

Asbestos manufacturing plants in Poland

Abstract

The unique set of physical and chemical properties of asbestos has led to its many industrial applications, such as roof coverings, textiles, rope, cord and yarn, paper, friction and composition materials, household product, acid-resistant filters, packing, insulation, and certain types of lagging, amongst others. In Poland asbestos-containing products were manufactured from raw materials imported mainly from the former Soviet Union, with production launched at the beginning of 20th century. According to Annex 4 to the Act of 19 June 1997 on the prohibition of the use of asbestos-containing products, there were 28 asbestos manufacturing plants in Poland located in 11 provinces throughout the country. The current survey was undertaken to enable asbestos manufacturing plants to be arranged, described and divided in order to contribute to further surveys.

Keywords

Asbestos • asbestos manufacturing • asbestos plants in Poland

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Introduction

The term asbestos denotes chrysotile (white asbestos), amosite (brown asbestos), crocidolite (blue asbestos), tremolite, anthophyllite and actinolite. Asbestos fibres are tensile, strong, resistant to thermal and chemical degradation, flexible, have a high electrical resistance and can be woven (Hendry 1965; Ross et al. 2007). Taking into account asbestos fibre structure allows division into two groups: serpentines and amphiboles (Ross et al. 2007). Chrysotile, the serpentine mineral, crystallizes as rolled up sheets. The double-chain structure is specific for amphiboles. Different kinds of amphiboles are distinguishable by the amount of sodium, magnesium, calcium and iron that they contain. Serpentine and amphibole minerals can have fibrous or non-fibrous structures. The fibrous type is known as asbestos (Virta 2001). The amphibole minerals can occur in a form that is not poly filamentous and therefore they are not classified as asbestos (Ross et al. 2007). Despite the common occurrence of asbestos, there is a crucial difference between occurrences and commercial deposits. In terms of production of all types of asbestos, North America has been the leader, followed by Europe, Africa, Asia, Australia, and South America. Chrysotile, also known as "white asbestos" (Thomson & Mason 2002), accounts for 93 percent of total asbestos production. The main recipient of chrysotile is the asbestos cement industry. The combination of asbestos fibres with cement, silica and water has led to the development of a variety of products and applications. Chrysotile has been used in the manufacture of roof coverings (flat and corrugated sheets), pipes, and floors (Dunnigan 1993). Depending on the product, the weight proportion of asbestos to cement may vary from 15 to 90 percent (Virta 2002). Chrysotile also has many

different industrial applications, being the component of textiles, rope, cord and yarn, paper, friction and composition materials, household products, etc. (Alleman & Mossman 1997). Amphiboles have also been used in the industry. Crocidolite, also known as "blue asbestos", has been used mainly in the manufacture of asbestos cement products (Thompson & Mason 2002), as well as the manufacturing of acid-resistant filters, packing, insulation, and certain types of lagging. Tremolite and actinolite are of less importance from an economic point of view. They are exploited in the chemical industry as filter mediums and also for special uses in the filtration field. Anthophyllite has been used in the chemical industry, as a filler in the rubber and plastic industries and in various adhesives and cements. Use of amosite ("brown asbestos") was of great importance in the insulation field in the manufacture of pipes and boilers (Hendry 1965).

Commercial production of asbestos began in Italy around 1850 with cloth and paper making. In 1880 a breakthrough in production took place due to the development of asbestos mining in Canada and South Africa. It reduced costs and therefore reinforced the manufacture of asbestos products. Soon mining and production of asbestos in the United States, Italy and Russia was expanded (Lee & Selikoff 1979). Asbestos usage was at an extremely low level when compared with 20th century production. Along with the progress of industrialization, new uses of asbestos were implemented in order to benefit from the strength, heat resistance and flexibility of asbestos fibres (Virta 2006). In the 1930s Canada was the major asbestos producer. Production increased slowly until the beginning of World War II. During the war there was a notable decline in production, with the exception

