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International environmental policy and governance issues

Information on the implementation of paragraph 24 of resolution 5/7 on the sound management of chemicals and waste, presenting a paper entitled "Options for addressing asbestos contaminants in products and the environment"

Note by the secretariat

1. In paragraph 24 of resolution 5/7 on the sound management of chemicals and waste, the United Nations Environment Assembly of the United Nations Environment Programme (UNEP) requested the Executive Director of UNEP, subject to the availability of resources and in cooperation with the World Health Organization, to present a full range of options for addressing asbestos contaminants in products and the environment for consideration by the Environment Assembly at its sixth session.

2. In response to this request, UNEP, in cooperation with the World Health Organization and with input from the International Labour Organization, prepared a paper entitled "Options for addressing asbestos contaminants in products and the environment".

3. The paper, presented in the annex to the present note, provides an overview of the foundational knowledge on asbestos, including its adverse impacts on human health and the environment, and the material flows along the life cycle. It outlines lessons learned from regulatory approaches applied in various countries, provides considerations on alternatives, and presents a range of recommended options for addressing asbestos in the environment.

* UNEP/EA.6/1.

Annex

Information on the implementation of paragraph 24 of resolution 5/7 on the sound management of chemicals and waste, presenting a paper entitled "Options for addressing asbestos contaminants in products and the environment"

Options for addressing asbestos contaminants in products and the environment.

About the document

Following the request from the fifth session of the United Nations Environment Assembly (UNEA), a joint paper on 'Options for addressing asbestos contaminants in products and the environment' was prepared by United Nations Environment Programme (UNEP) in cooperation with World Health Organization (WHO)[1] and with inputs from International Labour Organization (ILO).[2]

The following paper provides an overview of the foundational knowledge on asbestos, including its adverse impacts on the human health and the environment, and the material flows along the life cycle. It outlines lessons learned from regulatory approaches applied in various countries, provides considerations for safe alternatives and presents a range of recommended options for addressing asbestos in the environment. The paper does not encompass an exhaustive review of all available information and references but is a summary of a rapid review.

Key findings

- Evidence persists that exposure to asbestos and asbestos containing materials (ACMs) threatens the health of humans, causing severe diseases including mesothelioma, asbestosis and cancers of the lung, larynx, and ovary.
- Millions of metric tons of asbestos are still in buildings and in products across the world, and new ACMs are being manufactured and introduced into commerce.
- The threat of asbestos to humans and to the environment is particularly dire in areas where there is a lack of coordinated asbestos management plans, reduced awareness about asbestos health risks, or delay in the implementation of asbestos-ban.
- Globally in 2016, occupational exposure to asbestos caused an estimated 209,481 deaths, which stands for more than 70 per cent of all deaths from work-related cancers.
- Asbestos contamination as an impurity has been found in consumer products, including powdered cosmetics, baby powder and crayons.

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- There is ongoing evidence that mismanagement of asbestos is resulting in elevated healthcare expenses that surpass any benefits. Over the lifetime of all patients with an asbestos-related disease, burden of disease costs has been estimated to be US$11 billion.
- Efforts to tackle the continuing risks of asbestos have been implemented, yielding valuable lessons. Asbestos mining and use persist because regulations on asbestos are weak or inadequate; there is low awareness on hazards of asbestos exposure and on the availability of safer alternatives; and removal of asbestos from existing structures is costly and complex.
- An examination of the economic effects of asbestos bans concluded that in countries that transitioned away from asbestos, no negative economic impact was seen following the enforcement of the bans.
- In certain instances, the lack of consensus within the government has hindered national efforts to implement effective controls and/or bans on asbestos use, highlighting the difficulty of achieving multisectoral governance.

Considering the existing evidence, the following five recommended options for management of asbestos are suggested to guide relevant stakeholders and others:

- Option 1: Reinforcing legal frameworks and institutional mechanisms to bolster the elimination asbestos-related diseases by stopping the use of all types of asbestos and managing asbestos risks across its entire life cycle.
- Option 2: Investigating and adopting safer alternatives to asbestos and incorporating innovative and sustainable solutions throughout product value chains, using a life-cycle approach.
- Option 3: Adopting evidence-based strategies to deal with asbestos already in use and to tackle the legacy uses and exposure to asbestos.
- Option 4: Cultivating partnerships and improving resource mobilization, to reinforce capacity-building and advance awareness-raising efforts about the risks of asbestos.
- Option 5: Enhancing the generation of comprehensive knowledge and data, strengthening early diagnosis, treatment, and rehabilitation services, and ensuring access to information concerning asbestos to support informed decision-making and actions.

These options align with the strategic objectives and targets outlined in the Global Framework on Chemicals - For a Planet Free of Harm from Chemicals and Waste (GFC). The GFC’s unique and multi-stakeholder approach can contribute to addressing asbestos contaminants in products and the environment while driving the transformational shift towards innovation to provide safer and more sustainable products and advancement of sustainable consumption and production patterns.

The outlined options for addressing asbestos-related issues are mutually reinforcing, creating a comprehensive and interconnected strategy. Customizing these five options to align with specific regional and national conditions is essential for effectively managing and mitigating the risks associated with asbestos contamination in both products and the environment.

Option 1 serves as a foundational pillar, focusing on reinforcing legal frameworks and institutional mechanisms to eliminate asbestos-related diseases. Robust legal structures and institutional support are vital for ensuring compliance, monitoring asbestos life cycles, and enforcing the cessation of asbestos use.

Options 2, 3, and 5 build upon this foundation, providing practical measures such as exploring safer alternatives, adopting evidence-based strategies for existing asbestos, and emphasizing knowledge generation and access.

