,387	—	8,387
Colombia	12,435	14,185	—	26,620
Ecuador	—	5,031	—	5,031
Peru	—	3,242	—	3,242
Uruguay	—	596	—	596
Venezuela	—	4,669	—	4,669
Total	179,125	44,565	23,248	200,442
Grand total	4,328,874	1,607,399	1,589,152	4,347,121

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Southern Rhodesia became Zimbabwe after 1980.

[3]Combined production and exports of Kazakhstan and Russia.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/60

Table A10. Asbestos production, trade, and consumption in 1990.

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from British Geological Survey, 1995]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Algeria	—	17,382	—	17,382
Burundi	—	68	—	68
Egypt	367	—	—	367
Morocco	—	7,157	—	7,157
Nigeria	—	10,000	—	10,000
Senegal	—	646	—	646
South Africa	161,494	12,354	178,750	-4,902
Swaziland	35,938	—	19,292	16,646
Tunisia	—	7,179	—	7,179
Zambia	—	2,472	—	2,472
Zimbabwe	160,500	—	172,206	-11,706
Total	358,299	57,258	370,248	45,309
Asia and the Middle East:				
China	191,800	1,083	7,135	185,748
India	26,053	93,165	254	118,964
Indonesia	—	28,599	—	28,599
Iran	2,800	69,446	—	72,246
Israel	—	2,955	—	2,955
Japan	5,184	287,659	142	292,701
Korea, Republic of	1,534	74,549	—	76,083
Kuwait	—	1,140	—	1,140
Malaysia	—	22,000	—	22,000
Pakistan	—	4,525	—	4,525
Philippines	—	1,869	—	1,869
Saudi Arabia	—	2,005	422	1,583
Singapore	—	4,741	2,181	2,560
Sri Lanka	—	7,002	—	7,002
Syria	—	1,548	—	1,548
Taiwan	—	15,165	—	15,165
Thailand	—	116,652	—	116,652
Turkey	—	26,259	—	26,259
Total	227,371	760,362	10,134	977,599
Central and North America:				
Canada	724,620	879	649,485	76,014
Cuba	—	1,500	—	1,500
El Salvador	—	904	—	904
Honduras	—	416	—	416
Mexico	—	39,316	—	39,316
Panama	—	352	—	352
United States	20,000	41,331	28,875	32,456
Total	744,620	84,698	678,360	150,958
Europe:				
Austria	—	6,167	675	5,492
Belgium and Luxembourg	—	26,514	310	26,204
Bulgaria	500	—	—	500
Czechoslovakia	—	32,776	—	32,776
Denmark	—	800	—	800

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/61

Table A10. Asbestos production, trade, and consumption in 1990.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from British Geological Survey, 1995]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Europe (continued):				
France	—	63,672	101	63,571
Germany[2]	—	15,692	608	15,084
Greece	65,993	2,299	56,963	11,329
Hungary	—	33,375	5,784	27,591
Ireland	—	5,533	—	5,533
Italy	3,862	63,438	4,893	62,407
Netherlands	—	6,252	—	6,252
Poland	—	65,621	—	65,621
Portugal	—	12,284	—	12,284
Romania	—	3,000	—	3,000
Soviet Union[3]	2,400,000	—	248,200	2,151,800
Spain	—	39,609	127	39,482
Sweden	—	595	—	595
Switzerland	—	1,341	—	1,341
United Kingdom	—	16,022	291	15,731
Yugoslavia	6,578	28,323	—	34,901
Total	2,476,933	423,313	317,952	2,582,294
Oceania: Australia	—	1,706	—	1,706
South America:				
Argentina	275	6,588	—	6,863
Bolivia	—	1,297	—	1,297
Brazil	205,220	11,160	53,142	163,238
Chile	—	7,749	—	7,749
Colombia	8,000	13,437	—	21,437
Ecuador	—	1,151	—	1,151
Peru	—	1,060	—	1,060
Uruguay	—	1,794	—	1,794
Venezuela	—	1,418	—	1,418
Total	213,495	45,654	53,142	206,007
Grand total	4,020,718	1,372,991	1,429,836	3,963,873

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Germany was divided into East and West Germany from 1949 to 1990.

[3]Combined production and exports of Kazakhstan and Russia.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/62

Table A11. Asbestos production, trade, and consumption in 1995.

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from British Geological Survey, 2001]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Algeria	—	10,000	—	10,000
Egypt	392	7,600	—	7,992
Morocco	—	5,023	—	5,023
Nigeria	—	15,000	—	15,000
Senegal	—	300	—	300
South Africa	88,642	7,891	92,100	4,433
Swaziland	28,574	—	19,000	9,574
Tunisia	—	7,297	—	7,297
Zambia	—	3,000	—	3,000
Zimbabwe	169,487	1,500	174,558	-3,571
Total	287,095	57,611	285,658	59,048
Asia and the Middle East:				
China	447,000	68,300	3,465	511,835
India	23,844	91,909	14	115,739
Indonesia	—	50,231	—	50,231
Iran	—	54,933	—	54,933
Israel	—	2,200	—	2,200
Japan	2,399	191,475	74	193,800
Korea, Republic of	—	88,722	—	88,722
Malaysia	—	28,200	—	28,200
Oman	—	181	—	181
Philippines	—	2,904	—	2,904
Saudi Arabia	—	306	8,400	-8,094
Singapore	—	475	—	475
Sri Lanka	—	35	—	35
Syria	—	1,222	—	1,222
Taiwan	—	5,582	—	5,582
Thailand	—	181,692	—	181,692
Turkey	—	25,471	—	25,471
United Arab Emirates	—	6,000	—	6,000
Total	473,243	799,838	11,953	1,261,128
Central and North America:				
Canada	524,392	297	509,575	15,114
Cuba	—	3,000	—	3,000
El Salvador	—	398	—	398
Mexico	—	19,154	—	19,154
Panama	—	844	—	844
United States	9,290	21,941	16,556	14,675
Total	533,682	45,634	526,131	53,185
Europe:				
Albania	—	1,000	—	1,000
Belarus[2]	—	20,000	2,000	18,000
Belgium and Luxembourg	—	10,462	94	10,368
Bulgaria	100	—	—	100
Croatia[3]	—	3,045	—	3,045
Czech Republic[4]	—	4,500	100	4,400
Denmark	—	345	—	345