Table 1. Asbestos product applications (Thompson & Mason 2002, Siuta 2001, Łuniewski & Łuniewski 2009, Brzozowski & Obmiński 2004, ed. Dyczek 2005)

Type of asbestos products	Example of uses
Asbestos-cement	Flat and corrugated sheets, floors and walls, burners, sewer pipes, water pipes, covering for furnaces, fire-retardant board made of asbestos-containing products („sokalit”, „PYRAL”), plaster containing asbestos and fire protection covering and as thermal insulation (fire resistant) and acoustic insulation in public buildings using plaster containing asbestos and fire-retardant asbestos coatings
Asbestos rope and cord	Fire mats, gaskets, pipe and joint packing, covering for electric fires, wicks, duct tape, insulating fabrics, cotton and yarn
Asbestos cloth	Brake lining, clutch facings, theatre curtains and scenery, sheet packing, firemen's clothing, fireproof gloves, welding equipment, filter pads, protective, fire-resistant asbestos-weave blankets, asbestos tape and ropes
Composition materials	Asbestos-rubber sealant („POLONIT”, „Gambit”), binders for plasters, hard rubber and stucco, electrical insulation, laboratory uses, plates and seals for the valve connections leading to high performance water or steam, inert gas and active solutions of inorganic and organic salts, seals, insulators
Asbestos paper	Roofing paper, pipe covering, seals, electrical equipment, flooring paper, cartons, steam equipment
Other	Hair dryers, pot holders, ironing pads, artificial fireplaces, baby bibs, paints, jewellery

of Canada and South Africa. After World War II, global asbestos production increased again. By 1958, asbestos was used in about 3,000 applications. During the first half of the 20th century Canada remained the major asbestos producer, and by 1980, Russia had become the largest manufacturer of asbestos products, followed by Brazil, China, South Africa, and Zimbabwe. Current production has decreased in all major producing countries except China. The leading producer of asbestos worldwide is Russia, followed by China, Kazakhstan, Brazil, Canada, Zimbabwe, and Colombia, who together manufacture more than 90% of the entire global production nowadays (Virta 2002), with total annual production of asbestos-containing products exceeding 2 million tons (Asbestos. 2006 Mineral Yearbook 2007, Asbestos. 2012 Mineral Yearbook 2013). The use and the production of asbestos is now banned in 52 countries, including all European Union member countries, and safer products have replaced many that were once made with asbestos (Collegium Ramazzini 2010).

The purpose of the study is to present the asbestos production in Poland in terms of manufacturing plants, types of asbestos used and kinds of asbestos-containing products made.

Research objective

In Poland asbestos-containing products were manufactured from raw materials imported from the former Soviet Union (Russia, Lithuania, Kazakhstan, and Belarus), as well as from Canada, Italy, Australia and the UK. Poland does not have natural resources of asbestos mined on an industrial scale. According to Chief Statistical Office data for the period 1955-1995, the import of asbestos into the country amounted to more than 2,000,000 tons. It is estimated that more than 75% of asbestos imported into the country is used for the fabrication of asbestos-cement products, and more than 500,000 tons as raw material for the manufacture of other products containing asbestos (Siuta 2001).

The production of asbestos-containing products was launched in 1907 at the Cracow Eternit Plant in Cracow. Two years later, production was initiated in Lublin at the Lublin Eternit Plant. In the 1930s, the Chrzanów Eternit Plant in Górka launched asbestos manufacture. In the 1950s, asbestos production began at the Zawiercie Eternit Plant in Ogródzieniec, the Asbestos cement Products Plant in Szczucin and the Asbestos-Cement Products

Plant in Wierzbica. At the end of the 1960s, the production of corrugated and flat sheets as well as cladding panels began at the Asbestos Cement Plant in Trzemeszno. In the early 1970s, the production of corrugated and autoclaved sheets was launched at the plant in Małkinia.

