

ASBESTOS



Indian Minerals Yearbook 2022

(Part- III : MINERAL REVIEWS)

61th Edition

ASBESTOS

(Advance Release)

GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES

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2 Asbestos

Asbestos is a group of six naturally occurring fibrous silicate minerals. The physical properties, besides fibrous character, such as, fineness, flexibility, tensile strength & length of fibres, infusibility, low heat conductivity and high resistance to electricity & sound as also to corrosion by acids, make asbestos commercially important. Commercial asbestos is classified into two main mineralogical groups: serpentine asbestos or chrysotile asbestos and amphibole asbestos. The latter includes asbestos minerals, such as, tremolite, actinolite, anthophyllite, amosite and crocidolite. Commercially, chrysotile asbestos is far superior in physical properties, and hence, more valuable than amphibole asbestos.

India's asbestos requirement is met through imports from Russia, Brazil, Kazakhstan, Hungary and Poland.

RESERVES/RESOURCES

As per NMI database, based on UNFC system,

the total reserves/resources of asbestos in the country as on 1.4.2020 has been placed at 22.90 million tonnes. A total of 22.90 million tonnes of asbestos are placed under Remaining Resources. Out of the total resources, Rajasthan accounts for 13.61 million tonnes (59%) and Karnataka 8.28 million tonnes (36%). The remaining five per cent resources are estimated in States of Andhra Pradesh, Jharkhand, Odisha and Uttarakhand (Table-1).

Table-2 summarises the mineralogical varieties of asbestos occurring in various parts of the country.

PRODUCTION

No production of asbestos was reported in 2021-22 as well as in the previous year and there were no reporting mines in 2021-22 as well as in preceding year.

Similarly, the mine-head closing stocks of asbestos also remained 'Nil' for the year 2021-22 as well as in the preceding year 2020-21. The average daily employment of labour for both the years was 'Nil.'

Table – 2 : Occurrences of Asbestos in India

State	District	Mineralogical variety
Andhra Pradesh	Anantapur Cuddapah	Chrysotile
Jharkhand	Singhbhum (East) Singhbhum (West)	Chrysotile, tremolite, chrysotile mixed with other minerals
Karnataka	Chikkamagaluru Hassan Mandya Mysuru Shivamogga	Amosite Anthophyllite Mixed amphibole minerals Chrysotile Amosite
Odisha	Kendujhar	-
Rajasthan	Ajmer Bhilwara Dungarpur Pali Rajsamand Udaipur	Mixed amphibole minerals -do- -do- Tremolite, chrysotile mixed with other amphibole minerals Tremolite, actinolite and mixed amphibole minerals Chrysotile, tremolite and mixed amphibole minerals
Uttarakhand	Chamoli	Others

Table – 1 : Reserves/Resources of Asbestos as on 1.4.2020 (P)
(By Grades/States)

(In tonnes)

Grade/State	Reserves			Remaining Resources					Total Resources (A+B)			
	Proved STD111	Probable STD121 STD122	Total (A)	Feasibility STD211	Pre-feasibility STD221 STD222	Measured STD331	Indicated STD332	Inferred STD333		Reconnaissance STD334	Total (B)	
All India : Total	-	-	-	2488022	3113446	4062376	100687	2527959	1055777	57800	22908067	22908067
By Grades												
Chrysotile	-	-	-	684838	39126	16553	2885	17660	70843	-	831905	831905
Amosite	-	-	-	-	-	-	-	3987	4459680	-	4463667	4463667
Tremolite	-	-	-	-	94768	116516	-	2426700	1562125	-	4200109	4200109
Chrysotile mixed with others	-	-	-	-	3871	18309	-	-	336	-	22516	22516
Mixed Amphibole	-	-	-	1743560	2642595	3745856	87802	42101	4121718	-	12383632	12383632
Actinolite	-	-	-	-	-	-	-	311	34000	-	34311	34311
Anthophyllite	-	-	-	-	-	-	-	-	20000	-	20000	20000
Others	-	-	-	-	332459	99675	-	-	-	-	432134	432134
Not-known	-	-	-	59623	627	65467	-	-	279574	57800	463091	463091
Unclassified	-	-	-	1	-	-	10000	37200	9500	-	56701	56701
By States												
Andhra Pradesh	-	-	-	684839	39126	16553	-	1541	55936	-	797995	797995
Jharkhand	-	-	-	-	3871	18309	2885	5769	124059	-	154893	154893
Karnataka	-	-	-	-	-	-	-	2441037	5841420	-	8282457	8282457
Odisha	-	-	-	-	-	-	10000	37200	9500	-	56700	56700
Rajasthan	-	-	-	1803183	3070449	4027514	87802	42101	4526861	57800	13615710	13615710
Uttarakhand	-	-	-	-	-	-	-	311	-	-	311	311