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/63

Table A11. Asbestos production, trade, and consumption in 1995.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from British Geological Survey, 2001]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Europe (continued):				
Estonia[2]	—	7,976	9,037	-1,061
France	—	48,205	224	47,981
Germany	—	98	—	98
Greece	75,003	272	67,991	7,284
Hungary	—	3,356	—	3,356
Ireland	—	6,355	—	6,355
Italy	—	126	22	104
Kazakhstan[2]	160,829	—	115,400	45,429
Kyrgyzstan[2]	—	11,445	793	10,652
Latvia[2]	—	2,228	—	2,228
Lithuania[2]	—	5,600	5,173	427
Macedonia[3]	—	2,800	—	2,800
Moldova[2]	—	2,800	—	2,800
Poland	—	31,315	948	30,367
Portugal	—	9,163	—	9,163
Romania	—	27,425	—	27,425
Russia[2]	685,000	41,400	76,820	649,580
Serbia[3]	497	—	—	497
Slovakia[4]	—	2,300	100	2,200
Slovenia[3]	—	4,900	—	4,900
Spain	—	26,852	142	26,710
Sweden	—	298	—	298
United Kingdom	—	10,157	14	10,143
Total	921,429	284,423	278,858	926,994
Oceania: Australia	—	1,488	—	1,488
South America:				
Argentina	300	5,788	—	6,088
Bolivia	—	1,575	—	1,575
Brazil	210,352	43,524	71,747	182,129
Chile	—	11,666	—	11,666
Colombia	3,000	19,925	—	22,925
Ecuador	—	805	—	805
Peru	—	4,947	—	4,947
Uruguay	—	903	—	903
Venezuela	—	5,012	—	5,012
Total	213,652	94,145	71,747	236,050
Grand total	2,429,101	1,283,139	1,174,347	2,537,893

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Data for Belarus, Estonia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, and Russia became available after the dissolution of the Soviet Union in 1991. Both Asian and European countries of the former Soviet Union are listed under Europe to facilitate comparison of regional totals for different time periods.

[3]Data for Croatia, Macedonia, Serbia, and Slovenia were combined under Yugoslavia before 1991.

[4]Data for the Czech Republic and Slovakia were combined under Czechoslovakia before 1993.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/64

Table A12. Asbestos production, trade, and consumption in 1996.

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from British Geological Survey, 2001]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Algeria	—	7,102	—	7,102
Egypt	552	29,849	—	30,401
Morocco	—	5,643	—	5,643
Nigeria	—	15,841	—	15,841
Senegal	—	300	—	300
South Africa	61,800	9,133	60,829	10,104
Swaziland	26,014	—	20,000	6,014
Tunisia	—	6,081	—	6,081
Zambia	—	3,000	—	3,000
Zimbabwe	165,494	1,500	152,091	14,903
Total	253,860	78,449	232,920	99,389
Asia and the Middle East:				
China	440,500	77,959	9,392	509,067
Dubai[2]	—	6,100	—	6,100
India	27,180	84,378	275	111,283
Indonesia	—	48,331	—	48,331
Iran	2,127	—	—	2,127
Israel	—	1,500	—	1,500
Japan	2,269	177,869	133	180,005
Korea, Republic of	—	77,145	—	77,145
Malaysia	—	19,600	—	19,600
Oman	—	2,061	—	2,061
Pakistan	—	5,500	—	5,500
Philippines	—	1,770	—	1,770
Saudi Arabia	—	500	11,530	-11,030
Singapore	—	429	—	429
Sri Lanka	—	4,818	—	4,818
Syria	—	2,672	—	2,672
Taiwan	—	6,164	—	6,164
Thailand	—	190,205	—	190,205
Turkey	—	26,863	—	26,863
United Arab Emirates	—	6,000	—	6,000
Total	472,076	739,864	21,330	1,190,610
Central and North America:				
Canada	475,130	353	504,069	-28,586
Cuba	—	7,100	—	7,100
El Salvador	—	398	—	398
Mexico	—	29,097	—	29,097
Panama	—	650	—	650
United States	9,550	30,449	24,231	15,768
Total	484,680	68,047	528,300	24,427
Europe:				
Albania	—	9	—	9
Belarus	—	20,000	3,000	17,000
Belgium and Luxembourg	—	5,681	11	5,670
Bulgaria	400	—	—	400
Croatia	—	2,363	—	2,363

Table A12. Asbestos production, trade, and consumption in 1996.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from British Geological Survey, 2001]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Europe (continued):				
Czech Republic	—	1,400	27,100	-25,700
Denmark	—	225	—	225
Estonia	—	800	300	500
France	—	20,576	14,053	6,523
Germany	—	119	—	119
Greece	80,213	252	74,043	6,422
Hungary	—	5,249	—	5,249
Ireland	—	4,638	—	4,638
Italy	—	127	51	76
Kazakhstan	134,484	—	139,100	-4,616
Kyrgyzstan	—	12,542	—	12,542
Latvia	—	1,212	—	1,212
Lithuania	—	6,343	4,656	1,687
Macedonia	—	2,999	—	2,999
Moldova	—	1,537	—	1,537
Poland	—	15,700	200	15,500
Portugal	—	6,442	—	6,442
Romania	—	39,130	—	39,130
Russia	629,863	31,366	33,411	627,818
Serbia	509	—	—	509
Slovakia	36,000	3,322	201	39,121
Slovenia	—	5,000	—	5,000
Spain	—	27,030	625	26,405
Sweden	—	158	—	158
United Kingdom	—	7,099	967	6,132
Total	881,469	221,319	297,718	805,070
Oceania: Australia	—	1,366	—	1,366
South America:				
Argentina	446	5,791	—	6,237
Bolivia	—	1,567	—	1,567
Brazil	213,213	31,765	78,294	166,684
Chile	—	9,349	—	9,349
Colombia	2,000	20,548	—	22,548
Ecuador	—	1,278	—	1,278
Peru	—	4,098	—	4,098
Uruguay	—	895	—	895
Venezuela	—	1,561	—	1,561
Total	215,659	76,852	78,294	214,217
Grand total	2,307,744	1,185,897	1,158,562	2,335,079

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Although Dubai is one of the seven United Arab Emirates, separate statistical data are available for that state.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/66

Table A13. Asbestos production, trade, and consumption in 1997.