According to Polish legal regulations, an asbestos-containing product is a product which contains 0.1% or more of asbestos (Act of 19 June 1997). Manufactured asbestos-containing products can be divided into the following groups:

- loose mixture of different fibres, and mixtures of pure asbestos fibres with cement or plaster;
- composites of asbestos-related inorganic (cement) or organic (plastics, bitumen) binder;
- asbestos textiles (yarn, ribbons, lace, fabrics, clothes, etc.).

Asbestos-containing products have been used in Poland in many branches of the economy. A sample of asbestos applications is presented in Table 1.

The aim of the study was to present the locations of the asbestos manufacturing plants in Poland, types of asbestos used and kinds of asbestos-containing products manufactured. The study consisted of three stages:

1. Preparatory stage, including literature review, development of research questionnaires.
2. Data collection, including questionnaire survey supported by field visits.
3. In-depth analysis, synthesis and result formulation.

In 1997, Poland introduced a ban on the production of asbestos-containing products. According to its provisions, the production of asbestos products was terminated by 28 September 1998, and a ban on the marketing of asbestos and products containing asbestos was introduced after 28 March 1999 (Act of 19 June 1997, Ordinance of Minister of Economy of 13 December 2010).

Research methods

All asbestos manufacturing plants listed in Annex 4 to the Act of 19 June 1997 on the prohibition of the use of asbestos-containing products formed the basis for the study covering the following plants:

1. Fabryka Okładzin Ciernych "FOMAR ROULUNDS" S.A. in Marki near Warsaw with its cooperators.
2. Przedsiębiorstwo Państwowe "GAMBIT" Zakład Pracy Chronionej in Lubawka.
3. Wytwórnia Uszczelerek "MORPAK" Sp. z o.o. in Gdańsk.
4. Fabryka Odzieży i Tkanin Żaroodpornych "IZO-TERM" in Gryfów Śląski.
5. Zakłady Wyrobów Uszczelniających i Termoizolacyjnych POLONIT Sp. z o.o. in Łódź.
6. Mazowieckie Przedsiębiorstwo Materiałów Izolacji Budowlanej "Izolacja" in Małkinia.
7. Pruszkowskie Zakłady Materiałów Izolacyjnych in Pruszków.
8. Lubelskie Zakłady Eternitu in Lublin.
9. Zakład Produkcji Płytek Cementowo-Azbestowych in Końskowola near Puławy.
10. Przedsiębiorstwo Materiałów Izolacji Budowlanej "IZOLACJA" in Jarocin.
11. Zakłady Wyrobów Azbestowo-Cementowych "COBRPIB" in Katowice.
12. Centralny Ośrodek Badawczo-Rozwojowy Przemysłu Izolacji Budowlanej at the Katowice Branch in Pruszków.
13. BEMA Fabryka Płyt Filtracyjnych i Tektury in Pilchowiec.
14. "Dachy Szczucińskie" Sp. z o.o. in Szczucin.
15. Przedsiębiorstwo Produkcyjno-Handlowo-Usługowe "IZOPOL" S.A. in Trzemeszno.
16. Przedsiębiorstwo Materiałów Izolacji Budowlanej "IZOLACJA" in Ogrodzieniec.
17. Fabryka Styropianu i Wyrobów Pokryciowych "Izolacja" PP in Wierzbica near Radom.
18. "POLIFARB-CIESZYN" S.A. in Wrocław.
19. PPHU HAMEX in Wrocław.
20. Kombinat Budowlany in Włocławek.
21. Rolnicza Spółdzielnia Produkcyjna in Parczew.
22. Przedsiębiorstwo Produkcyjno-Wdrożeniowe "Polinova" Sp. z o.o. in Katowice – Branch in Trzebinia.
23. Metsa Tissue S.A. in Konstancin-Jeziorna.
24. Zakłady Chemiczne i Tworzyw Sztucznych Boryszew S.A. in Sochaczew.
25. KONIMPEX Sp. z o.o. Konin, Branch in Sokółka.
26. Wytwórnia Materiałów Izolacyjnych Azbestowo-Cementowych S.C. in Żelechy, Piątnica.
27. Wytwórnia Uszczelerek "PZL MORPAK" Branch in Łapino.
28. PILKINGTON POLSKA in Sandomierz.