Figures rounded off

MINING & MILLING

Presently, there is no working asbestos mine in India. The usual method of mining chrysotile in Pulivendla Tehsil, Cuddapah district, Andhra Pradesh, was by opening an incline along the dip varying from 20° to 25°, keeping the trap as floor and limestone as roof. Two or three such inclines were converted into a regular underground mine by developing levels and winzes, connecting them and adopting board-and-pillar system of development. In almost all the mines, operations like blasting, hole drilling, hoisting, pumping and ventilation were mechanised.

The run-of-mine was subjected to manual sorting of asbestos-bearing rock (ABR). ABR was then hand-combed for chipping off the asbestos-bearing portion in small pieces of about 2.5 cm for producing asbestos concentrates. From ABR, the serpentine was removed as a waste. The asbestos concentrate was fed manually into hopper of a hammer mill. In hammer mill, asbestos and other minerals were separated and then fed to double-deck screen having 10 to 40 mesh sieves. The screening gives three fractions: (a) oversize, (b) middling and (c) tailing.

Tailing was taken as a waste which generally did not contain appreciable quantity of asbestos. The oversize was recycled in the hammer mill, and the middling fibre was sucked up by a cyclone and collected.

GRADING & MARKETING

Small fibres recovered through milling process account for nearly a two-third production. The general grading system adopted is as follows:

Grade	Fibre Size	Method
Grade - As	45 mm and above	Hand-sorted
Grade - A	Between 25 and 45 mm	
Grade - B	Between 12 and 25 mm	
Grade - C	Above 16 mesh	Mill-processed
Grade - D3	24 mesh	
Grade - D4	40 mesh	
Grade - D6	60 mesh	

Note: Producers of amphibole asbestos sell their output as crude or fluff and powder.

CLASSIFICATIONS

Various classifications of chrysotile asbestos followed in India are based, by and large, on fibre length:

- (1) Grade A or
 - A Special - 25.4 mm fibres or larger
 - As1 - 25.4 mm and larger fibres but brittle compared to As or A Special
 - A - 19.05 to 25.4 mm fibres
 - A1 - 19.05 to 25.4 mm fibres but brittle compared to A
 - A2 - 19.05 to 25.4 mm fibres but brittle compared to A1
- Grade B - 6.35 to 19.05 mm fibres
 - B1 - 6.35 to 19.05 mm fibres but brittle compared to B
 - B2 - 6.35 to 19.05 mm fibres but brittle compared to B1
 - C - Below 6.35 mm fibres
- (2) Grade A Special - Above 31.5 mm
 - A - Between 19 and 31.5 mm
 - B - Between 6.3 and 19 mm
 - C - Below 6.3 mm including powder
 - D - Dust

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3) Quebec standard asbestos testing machine classification of chrysotile asbestos according to groups is given below:

Crude Asbestos

- Group No. 1 Crude No. 1: Consists basically of crude, 3/4 inch and longer staple
- Group No. 2 Crude No. 2: Consists basically of crude, 3/8 to 3/4 inch staple.

Milled Asbestos

Standard designation of grade	Guaranteed minimum spinning test
Group No. 3 (spinning fibres)	
3 D	10.5-3.9-1.3-0.3
3 Z	0-8-6-2
Group No. 4 (shingle fibres)	
4 D	0-7-6-3
4 Z	0-1.5-9.5-5
Group No. 5 (paper fibres)	
5 D	0-0.5-10.5-5
5 R	0-0-10-6
Group No. 6 (waste)	
6 D	0-0-7-9
Group No. 7 (shorts or refuse)	
7 D	0-0-8-11
7W	0-0-0-16
Group No. 7 (floats)*	
7 RF	No test
7 TF	No test
Group No. 8 (sand & gravel)	
8 S	Less than 50 lb per cu. ft loose measure
8 T	Less than 75 lb per cu. ft loose measure.
Group No. 9 (gravel & stone)	
9 T	More than 75 lb cu. ft loose measure

* The suffix 'F' designates 'floats' in the case of 7R and 7T grades.