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from British Geological Survey, 2001]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Algeria	—	9,997	—	9,997
Egypt	776	10,100	—	10,876
Morocco	—	4,376	—	4,376
Nigeria	—	7,799	—	7,799
Senegal	—	300	—	300
South Africa	49,986	9,571	38,209	21,348
Swaziland	25,888	—	20,000	5,888
Tunisia	—	3,573	—	3,573
Zambia	—	3,000	—	3,000
Zimbabwe	144,959	1,000	143,169	2,790
Total	221,609	49,716	201,378	69,947
Asia and the Middle East:				
China	437,000	103,265	13,553	526,712
Dubai[2]	—	7,660	—	7,660
India	25,537	83,356	282	108,611
Indonesia	—	41,845	—	41,845
Iran	10,373	75,587	—	85,960
Japan	2,254	176,021	160	178,115
Korea, Republic of	—	44,985	—	44,985
Malaysia	—	21,700	—	21,700
Oman	—	1,331	—	1,331
Pakistan	—	3,789	—	3,789
Philippines	—	2,206	—	2,206
Saudi Arabia	—	—	6,440	-6,440
Singapore	—	243	—	243
Sri Lanka	—	18	—	18
Syria	—	3,068	—	3,068
Taiwan	—	5,773	—	5,773
Thailand	—	177,124	—	177,124
Turkey	—	33,725	—	33,725
United Arab Emirates	—	6,000	—	6,000
Total	475,164	787,696	20,435	1,242,425
Central and North America:				
Canada	454,991	128	430,288	24,831
Cuba	—	6,600	—	6,600
El Salvador	—	999	—	999
Mexico	—	28,886	—	28,886
Panama	—	1,171	—	1,171
United States	6,890	20,922	23,061	4,751
Total	461,881	58,706	453,349	67,238
Europe:				
Belarus	—	20,000	3,000	17,000
Belgium and Luxembourg	—	2,366	263	2,103
Bulgaria	300	—	—	300
Croatia	—	3,033	—	3,033
Czech Republic	—	1,315	—	1,315
Denmark	—	125	—	125
Estonia	—	800	4	796

Table A13. Asbestos production, trade, and consumption in 1997.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from British Geological Survey, 2001]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Europe (continued):				
France	—	55	164	-109
Germany	—	143	—	143
Greece	63,294	239	51,720	11,813
Hungary	—	5,759	—	5,759
Ireland	—	2,468	—	2,468
Italy	—	—	42	-42
Kazakhstan	181,818	—	60,429	121,389
Kyrgyzstan	—	22,200	—	22,200
Latvia	—	1,828	—	1,828
Lithuania	—	10,819	7,113	3,706
Macedonia	—	1,998	—	1,998
Moldova	—	3,189	—	3,189
Poland	—	23,000	300	22,700
Portugal	—	7,324	—	7,324
Romania	—	6,807	—	6,807
Russia	723,973	17,128	98,832	642,269
Serbia	765	1,365	—	2,130
Slovakia	30,000	1,215	328	30,887
Slovenia	—	1,800	—	1,800
Spain	—	21,192	19	21,173
United Kingdom	—	4,320	16	4,304
Total	1,000,150	160,488	222,230	938,408
Oceania: Australia	—	1,556	—	1,556
South America:				
Argentina	301	6,549	—	6,850
Bolivia	—	1,818	—	1,818
Brazil	208,447	38,941	63,165	184,223
Chile	—	9,198	—	9,198
Colombia	3,000	16,650	—	19,650
Ecuador	—	1,348	—	1,348
Peru	—	4,078	—	4,078
Uruguay	—	1,511	—	1,511
Venezuela	—	2,214	—	2,214
Total	211,748	82,307	63,165	230,890
Grand total	2,370,552	1,140,469	960,557	2,550,464

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Although Dubai is one of the seven United Arab Emirates, separate statistical data are available for that state.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/68

Table A14. Asbestos production, trade, and consumption in 1998.

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Algeria	—	3,993	—	3,993
Angola	—	751	—	751
Benin	—	119	—	119
Congo (Kinshasa)[2]	—	9	—	9
Egypt	147	4,700	—	4,847
Gabon	—	1	—	1
Ghana	—	1,030	—	1,030
Kenya	—	174	([3])	174
Morocco	—	1,372	—	1,372
Nigeria	—	3,610	—	3,610
Senegal	—	736	419	317
South Africa	18,836	15,059	52,481	-18,586
Swaziland	22,912	—	8,000	14,912
Togo	—	251	—	251
Tunisia	—	2,301	—	2,301
Zambia	—	48,204	—	48,204
Zimbabwe	115,000	—	108,716	6,284
Total	156,895	82,309	169,617	69,588
Asia and the Middle East:				
Bangladesh	—	1,010	—	1,010
Burma	—	1,175	—	1,175
China	329,000	71,437	18,591	381,846
Hong Kong	—	45	—	45
India	20,000	109,036	348	128,688
Indonesia	—	18,615	38	18,577
Iran	2,258	36,693	—	38,951
Israel	—	68	—	68
Japan	1,389	123,225	38	124,576
Korea, North	—	1,737	—	1,737
Korea, Republic of	—	20,465	1	20,464
Lebanon	—	1,118	60	1,058
Malaysia	—	14,154	39	14,116
Maldives	—	1	—	1
Mongolia	—	424	—	424
Oman	—	290	—	290
Pakistan	—	1,772	—	1,772
Philippines	—	2,236	—	2,236
Saudi Arabia	—	144	—	144
Singapore	—	18	3	15
Sri Lanka	—	11,467	—	11,467
Syria	—	1,580	—	1,580
Thailand	—	50,272	—	50,272
Turkey	—	9,757	—	9,757
United Arab Emirates	—	6,860	—	6,860
Vietnam	—	36,507	—	36,507
Total	352,647	520,106	19,116	853,636