The study of the asbestos plants was divided into stages with tasks to perform. During the first stage an assumption was made that all asbestos manufacturing plants are listed in Annex 4 to the Act of 19 June 1997 on the prohibition of the use of asbestos-containing products. The subsequent task in the first stage was to develop research questionnaires and tailor them in order to obtain the required data for further analysis. The inquiry comprised the following issues: legal and organizational matters, data on historical production, current activities, and the plants' asbestos abatement, including the use of asbestos-containing products.

During the second stage of the study the data collection process was executed. The first task was to determine the current locations (address data). This task was of a great importance for the study due to the administrative changes which have taken place in Poland over the years. After determining the address data, questionnaires were distributed to all manufacturing plants and a thorough examination of source materials in the archives was also conducted. They were supported by the results of the literature review and other available data sources. Subsequently, the plants' legal status was verified with files derived from the National Court Register and the District Court.

For those plants where the responses given in the questionnaire survey were deficient, corrective actions have been taken. These actions involved the redistribution of questionnaires, telephone interviews and field visits to carry out in-depth interviews with the head of the entity or an authorized person. On-site visits were performed in all manufacturing plant locations. The main objective of performing on-site visits was to obtain an objective assurance as to the present condition of the asbestos manufacturing plants, including the usage of asbestos-containing products, and the preparation of photographic documentation of each plant.

The data submitted by asbestos manufacturing plants were verified at a later stage with the Marshal Offices, as the entities responsible for keeping a register of the use of asbestos-containing products. The verification process was executed with an additional questionnaire comprising the same attributes as requested from manufacturing plant owners. The purpose of this action was to check the comprehensiveness of acquired data, with particular attention paid to filling the obligations in the framework of the law.

During the third stage of the study, in-depth analyses were undertaken. The basis for the diagnosis of the status quo were the following data: questionnaires completed and returned by the current owners of former manufacturing plants, results of field visits including address data verification, interviews conducted, use of asbestos-containing products, and photographic documentation. Based on the data collected, GIS analyses were performed using ArcGIS 10 software.

Results

Plants listed in Annex 4 to the Act of 19 June 1997 banning the use of asbestos-containing products are located in 11 provinces throughout the country: Lower Silesia, Kuyavia and Pomerania, Lubelskie Region, Łódzkie Region, Lesser Poland, Mazovia, Podlaskie Region, Pomerania, Silesia, Greater Poland, and Świętokrzyskie Region. The details of asbestos manufacturing plants gathered through the preparation of study results are presented in Table 2.

The undertaken survey enabled asbestos manufacturing plants to be arranged, described and divided. Based on the survey results gathered in Table 2 and the asbestos-containing products division shown in Table 1, asbestos manufacturing plants were assigned to six groups, presented in Fig. 1. It is noteworthy that 10 out of all the asbestos manufacturing plants manufactured asbestos-cement roofing and 6 plants did not undertake asbestos manufacturing process.

The distribution of the plants that manufactured asbestos-cement products used in construction is of particular importance in our analysis. Asbestos-cement roofing and pipes account for 90% of asbestos used in the world today (Collegium Ramazzini 2010). The amount of asbestos-cement roofing in gminas (the lowest level of territorial division in Poland) as of the end of 2013 in relation to locations of asbestos manufacturing plants is presented on Fig. 2.