USES

Industrial use of asbestos is linked with the type of asbestos. Chrysotile asbestos, being more fibrous and possessing better tensile strength than amphibole variety is used in the

manufacture of asbestos fabrics, cement sheets, pipes and allied products. It is also used in brake linings, insulation and fireproof clothing. Short fibres are used with cement as binders for manufacturing asbestos-cement products. Amphibole asbestos generally finds use in heat insulation and treatment of acids. Anthophyllite and tremolite fibres, although of good length, are too weak and brittle to be spun. They are, therefore, used for boiler lagging, hard-setting magnesia composition and as a filler in asbestos paints and various asbestos-moulded articles.

SUBSTITUTION

Materials substituted for asbestos include calcium silicate, carbon fibres, fibres of cellulose, ceramic, glass & steel, wollastonite and several organic fibres like aramid, polyethylene, polypropylene and polytetrafluoroethylene. Where reinforcement properties of fibres are not required, several non-fibrous minerals are also considered for possible substitution. However, no single substitution is found to be as versatile or as cost-effective as asbestos.

ENVIRONMENTAL IMPACT OF ASBESTOS

Asbestos used as a part of construction material due to flame retardant quality, poses major risk to human health and environment. Asbestos has been linked in number of serious medical conditions. These include the lungs and respiratory problems because asbestos is made of tiny fibres that when released into the air and prolonged breathing of air laden with asbestos dust can settle inside the lungs and irritate the tissues in the chest cavities. Mesothelioma is a rare form of cancer of the lungs and digestive tract which is most commonly caused by exposure to asbestos mixed air. Besides health hazards, asbestos also has negative impact on the environment. A study presented in 2006 at the International Conference on Health, the Environment and Justice found that asbestos dust can easily travel through the air and into the

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water supply. It can also settle on the surface of the soil instead of getting absorbed into the ground, which means that it can still get picked up by the wind and inhaled into human respiratory system.

However, as per the report of the 'Asbestos Cement Products Manufactures' Association' in India, only chrysotile (white) asbestos fibre is used for the manufacture of asbestos-cement sheets and asbestos-cement pipes which contain a very small quantity of chrysotile fibre (only 8–10%). The other raw materials used are cement 45%, fly ash 30-35% and wood pulp. The asbestos fibres are firmly locked-in or encapsulated within the cement matrix during manufacture so that fibres cannot be emitted into the atmosphere under normal use and thus, pose no health risk to the general public or environment. Several studies abroad have concluded that use of chrysotile in the manufacture of Asbestos Cement Products under controlled conditions is safe for the workers, environment and the general public.

TRADE POLICY & LEGISLATION

No restrictions have been imposed on exports of asbestos in the Foreign Trade Policy, 2015-20. As per the prevailing Foreign Trade Policy, asbestos under Heading 2524 can be imported freely with the exception of amosite which is restricted. However, the imports of crocidolite, actinolite, anthophyllite, amosite and tremolite are restricted in terms of Interim Prior Informed Consent (PIC) Procedure of Rotterdam Convention for Hazardous Chemicals and Pesticides.

Ministry of Environment and Forest, vide Notification dated 13.10.1998, under Sections 3 (1) and 6 (2) (d) of Environment (Protection) Act, 1986 and Rule 13 of Environment (Protection) Rules, 1986, has prohibited the imports of waste asbestos (dust and fibre), on account of it being a hazardous waste detrimental to human health and environment.

WORLD REVIEW

Large reserves are located mainly in Kazakhstan, Zimbabwe, Russia, China, Brazil and USA. Reliable evaluations of global asbestos resources have not been published recently, and

available information was insufficient to make accurate estimates for many countries. However, world resources are large and more than adequate to meet anticipated demand in the foreseeable future. Resources in the United States are composed mostly of short-fiber asbestos for which use in asbestos-based products is more limited than long-fiber asbestos. In 2021, The world production of asbestos increased by 9% to 1200 thousand tonnes in 2021 as compared to 1100 thousand tonnes in preceding year. Russia was the leading producer with 700 thousand tonnes, followed by Kazakhstan (250 thousand tonnes) China (120 thousand tonnes) and Brazil (100 thousand tonnes) (Tables-3 and 4). To provide generalised view of the development in various countries, the country wise description sourced from latest available publication of USGS, Mineral Year Book, 2019 is detailed below:

Brazil

The Supreme Federal Court of Brazil (STF) enacted a comprehensive national ban on asbestos in November 2017, extending a prohibition that was limited to the State of Rio de Janeiro to the entire country. Eternit S.A., the only asbestos producer in Brazil, disputed the national nature of the ban and considered asbestos to be legal in those States without explicit laws that disallowed its mining and use. A judicial injunction allowed the company to continue operating its mine in the State of Goias until February 2019, when production ceased. In April, Eternit petitioned the STF to allow asbestos ore stockpiles to be processed for sale to foreign markets. In July, the State of Goias passed a law that authorized the extraction and processing of asbestos in the State for export purposes, generating immediate legal challenges. By year end 2019, the STF had not issued a ruling on the constitutionality of the Goias law, and Eternit had not restarted operations.