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/69

Table A14. Asbestos production, trade, and consumption in 1998.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Central and North America:				
Bahamas	—	([3])	1	-1
Canada	337,000	186	319,430	17,756
Cuba	—	6,908	—	6,908
Dominican Republic	—	976	—	976
El Salvador	—	1,680	([3])	1,680
Guatemala	—	—	4	-4
Honduras	—	6	—	6
Mexico	—	35,068	—	35,068
Nicaragua	—	26	—	26
Panama	—	990	—	990
United States	7,190	15,824	18,896	4,118
Total	344,190	61,664	338,331	67,523
Europe:				
Armenia[4]	—	435	—	435
Austria	—	7	3	4
Azerbaijan[4]	—	1,364	—	1,364
Belarus[4]	—	—	3,604	-3,604
Belgium and Luxembourg	—	—	685	-685
Bosnia and Herzegovina[5]	—	12	—	12
Bulgaria	350	1,673	([3])	2,023
Croatia[5]	—	948	12	936
Czech Republic	—	5,522	51	5,471
Estonia[4]	—	301	—	301
France	—	74	—	74
Germany	—	256	—	256
Greece	35,068	715	35,361	422
Hungary	—	2,750	—	2,750
Ireland	—	630	([3])	630
Italy	—	1	7	-6
Kazakhstan[4]	139,300	394	123,906	15,788
Kyrgyzstan[4]	—	16,421	—	16,421
Latvia[4]	—	1,123	40	1,083
Lithuania[4]	—	2,439	2,982	-543
Moldova[4]	—	6,229	—	6,229
Netherlands	—	7	—	7
Poland	—	5,174	323	4,850
Portugal	—	6,666	([3])	6,666
Romania	—	15,494	—	15,494
Russia[4]	675,000	36,583	238,131	473,452
Serbia[5]	361	—	—	361
Slovakia	—	1,764	1	1,763
Slovenia[5]	—	1,685	—	1,685
Spain	—	21,819	15	21,804
Switzerland	—	—	([3])	([3])
Tajikistan[4]	—	656	—	656
Turkmenistan[4]	—	5,752	—	5,752

Table A14. Asbestos production, trade, and consumption in 1998.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Europe (continued):				
Ukraine[4]	—	71,516	—	71,516
United Kingdom	—	1,861	45	1,815
Uzbekistan[4]	—	26,480	—	26,480
Total	850,079	236,752	405,166	681,665
Oceania: Australia	—	1,550	—	1,550
South America:				
Argentina	259	5,028	1,052	4,235
Bolivia	—	2,520	—	2,520
Brazil	188,386	37,715	51,243	174,859
Chile	—	4,937	—	4,937
Colombia	5,000	18,095	—	23,095
Ecuador	—	2,499	—	2,499
Paraguay	—	1	—	1
Peru	—	2,875	—	2,875
Uruguay	—	1,309	—	1,309
Venezuela	—	1,664	13	1,651
Total	193,645	76,644	52,308	217,981
Unknown trade destinations	—	4,393	—	4,393
Grand total	1,897,456	983,417	984,537	1,896,336

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Belgian Congo became Zaire between 1960 and 1998 and the Democratic Republic of the Congo [or Congo (Kinshasa)] after 1998.

[3]Less than 0.5 t.

[4]Data from Armenia, Azerbaijan, Belarus, Estonia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan became available after the dissolution of the Soviet Union in 1991. Both Asian and European countries of the former Soviet Union are listed under Europe to facilitate comparison of regional totals for different time periods.

[5]Data for Bosnia and Herzegovina, Croatia, Serbia, and Slovenia were combined under Yugoslavia before 1991.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/71

Table A15. Asbestos production, trade, and consumption in 1999.

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Algeria	—	11,875	—	11,875
Angola	—	920	—	920
Benin	—	154	—	154
Congo (Kinshasa)	—	10	—	10
Egypt	—	2,838	—	2,838
Ghana	—	66	—	66
Guinea	—	20	—	20
Kenya	—	57	32	25
Malawi	—	1	—	1
Mali	—	240	—	240
Morocco	—	922	—	922
Nigeria	—	79,370	—	79,370
Senegal	—	1,261	581	680
Seychelles	—	2	—	2
South Africa	18,782	17,268	44,794	-8,743
Sudan	—	88	([2])	88
Swaziland	12,690	—	7,000	5,690
Tanzania	—	18	—	18
Togo	—	341	—	341
Tunisia	—	3,190	—	3,190
Uganda	—	30	—	30
Zambia	—	1,736	—	1,736
Zimbabwe	152,000	37	152,658	-620
Total	183,472	120,444	205,064	98,852
Asia and the Middle East:				
Bangladesh	—	1,425	—	1,425
China	315,000	66,082	10,720	370,363
Hong Kong	—	425	—	425
India	21,000	115,220	172	136,048
Indonesia	—	29,263	198	29,065
Iran	2,000	44,587	1	46,586
Iraq	—	146	—	146
Israel	—	17	—	17
Japan	—	114,951	20	114,931
Korea North	—	357	—	357
Korea, Republic of	—	33,101	3	33,097
Kuwait	—	18	—	18
Lebanon	—	1,310	—	1,310
Malaysia	—	16,361	1	16,360
Maldives	—	1	—	1
Mongolia	—	5	—	5
Nepal	—	100	—	100
Oman	—	18	—	18
Pakistan	—	2,509	—	2,509
Philippines	—	2,755	—	2,755