Relatively high concentrations of asbestos products are observed in the proximity of asbestos roofing manufacturing plants, i.e. Małkinia, Lublin, Wierzbica, Szczucin, Trzebinia, Ogrodzieniec Trzemeszno. In gminas where the plants were located, as well as in their vicinities, the amount of asbestos in relation to the surface area of the gmina is greater than 50 tons/km². The research undertaken allows for the organization of acquired historical data on production as well as establishing directions for further research, in particular in terms of a geostatistical survey of the determinants influencing the amount of asbestos-cement roofing in Poland.

Table 2. Details of asbestos manufacturing plants in Poland

No.	Name of plant	Location of plant	Products manufactured	Year of commencement of production	Year of completion of production
1	Fabryka Okładzin Ciernych "FOMAR ROULUNDS" S.A.	Marki	friction linings, drums and discs containing asbestos	1956	1995
2	Przedsiębiorstwo Państwowe "GAMBIT" Zakład Pracy Chronionej	Lubawka	insulating cardboard, tape, brakes and seals	1962	1999
3	Wytwórnia Uszczelek "MORPAK" Sp. z o.o.	Gdańsk	seals and asbestos-copper rings	1946	1996
4	Fabryka Odzieży i Tkanin Żaroodpornych "IZO-TERM"	Gryfów Śląski	asbestos suits for metallurgists, mining teams and volunteer firefighters, corrugated asbestos as a blank for seals for the automotive industry, insulating cords	1954	1992
5	Zakłady Wyróbów Uszczelniających i Termoizolacyjnych POLONIT Sp. z o.o.	Łódź	asbestos sealant, insulating cords, sealing plates, yarn, cardboard and asbestos friction	1926	1997
6	Mazowieckie Przedsiębiorstwo Materiałów Izolacji Budowlanej "Izolacja"	Małkinia	corrugated asbestos-cement and flat sheets ("acekol" and "kolorys") and ridge hinges	1972	1990
7	Pruszkowskie Zakłady Materiałów Izolacyjnych	Pruszków	no asbestos products manufactured	-	-
8	Lubelskie Zakłady Eternitu	Lublin	corrugated asbestos-cement sheets	1952	1989
9	Zakład Produkcji Płytek Cementowo-Azbestowych	Końskowola near Puławy	asbestos-cement flat sheets ("karo")	1976	1990
10	Przedsiębiorstwo Materiałów Izolacji Budowlanej "IZOLACJA"	Jarocin	asphalt roofing with asbestos filler	1963	1982
11	Zakłady Wyróbów Azbestowo-Cementowych "COBRPIB"	Katowice	no asbestos products manufactured	-	-
12	Centralny Ośrodek Badawczo-Rozwojowy Przemysłu Izolacji Budowlanej in Katowice	Pruszków	no asbestos products manufactured	-	-
13	BEMA Fabryka Płyt Filtracyjnych i Tektury	Pilchowice	asbestos-containing filter plates for the food industry	1962	1989
14	"Dachy Szczucińskie" Sp. z o.o. *	Szczucin	corrugated asbestos-cement sheets, pressure pipes and asbestos cement products	1959	1998
15	Przedsiębiorstwo Produkcyjno-Handlowo-Usługowe "IZOPOL" S.A.	Trzemeszno	corrugated asbestos-cement sheets used in construction (type WF-6 and NF-9) and ridges	1968	1998
16	Przedsiębiorstwo Materiałów Izolacji Budowlanej "IZOLACJA" **	Ogrodzieniec	corrugated asbestos-cement sheets, flat sheets („karo”), flat cladding panels and ridge tiles containing asbestos	1952	1998
17	Fabryka Styropianu i Wyróbów Pokryciowych "Izolacja" PP	Wierzbica near Radom	corrugated sheets, pipes and fittings for sewerage	1965	1997
18	"POLIFARB" - CIESZYN S.A.	Wrocław	paints and varnishes containing asbestos	1972	1988
19	PPHU HAMEX	Wrocław	asbestos pads and brake linings	1973	1991