Colombia

The Government of Colombia enacted legislation to prohibit the mining, export, production, sale, and use of asbestos beginning 2021. Domestic companies that used asbestos to manufacture products would be exempt from the ban for 5 years.

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**Table – 3 : World Reserves of Asbestos
(By Principal Countries)**

(In million tonnes)	
Country	Reserves
World: Total	Large
Brazil	11
China	15
Kazakhstan	Large
Russia	110
USA	Small
Zimbabwe	Large

Source: USGS, Mineral Commodity Summaries, 2023.

* India's total reserves/resources of asbestos as per NMI database, based on UNFC system, as on 1.04.2020 have been estimated at 22.90 million tonnes.

Zimbabwe

At the former Mashaba Mine, which closed in 2007, Shabanie Mashaba Mine Holdings began producing asbestos from tailings and was working to dewater the mining shafts and procure equipment to restart underground production.

FOREIGN TRADE

Exports

Exports of asbestos increased to 1,906 tonnes in 2021-22 as compared to 299 tonnes in the previous year. Exports were mainly to Bangladesh. Exports of asbestos (fibre products) were at 49044 tonnes in 2021-22 as compared to 41739 tonnes in the previous year. Exports were mainly to USA (33%), UAE (7%), Egypt (6%), Brazil (5%) and Indonesia, Kenya, & Canada, (3% each). Exports of asbestos (chrysotile) were at 1905 tonnes during the year 2021-22 as compared to 275 tonnes in the preceding year. Exports of asbestos (others) decreased to 01 tonnes during the year 2021-22 as compared to 24 tonnes in the preceding year. Exports of asbestos-cement products were 116492

**Table – 4 : World Production of Asbestos
(By Principal Countries)**

(In '000 tonnes)			
Country	2019	2020	2021
World Total	1200	1100	1200
Brazil	12	77	100 ^e
China	150 ^e	120 ^e	120 ^e
Colombia	-	-	-
Kazakhstan	211	227	250
Russia	790	720 ^e	700 ^e

Source: BGS, World Mineral Production, 2017-2021.

(e) : Estimated.

tonnes in 2021-22 as compared to 89833 tonnes in the preceding year. Exports of asbestos-cement products were mainly to UAE (29%), Qatar (23%), Nepal (21%) and UK (12%) (Tables-5 to 9).

Imports

Imports of asbestos were 437511 tonnes in 2021-22 increased by 42% as against 308506 tonnes in the previous year. Almost entire import was that of chrysotile asbestos except only 534 tonnes import was in the form of Asbestos (others). Imports of asbestos were mainly from Russia (52%), Brazil (35%), Kazakhstan (6%), Hungary (4%) and Poland (2%). A total of 20721 tonnes asbestos-cement products were also imported in 2021-22 as against 19306 tonnes in the previous year. Imports were mainly from Thailand (91%) and Indonesia (5%). Imports of asbestos fibre products were 3353 tonnes during the year 2021-22 as compared to 2309 tonnes in previous year. Imports of asbestos fibre products were mainly from China (30%), Denmark (24%), Japan (14%) UK(10%), Germany (9%) and USA (4%). (Tables-10 to 14).

**Table – 5 : Exports of Asbestos
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	299	11991	1906	68026
Bangladesh	275	11887	1906	68000
Uganda	--	--	++	26
Nepal	24	54	++	++
Kenya	++	42	--	--
Cote D' Ivoire	++	8	--	--

Figures rounded off

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**Table – 6 : Exports of Asbestos (Fibre Products)
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	41739	5548536	49044	6902347
USA	13407	1834003	16223	2155064
Brazil	817	262332	2364	489080
U A E	3355	388212	3385	402632
Nepal	1076	151558	751	216908
Egypt	2244	179241	2762	212397
Russia	276	60510	856	189110
Indonesia	955	101843	1574	183692
Kenya	1440	133834	1412	175061
Turkey	464	131610	593	170571
Canada	1149	160061	1343	163853
Other Countries	16556	2145332	17781	2543979