Table A15. Asbestos production, trade, and consumption in 1999.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Asia and the Middle East (continued):				
Saudi Arabia	—	288	17,970	-17,682
Singapore	—	4,733	22	4,711
Sri Lanka	—	15,716	(2)	15,716
Syria	—	2,050	—	2,050
Thailand	—	71,488	—	71,488
Turkey	—	17,108	60	17,048
United Arab Emirates	—	10,441	—	10,441
Vietnam	—	2,569	—	2,569
Total	338,000	553,042	29,166	861,876
Central and North America:				
Bahamas	—	14	—	14
Canada	309,719	150	332,406	-22,537
Cuba	—	8,687	—	8,687
Dominican Republic	—	600	—	600
El Salvador	—	1,042	—	1,042
Guatemala	—	18	1	17
Honduras	—	1	—	1
Mexico	—	37,791	3	37,788
Panama	—	962	—	962
United States	5,260	14,508	[3]5,260	14,508
Total	314,979	63,773	337,670	41,082
Europe:				
Albania	—	4	—	4
Armenia[4]	—	592	—	592
Austria	—	(2)	—	(2)
Azerbaijan[4]	—	824	—	824
Belarus[4]	—	—	4,334	-4,334
Belgium and Luxembourg	—	509	1	508
Bosnia and Herzegovina	—	8	—	8
Bulgaria	350	781	—	1,131
Croatia	—	701	8	693
Cyprus	—	60	41	19
Czech Republic	—	712	1	711
Estonia[4]	—	728	578	150
France	—	6	—	6
Georgia[4]	—	591	592	-1
Germany	—	998	—	998
Greece	—	79	28,408	-28,328
Hungary	—	809	—	809
Ireland	—	6	—	6
Italy	—	—	(2)	(2)
Kazakhstan[4]	233,200	421	109,739	123,882
Kyrgyzstan[4]	—	9,176	—	9,176
Latvia[4]	—	399	—	399
Lithuania[4]	—	858	3,967	-3,109
Moldova[4]	—	4,129	—	4,129

Table A15. Asbestos production, trade, and consumption in 1999.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Europe (continued):				
Netherlands	—	1	—	1
Poland	—	537	—	537
Portugal	—	7,749	4	7,745
Romania	—	12,628	4	12,624
Russia[4]	750,000	24,556	262,557	511,999
Serbia and Montenegro	563	127	—	690
Slovakia	—	1,290	—	1,290
Slovenia	—	1,492	—	1,492
Spain	—	18,452	5	18,447
Switzerland	—	10	(2)	10
Turkmenistan[4]	—	1,683	—	1,683
Ukraine[4]	—	77,269	—	77,269
United Kingdom	—	578	49	529
Uzbekistan[4]	—	35,609	—	35,609
Total	984,113	204,372	410,288	778,197
Oceania: Australia	—	1,429	12	1,417
South America:				
Argentina	254	2,603	12	2,845
Bolivia	—	802	—	802
Brazil	209,332	12,686	49,419	172,598
Chile	—	2,296	—	2,296
Colombia	5,000	12,497	(2)	17,497
Ecuador	—	4,299	—	4,299
Peru	—	1,386	—	1,386
Suriname[5]	—	234	—	234
Uruguay	—	1,239	—	1,239
Venezuela	—	2,441	—	2,441
Total	214,586	40,482	49,431	205,637
Unknown trade destinations	—	22,195	—	22,195
Grand total	2,035,150	1,005,738	1,031,633	2,009,255

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Less than 0.5 t.

[3]Includes exports and reexports of asbestos fiber.

[4]Data for Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Turkmenistan, Ukraine, and Uzbekistan became available after the dissolution of the Soviet Union in 1991. Both Asian and European countries of the former Soviet Union are listed under Europe to facilitate comparison of regional totals for different time periods.

[5]Dutch Guiana and Netherlands Guiana became Suriname after 1975.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/74

Table A16. Asbestos production, trade, and consumption in 2000.

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Algeria	—	7,611	—	7,611
Angola	—	1,520	—	1,520
Benin	—	52	—	52
Burundi	—	200	—	200
Congo (Kinshasa)	—	122	—	122
Egypt	—	1,912	—	1,912
Ghana	—	1,071	—	1,071
Kenya	—	27	1	27
Malawi	—	15	—	15
Mauritius	—	42	—	42
Morocco	—	2,232	—	2,232
Mozambique	—	128	—	128
Namibia	—	—	(2)	(2)
Niger	—	40	—	40
Nigeria	—	7,222	—	7,222
Senegal	—	1,277	147	1,130
Sierra Leone	—	1	—	1
South Africa	18,782	10,842	34,695	-5,071
Swaziland	12,690	—	6,933	5,757
Tanzania	—	18	—	18
Togo	—	32	—	32
Tunisia	—	2,200	144	2,056
Zambia	—	871	—	871
Zimbabwe	152,000	—	64,583	87,417
Total	183,472	37,436	106,502	114,406
Asia and the Middle East:				
Bangladesh	—	1,445	—	1,445
Burma	—	100	—	100
China	315,000	79,129	11,814	382,315
Hong Kong	—	1,135	—	1,135
India	21,000	124,433	403	145,030
Indonesia	—	42,877	—	42,877
Iran	2,000	38,707	—	40,707
Israel	—	20	—	20
Japan	—	85,440	—	85,440
Korea, North	—	848	—	848
Korea, Republic of	—	30,135	12	30,124
Lebanon	—	975	—	975
Malaysia	—	17,711	—	17,711
Maldives	—	2	—	2
Mongolia	—	690	—	690
Oman	—	1	180	-179
Pakistan	—	1,589	—	1,589
Philippines	—	2,631	—	2,631
Saudi Arabia	—	68	9,733	-9,664
Singapore	—	3,014	24	2,990
Sri Lanka	—	12,640	—	12,640