Continued Table 2. Details of asbestos manufacturing plants in Poland

No.	Name of plant	Location of plant	Products manufactured	Year of commencement of production	Year of completion of production
20	Kombinat Budowlany	Włocławek	no asbestos products manufactured	-	-
21	Rolnicza Spółdzielnia Produkcyjna	Parczew	flat asbestos cement sheets ("karo")	1956	1997
22	Przedsiębiorstwo Produkcyjno-Wdrożeniowe "Polinova" Sp. z o.o.	Trzebinia	corrugated asbestos-cement sheets	1924	1991
23	Metsa Tissue S.A.	Konstancin-Jeziorna	asbestos cartons	1939	1989
24	Zakłady Chemiczne i Tworzyw Sztucznych Boryszew S.A.	Sochaczew	floor tiles, molding plates and brake pads using asbestos	1957	1983
25	KONIMPEX Sp. z o.o. ***	Sokółka	no asbestos products manufactured	-	-
26	Wytwórnia Materiałów Izolacyjnych Azbestowo-Cementowych S.C.	Żelechy near Piątnica	corrugated asbestos-cement sheets used in construction	1988	1989
27	Wytwórnia Uszczeltek "PZL MORPAK"	Łapino	asbestos-rubber paper used for the production of gaskets	1982	1996
28	PILKINGTON POLSKA	Sandomierz	no asbestos products manufactured	-	-

* This plant was the only manufacturer in the country of pressure pipes of a large diameter, for which crocidolite was used.