Figures rounded off

**Table – 7 : Exports of Asbestos (Chrysotile)
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	275	11895	1905	67961
Bangladesh	275	11887	1905	67961
Cote D' Ivoire	++	8	--	--

Figures rounded off

**Table – 8 : Exports of Asbestos (Others)
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	24	96	1	65
Bangladesh	--	--	1	39
Uganda	--	--	++	26
Nepal	24	54	++	++
Kenya	++	42	--	--

Figures rounded off

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**Table – 9 : Exports of Asbestos Cement Products
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	89833	1444464	116492	1876220
Nepal	20814	323160	24363	486952
UAE	27254	389165	33988	446358
Qatar	18132	283356	26692	372451
UK	6398	128380	13474	238312
South Africa	3319	55863	2803	48462
Oman	2577	41041	2881	41930
Maldives	1313	27240	1856	33858
Somalia	504	10326	1493	29620
Iraq	527	8322	1511	24134
Ghana	668	11090	1013	17336
Other Countries	8327	166521	6418	136807

Figures rounded off

**Table – 10 : Imports of Asbestos
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	308506	11851124	437511	16631390
Russia	195419	7749132	228529	8952770
Brazil	72385	2454931	151277	5408508
Kazakhstan	10105	379339	25168	935189
Hungary	16549	688296	16515	726658
Poland	9614	348194	10302	333479
South Africa	2816	169062	2718	152208
USA	240	18102	2407	102007
Hong Kong	--	--	338	12970
Singapore	136	4864	68	2381
China	1017	33651	67	2302
Other countries	225	5553	122	2918

Figures rounded off

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**Table – 11 : Imports of Asbestos (Chrysotile)
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	308100	11840174	436977	16613219
Russia	195419	7749132	228529	8952770
Brazil	72385	2454931	151232	5406513
Kazakhstan	10105	379339	25168	935189
Hungary	16549	688296	16515	726658
Poland	9344	338450	9867	317968
South Africa	2816	169062	2718	152208
USA	240	18102	2407	102007
Hong Kong	--	--	338	12970
Singapore	136	4864	68	2381
China	1016	33621	67	2302
Other Countries	90	4377	68	2253

Figures rounded off

**Table – 12 : Imports of Asbestos (Others)
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	406	10950	534	18171
Poland	270	9744	435	15511
Brazil	--	--	45	1995
Turkey	135	1176	54	597
Japan	--	--	++	68
China	1	30	--	--

Figures rounded off

**Table – 13 : Imports of Asbestos Cement Products
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	19306	466845	20721	590388
Thailand	17629	373669	18816	458621
Germany	2	14552	35	29064
Indonesia	1185	36903	994	24449
USA	24	18133	25	19339
China	202	8747	251	18343
Mexico	119	3924	218	8155
Canada	—	—	144	7183
Poland	—	—	39	5296
UK	—	—	40	5280
Turkey	22	6063	19	5244
Other Countries	123	4854	140	9414

Figures rounded off

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Table – 14 : Imports of Asbestos Fibre Products (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	2309	2750723	3353	3130952
Japan	589	1251083	474	1399517
Denmark	667	526425	803	684867
Germany	93	182431	295	228687
China	510	183946	1013	218759
USA	150	198495	150	185401
UK	65	68067	339	84795
Korea	76	110737	57	82633
France	30	32344	73	49001
Czech Republic	11	23847	36	48758
Hungary	3	17392	34	34627
Other Countries	115	155956	79	113907

Figures rounded off

FUTURE OUTLOOK

Consumption of asbestos minerals in India & other countries of the world will decline steadily in near future due to liability issues associated with

asbestos use, leading to the displacement of asbestos from traditional domestic markets by substitutes, alternative materials and technological advancement.

While the economic impact of asbestos mining in India is minimal, mining operations do adversely affect human and environmental health. Globally, asbestos-cement products are expected to continue to be the leading market for asbestos. India's imports of chrysotile asbestos too have been showing significant growth.

As per USGS report, Domestic use of unmanufactured asbestos fiber has declined significantly since the 1970s and will likely remain steady or continue to decrease over the long term as alternative materials and (or) new technologies displace it from the chloralkali production process. The trajectory of world production in the coming years will depend on the outcome of the asbestos ban in Brazil and the restart of mining in Zimbabwe. However, significant global demand for asbestos products is expected to continue in several regions of the world, particularly for cement pipe, roofing sheets, and other construction materials in Asia.