Table A16. Asbestos production, trade, and consumption in 2000.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Asia and the Middle East (continued):				
Syria	—	2,010	—	2,010
Thailand	—	109,600	—	109,600
Turkey	—	27,569	—	27,569
United Arab Emirates	—	10,221	1	10,220
Vietnam	—	44,150	—	44,150
Yemen	—	172	—	172
Total	338,000	637,310	22,165	953,145
Central and North America:				
Bahamas	—	515	—	515
Canada	309,719	22	314,706	-4,965
Costa Rica	—	109	—	109
Cuba	—	5,512	—	5,512
Dominican Republic	—	200	—	200
El Salvador	—	1,460	2	1,458
Guatemala	—	20	2	18
Haiti	—	17	—	17
Honduras	—	2	—	2
Mexico	—	36,945	1	36,945
Panama	—	1,280	—	1,280
Trinidad and Tobago	—	—	(2)	(2)
United States	5,260	14,849	[3]18,975	1,134
Total	314,979	60,932	333,686	42,225
Europe:				
Austria	—	—	5	-5
Azerbaijan	—	7,149	—	7,149
Belarus	—	—	65	-65
Belgium and Luxembourg	—	—	(2)	(2)
Bosnia and Herzegovina	—	21	—	21
Bulgaria	350	391	324	417
Croatia	—	3,655	—	3,655
Cyprus	—	324	(2)	324
Czech Republic	—	1,076	—	1,076
Estonia	—	180	(2)	180
France	—	20	46	-26
Georgia	—	5	—	5
Germany	—	212	—	212
Greece	—	90	8,946	-8,856
Hungary	—	3,456	—	3,456
Ireland	—	—	(2)	(2)
Italy	—	40	—	40
Kazakhstan	233,200	1,252	162,716	71,737
Kyrgyzstan	—	16,486	—	16,486
Latvia	—	1,124	—	1,124
Lithuania	—	1,305	643	663
Macedonia	—	48	—	48
Moldova	—	1,679	—	1,679

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/76

Table A16. Asbestos production, trade, and consumption in 2000.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Europe (continued):				
Netherlands	—	3	—	3
Norway	—	12	—	12
Poland	—	117	—	117
Portugal	—	3,437	36	3,401
Romania	—	10,658	—	10,658
Russia	750,000	31,656	332,417	449,239
Serbia and Montenegro	563	43	69	537
Slovakia	—	1,201	—	1,201
Slovenia	—	754	—	754
Spain	—	13,060	126	12,934
Sweden	—	—	12	-12
Switzerland	—	—	([2])	([2])
Tajikistan	—	450	—	450
Turkmenistan	—	979	([2])	979
Ukraine	—	80,942	—	80,942
United Kingdom	—	270	2	268
Uzbekistan	—	43,374	—	43,374
Total	984,113	225,467	505,405	704,175
Oceania:				
Australia	—	1,424	—	1,424
Tokelau	—	212	—	212
Total	—	1,636	—	1,636
South America:				
Argentina	254	1,843	26	2,071
Bolivia	—	513	—	513
Brazil	209,332	26,362	63,134	172,560
Chile	—	1,969	158	1,811
Colombia	5,000	12,994	2	17,992
Ecuador	—	4,595	—	4,595
Paraguay	—	396	—	396
Peru	—	1,275	([2])	1,275
Uruguay	—	778	—	778
Venezuela	—	2,943	—	2,943
Total	214,586	53,668	63,320	204,934
Unknown trade destinations	—	14,630	—	14,630
Grand total	2,035,150	1,031,079	1,031,079	2,035,150

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Less than 0.5 t.

[3]Includes exports and reexports of asbestos fiber.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/77

Table A17. Asbestos production, trade, and consumption in 2001.

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Algeria	—	5,813	—	5,813
Angola	—	260	—	260
Congo (Kinshasa)	—	24	—	24
Egypt	—	2,145	—	2,145
Eritrea	—	8	—	8
Ghana	—	18	—	18
Kenya	—	96	(2)	96
Mauritius	—	18	—	18
Morocco	—	414	—	414
Mozambique	—	200	—	200
Nigeria	—	2,146	—	2,146
Senegal	—	1,190	8	1,182
Sierra Leone	—	397	—	397
South Africa	13,393	18,961	21,456	10,898
Sudan	—	21	—	21
Swaziland	—	—	7,894	-7,894
Tanzania	—	(2)	—	(2)
Tunisia	—	700	—	700
Uganda	—	—	9	-9
Zambia	—	1,225	—	1,225
Zimbabwe	136,327	32	85,033	51,326
Total	149,720	33,670	114,401	68,989
Asia and the Middle East:				
Bangladesh	—	1,266	—	1,266
Brunei	—	1	—	1
Burma	—	302	—	302
China	310,000	102,755	18,431	394,324
Hong Kong	—	3,400	—	3,400
India	21,000	130,291	1,129	150,161
Indonesia	—	38,566	4	38,562
Iran	2,000	42,391	—	44,391
Iraq	—	81	—	81
Japan	—	78,304	57	78,247
Korea, North	—	750	—	750
Korea, Republic of	—	25,049	5	25,044
Lebanon	—	142	—	142
Malaysia	—	12,266	6,100	6,166
Maldives	—	(2)	—	(2)
Mongolia	—	91	(2)	91
Oman	—	1,799	—	1,799
Pakistan	—	464	—	464
Philippines	—	3,023	—	3,023
Saudi Arabia	—	54	4,626	-4,573
Singapore	—	418	3	415
Sri Lanka	—	11,205	40	11,165
Syria	—	1,197	—	1,197

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/78

Table A17. Asbestos production, trade, and consumption in 2001.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Asia and the Middle East (continued):				
Thailand	—	103,321	1	103,320
Turkey	—	5,315	5	5,310
United Arab Emirates	—	8,675	—	8,675
Vietnam	—	24,905	—	24,905
Total	333,000	596,030	30,402	898,627
Central and North America:				
Bahamas	—	19	—	19
Canada	276,790	424	272,596	4,618
Costa Rica	—	1	—	1
Cuba	—	7,344	—	7,344
Dominican Republic	—	253	—	253
El Salvador	—	1,974	—	1,974
Guatemala	—	1	4	-3
Honduras	—	4	—	4
Mexico	—	28,075	3	28,072
Panama	—	1,040	—	1,040
Trinidad and Tobago	—	—	(2)	(2)
United States	5,260	12,760	3 14,748	3,272
Total	282,050	51,894	287,350	46,594
Europe:				
Austria	—	1	—	1
Azerbaijan	—	4,142	—	4,142
Belarus	—	1,588	3	1,585
Belgium and Luxembourg	—	1	—	1
Bosnia and Herzegovina	—	1	—	1
Bulgaria	—	529	36	493
Croatia	—	1,815	(2)	1,815
Czech Republic	—	1,922	—	1,922
Estonia	—	605	606	-2
France	—	17	59	-42
Germany	—	135	—	135
Greece	—	69	252	-183
Hungary	—	2,339	—	2,339
Ireland	—	—	1	-1
Italy	—	52	—	52
Kazakhstan	271,300	1,952	58,954	214,298
Kyrgyzstan	—	10,546	—	10,546
Latvia	—	664	—	664
Lithuania	—	105	139	-34
Macedonia	—	72	4	68
Moldova	—	170	—	170
Netherlands	—	28	—	28
Poland	—	948	—	948
Portugal	—	4,238	(2)	4,238
Romania	—	13,278	—	13,278
Russia	750,000	2,688	340,397	412,291