** Crocidolite was used in production (crocidolite is the most hazardous of all asbestos fibre types).

*** The plant was used as a loading area for asbestos imported from the territory of the former USSR.

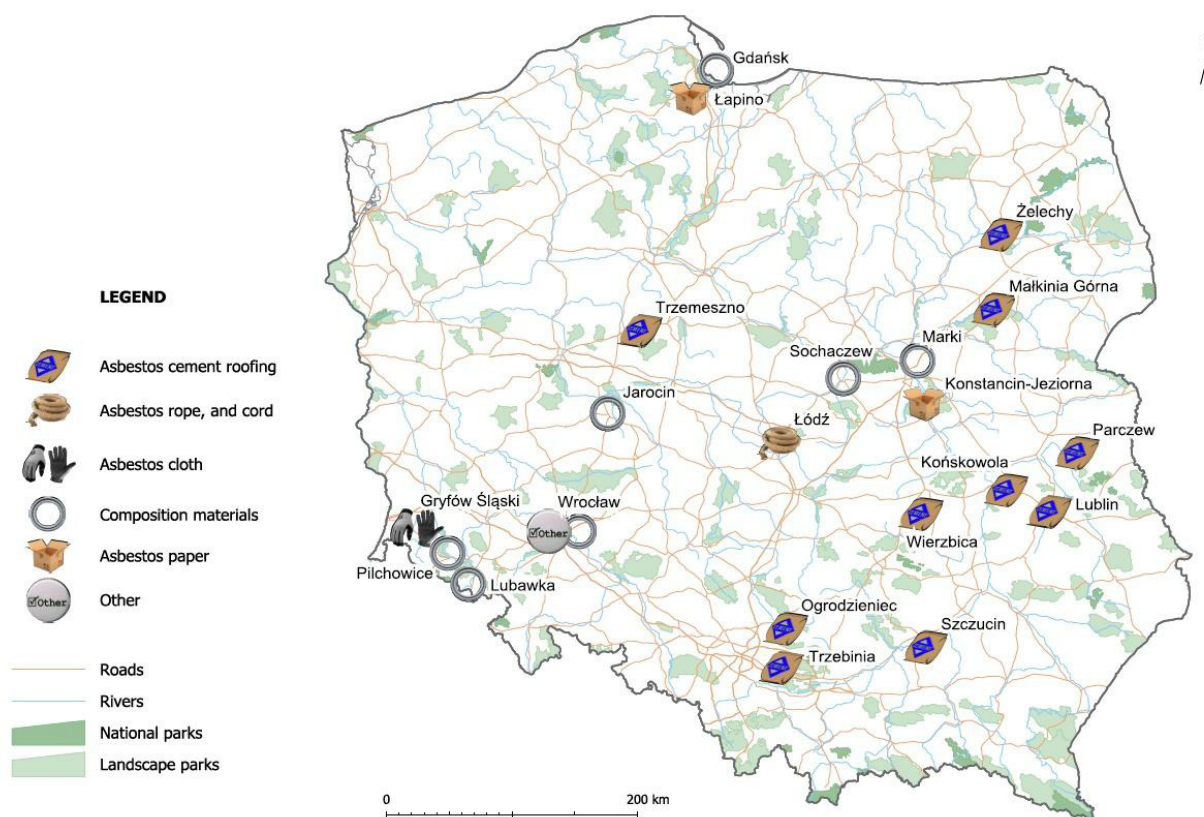


Figure 1. Type of asbestos-containing products

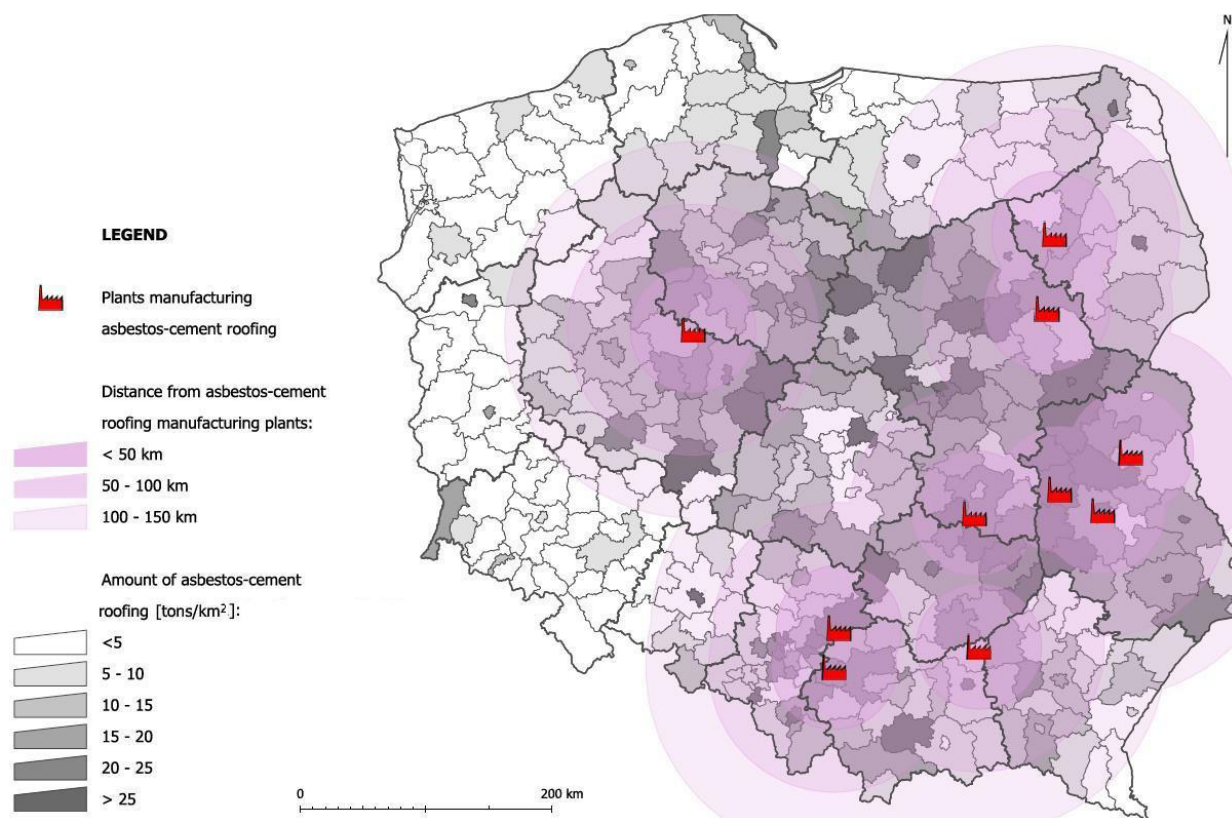


Figure 2. Plants manufacturing asbestos-cement roofing

References

- Act of 19 June 1997 on the prohibition of the use of asbestos-containing products.
- Alleman, JE & Mossman, BT 1997, 'Asbestos revisited', *Scientific American*, vol. 277, no. 1, pp. 70–75.
- 'Asbestos. 2006 Mineral Yearbook' 2007, U.S. Department of the Interior, U.S. Geological Survey.
- 'Asbestos. 2012 Mineral Yearbook' 2013, U.S. Department of the Interior, U.S. Geological Survey.
- Brzozowski, A & Obmiński, A 2004, 'Gdzie występuje potrzeba zabezpieczania lub usuwania azbestu w Polsce?', *Bezpieczeństwo Pracy*, no. 4, pp. 11–15.
- Collegium Ramazzini 2010, 'Asbestos is still with us: repeat call for a universal ban', *Odontology*, no. 98, pp. 97–101.
- Dunnigan, J 1993, 'Chrysotile asbestos revisited', *British Journal of Industrial Medicine*, vol. 50, pp. 862–863.
- Dyczek, J (ed.) 2005, 'Azbest-bezpieczne postępowanie', conference materials *Asbestos and asbestos-containing materials in buildings and structures. Minimizing the risk of emission of fibers during the removal of asbestos-containing materials*, Wydawnictwo Naukowe „Akapi”, AGH, Kraków, pp. 77–78.
- Hendry, NW 1965, 'The Geology, Occurrences, And Major Uses Of Abestos', *Annals of the New York Academy of Sciences*, vol. 132, pp. 12–21.