Table A17. Asbestos production, trade, and consumption in 2001.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Europe (continued):				
Serbia and Montenegro	194	101	75	221
Slovakia	—	337	—	337
Slovenia	—	—	([2])	([2])
Spain	—	13,963	36	13,927
Switzerland	—	2,526	([2])	2,525
Turkmenistan	—	1,925	—	1,925
Ukraine	—	55,220	228	54,992
United Kingdom	—	179	1	178
Uzbekistan	—	26,609	—	26,609
Total	1,021,494	148,764	400,791	769,467
Oceania: Australia	—	653	—	653
South America:				
Argentina	203	1,636	—	1,839
Bolivia	—	684	—	684
Brazil	172,695	30,763	53,919	149,540
Chile	—	301	—	301
Colombia	5,000	11,402	8	16,394
Ecuador	—	3,959	—	3,959
Peru	—	920	—	920
Venezuela	—	2,833	1	2,832
Total	177,898	52,497	53,927	176,468
Unknown trade destinations	—	3,365	—	3,365
Grand total	1,964,162	886,874	886,873	1,964,164

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Less than 0.5 t.

[3]Includes exports and reexports of asbestos fiber.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/80

Table A18. Asbestos production, trade, and consumption in 2002.

[Data in metric tons. Terms used: NA, not available; —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Algeria	—	14,126	—	14,126
Angola	—	762	—	762
Congo (Kinshasa)	—	54	—	54
Egypt	—	2,431	—	2,431
Kenya	—	36	(2)	36
Malawi	—	4	—	4
Mali	—	40	—	40
Mauritius	—	23	—	23
Morocco	—	1,206	—	1,206
Mozambique	—	233	—	233
Namibia	—	—	32	-32
Nigeria	—	660	—	660
Rwanda	—	3	—	3
Senegal	—	1,382	NA	1,382
South Africa	372	5,923	9,743	-3,448
Swaziland	—	—	1,372	-1,372
Tunisia	—	1,450	—	1,450
Uganda	—	(2)	—	(2)
Zambia	—	1,069	—	1,069
Zimbabwe	168,000	1	78,242	89,759
Total	168,372	29,403	89,389	108,386
Asia and the Middle East:				
Bangladesh	—	1,467	—	1,467
Burma	—	601	—	601
China	270,000	113,486	5,029	378,457
Hong Kong	—	970	—	970
India	18,000	150,461	169	168,292
Indonesia	—	34,633	14	34,618
Iran	—	46,265	—	46,265
Iraq	—	60	—	60
Israel	—	175	—	175
Japan	—	44,550	29	44,521
Korea, North	—	893	—	893
Korea, Republic of	—	18,044	9	18,035
Malaysia	—	10,645	38	10,607
Mongolia	—	192	—	192
Pakistan	—	1,530	—	1,530
Philippines	—	2,764	25	2,738
Saudi Arabia	—	14	4,594	-4,579
Singapore	—	(2)	—	(2)
Sri Lanka	—	8,659	—	8,659
Syria	—	50	—	50
Thailand	—	109,684	—	109,684
Turkey	—	13,564	3	13,561
United Arab Emirates	—	10,091	—	10,091
Vietnam	—	27,885	—	27,885
Total	288,000	596,682	9,911	874,771

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/81

Table A18. Asbestos production, trade, and consumption in 2002.—Continued

[Data in metric tons. Terms used: NA, not available; —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Central and North America:				
Canada	240,500	24	235,138	5,386
Cuba	—	10,196	—	10,196
Dominican Republic	—	125	—	125
El Salvador	—	2,473	—	2,473
Guatemala	—	—	1	-1
Mexico	—	21,088	1	21,087
Panama	—	1,068	—	1,068
United States	2,722	6,672	[3]6,866	2,528
Total	243,222	41,647	242,007	42,862
Europe:				
Albania	—	29	—	29
Armenia	—	247	—	247
Azerbaijan	—	8,928	—	8,928
Bosnia and Herzegovina	—	20	—	20
Bulgaria	—	612	9	603
Croatia	—	3,493	20	3,473
Cyprus	—	—	([2])	([2])
Czech Republic	—	943	—	943
Estonia	—	390	387	3
France	—	1	—	1
Georgia	—	247	247	([2])
Germany	—	141	—	141
Gibraltar	—	1	—	1
Greece	—	—	29	-29
Hungary	—	355	—	355
Italy	—	26	—	26
Kazakhstan	291,000	1,912	117,327	175,584
Kyrgyzstan	—	21,048	—	21,048
Lithuania	—	10	—	10
Macedonia	—	123	1	122
Moldova	—	361	NA	361
Netherlands	—	4	—	4
Poland	—	387	—	387
Portugal	—	6,537	6	6,531
Romania	—	12,875	28	12,847
Russia	775,000	11,789	370,929	415,860
Serbia and Montenegro	—	9	48	-39
Slovakia	—	575	—	575
Spain	—	2,261	1	2,260
Sweden		—	10	-10
Switzerland	—	—	([2])	([2])
Tajikistan	—	51	—	51
Turkmenistan	—	1,925	—	1,925
Ukraine	—	115,613	361	115,252

Table A18. Asbestos production, trade, and consumption in 2002.—Continued

[Data in metric tons. Terms used: NA, not available; —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Europe (continued):				
United Kingdom	—	107	1	106
Uzbekistan	—	15,285	—	15,285
Total	1,066,000	206,303	489,404	782,899
Oceania:				
Australia	—	491	NA	491
New Caledonia	—	—	1	-1
Total	—	491	1	490
South America:				
Argentina	155	1,000	—	1,155
Bolivia	—	883	—	883
Brazil	194,750	28,326	99,341	123,735
Colombia	5,000	13,071	—	18,071
Ecuador	—	2,779	—	2,779
Peru	—	547	—	547
Uruguay	—	32	—	32
Venezuela	—	1,246	—	1,246
Total	199,905	47,884	99,341	148,448
Unknown trade destinations	—	7,660	—	7,660
Grand total	1,965,499	930,070	930,052	1,965,517

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Less than 0.5 t.

[3]Includes exports and reexports of asbestos fiber.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/83

Table A19. Asbestos production, trade, and consumption in 2003.

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Africa:				
Algeria	—	10,756	—	10,756
Angola	—	1,364	—	1,364
Benin	—	99	—	99
Egypt	—	2,382	—	2,382
Ghana	—	65	—	65
Guinea	—	4	—	4
Kenya	—	84	(2)	84
Malawi	—	2	—	2
Morocco	—	1,478	—	1,478
Mozambique	—	320	—	320
Namibia	—	—	(2)	(2)
Nigeria	—	561	—	561
Senegal	—	1,628	377	1,251
South Africa	6,218	1,470	4,192	3,496
Sudan	—	91	—	91
Tanzania	—	2	—	2
Togo	—	259	—	259
Tunisia	—	1,020	—	1,020
Zambia	—	408	—	408
Zimbabwe	147,000	1	99,262	3,5000
Total	153,218	21,994	103,831	28,642
Asia and the Middle East:				
Bangladesh	—	2,802	—	2,802
Burma	—	2	—	2
China	350,000	145,425	3,472	491,954
Hong Kong	—	2	—	2
India	19,000	175,581	2,548	192,033
Indonesia	—	32,306	22	32,284
Iran	—	75,852	12	75,840
Iraq	—	12	—	12
Japan	—	23,459	22	23,437
Korea, North	—	1,234	—	1,234
Korea, Republic of	—	23,862	62	23,799
Malaysia	—	13,439	—	13,439
Mongolia	—	310	—	310
Nepal	—	25	—	25
Pakistan	—	3,129	—	3,129
Philippines	—	2,453	—	2,453
Saudi Arabia	—	7	—	7
Singapore	—	269	(2)	268
Sri Lanka	—	6,106	—	6,106
Syria	—	1,209	—	1,209
Thailand	—	133,110	127	132,983
Turkey	—	13,552	42	13,510
United Arab Emirates	—	9,112	—	9,112
Vietnam	—	39,382	—	39,382
Total	369,000	702,640	6,307	1,065,333

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/84

Table A19. Asbestos production, trade, and consumption in 2003.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Central and North America:				
Canada	194,350	205	174,774	19,781
Cuba	—	9,896	—	9,896
Dominican Republic	—	75	—	75
El Salvador	—	2,600	—	2,600
Guatemala	—	—	(2)	(2)
Mexico	—	20,105	20	20,085
Panama	—	1,080	—	1,080
United States	—	4,634	[4]3,548	[5]4,634
Total	194,350	38,596	178,342	58,152
Europe:				
Austria	—	(2)	—	(2)
Azerbaijan	—	10,181	—	10,181
Belarus	—	—	61	-61
Belgium and Luxembourg	—	111	—	111
Bosnia and Herzegovina	—	—	1	-1
Bulgaria	—	108	(2)	108
Croatia	—	2,709	—	2,709
Czech Republic	—	1,610	(2)	1,610
Denmark	—	—	3	-3
Estonia	—	—	(2)	(2)
France	—	—	5	-5
Georgia	—	(2)	—	(2)
Germany	—	102	—	102
Greece	—	—	13	-13
Hungary	—	329	—	329
Iceland	—	3	—	3
Kazakhstan	354,500	3,340	183,949	173,891
Kyrgyzstan	—	23,652	—	23,652
Lithuania	—	—	(2)	(2)
Macedonia	—	50	—	50
Moldova	—	956	7	949
Netherlands	—	2	—	2
Portugal	—	1,648	(2)	1,648
Romania	—	11,400	113	11,286
Russia	878,000	1,050	450,031	429,020
Slovakia	—	240	—	240
Spain	—	2	—	2
Switzerland	—	—	(2)	(2)
Tajikistan	—	490	—	490
Turkmenistan	—	1,849	—	1,849
Ukraine	—	156,393	—	156,393
United Kingdom	—	23	(2)	22
Uzbekistan	—	42,362	—	42,362
Total	1,232,500	258,609	634,182	856,927

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/85

Table A19. Asbestos production, trade, and consumption in 2003.—Continued

[Data in metric tons. Term used: —, zero. Data are unrounded but are believed to be accurate to no more than three significant digits. Production, import, and export data from United Nations Statistics Division, 2005; Virta, 2005a]

Region and country	Production	Imports	Exports	Apparent consumption[1]
Oceania:				
Australia	—	20	1	19
Fiji	—	1	—	1
Total	—	21	1	20
South America:				
Argentina	166	—	—	166
Bolivia	—	1,159	—	1,159
Brazil	194,350	28,395	144,343	78,403
Colombia	5,000	8,118	—	13,118
Ecuador	—	1,458	—	1,458
Peru	—	492	(2)	492
Venezuela	—	1,464	—	1,464
Total	199,516	41,086	144,343	96,260
Unknown trade destinations	—	3,609	—	3,609
Grand total	2,148,584	1,066,556	1,067,006	2,108,943

[1]Apparent consumption calculated as production plus imports minus exports, not adjusted to account for changes in government and industry stocks. Negative values indicate shipments from stocks.

[2]Less than 0.5 t.

[3]For Zimbabwe, which has a small manufacturing capacity for asbestos products, the calculated apparent consumption probably includes about 42,739 t going into stocks and 5,000 t of estimated consumption.

[4]Includes exports and reexports of asbestos fiber.

[5]For the United States, the apparent consumption is assumed to equal the imports.

Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/86

USGS

Virta—**Worldwide Asbestos Supply and Consumption Trends from 1900 through 2003**—Circular 1298

ISBN 1-411-31167-1



Published by AsbestosClaims.Law
asbestosclaims.law/library/11054/87