- Lee, D & Selikoff, I 1979, 'Historical background to the asbestos problem', *Environmental Research*, no. 18(2), pp. 300–314.
- Łuniewski, A & Łuniewski, S 2009, 'Azbest. Historyczne obciążenie z XX wieku', Wydawnictwo Ekonomia i Środowisko, Białystok.
- Ordinance of the Minister of Economy of 13 December 2010 on requirements for the use of products containing asbestos and the use and cleaning of plant or equipment, which have been or are being used asbestos-containing products.
- Ross, M, Langer, AM, Nord GL, Nolan, RP, Lee, RJ, Van Orden D & Addison, J 2007, 'The mineral nature of asbestos', *Regulatory Toxicology And Pharmacology: RTP [Regul Toxicol Pharmacol]*, vol. 52 (1 Suppl), pp. 26–30.
- Siuta, J 2001, 'Nie tylko w Szczucinie', *Ekoprofit*, no 2, pp. 6–10.
- Thompson, S & Mason, E 2002, 'Asbestos: Mineral and fibers', *Chemical Health And Safety*, vol. 9, no. 4, pp. 21–23.
- Virta, RL 2001, 'Some Facts About Asbestos', *USGS Fact Sheet: 012-01*. Available from: <<http://www.capcoa.org/Docs/noa/%5B12%5D%20USGS%20Facts%20on%20Asbestos.pdf>>. [10 December 2013].
- Virta, RL 2002, 'Asbestos: Geology, Mineralogy, Mining, and Uses 2002', *USGS Open-File Report: 2002–149*. Available from: <<http://pubs.usgs.gov/of/2002/of02-149/>>. [10 December 2013].
- Virta, RL 2006, 'Worldwide asbestos supply and consumption trends from 1900 through 2003', *U.S. Geological Survey Circular 1298*. Available from: <<http://pubs.usgs.gov/circ/2006/1298/c1298.pdf>>. [10 December 2013].