Option 4 acts as a cross-cutting element, centred around partnerships, resource mobilization, capacity-building, and awareness efforts. By fostering collaborations and enhancing awareness, Option 4 strengthens the overall capacity to implement legal, practical, and knowledge-based measures proposed in Options 1, 2, 3, and 5.

Together, these options collectively form a synergistic and mutually supportive strategy to effectively tackle the challenges associated with asbestos.

Introduction: addressing asbestos matters

While progress in minimizing adverse impacts of asbestos and ACMs has been made, more innovative, ambitious, and urgent action by all stakeholders and sectors is needed to protect present and future generations.

As detailed in Figure 1, exposure to asbestos may happen through different pathways and releases.

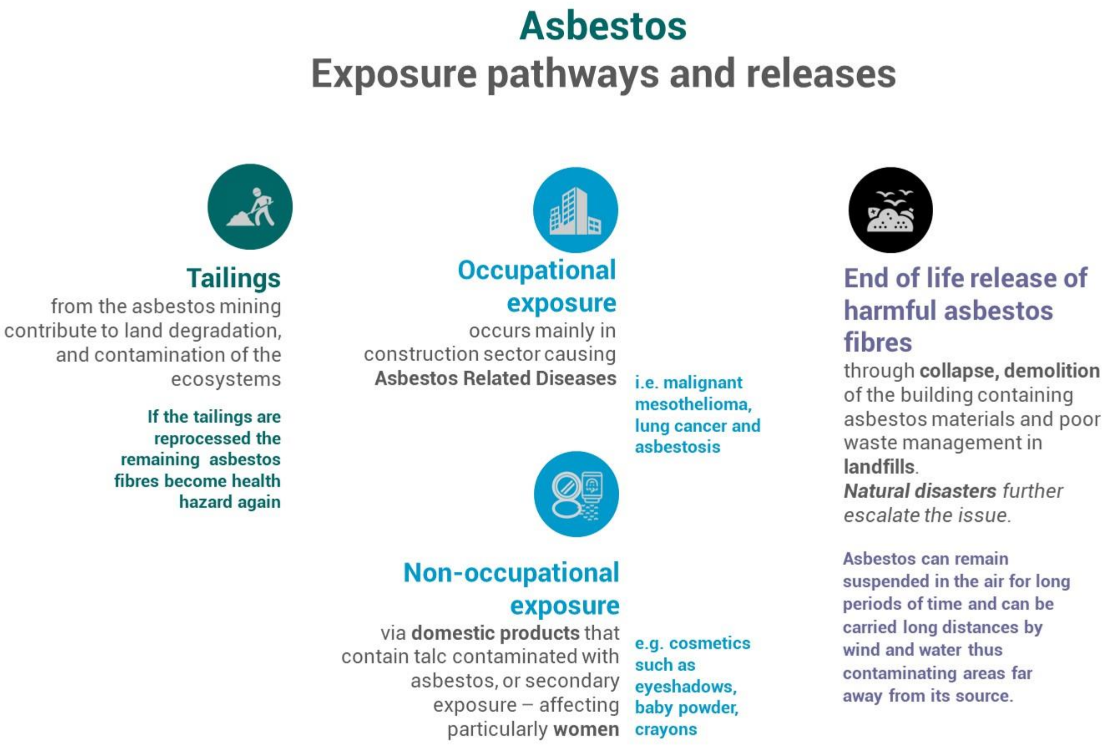

Figure 1. Asbestos exposure pathways and releases

(Sources: Landrigan 1992; Olsen et al. 2011; Emmett and Cakouros 2017; ILO 2019; Wallis et al. 2020; WHO 2021; Indiana Department of Environmental Management 2023; ILO 2023)

Globally as of 2016, occupational exposure to asbestos represented over 70 per cent of deaths from work-related cancers (WHO/ILO Joint Estimates). It caused an estimated 209,481 deaths and the loss of 3.97 million disability-adjusted life years from trachea, bronchus, and lung cancers; ovary cancer; larynx cancer; and mesothelioma (WHO and ILO 2021; Pega *et al.* 2022). Most of the workers exposed to asbestos belong to the construction sector, followed by waste management, and mining and quarrying related jobs (Mandrioli *et al.* 2018; European Commission 2022; Schlünssen *et al.* 2023).

Non-occupational exposures, often affecting women, are more likely to be under-recognized and underestimated (D'Agostin *et al.* 2018; Krówczyńska and Wilk 2019). Because of occupational gender differences, women have a higher risk of exposure from domestic products such as talc contaminated with asbestos, or secondary exposure to asbestos, for example from family members working with asbestos carrying residues home with them (Gordon *et al.* 2014). Studies have shown that over 60 per cent or greater of mesothelioma cases in women are likely attributable to non-occupational asbestos exposures (Rake *et al.* 2009; Lacourt *et al.* 2014).

Health impacts

All forms of asbestos can cause asbestos-related diseases (International Agency for Research on Cancer [IARC] 2012; WHO 2014a). This includes asbestiform minerals, such as erionite and antigorite and all forms of asbestos found as a natural contaminant of other minerals, e.g. talc, vermiculite and feldspar.

Exposure to asbestos causes cancers of the lung, larynx and ovary and asbestosis. Asbestos acts as a carcinogen in lung carcinoma and the combination of cigarette smoking and asbestos exposure greatly increases the risk of lung cancer (Villeneuve *et al.* 2012). Asbestosis is a respiratory disease marked by inflammation and scarring of the lungs that restricts lung expansion (Carbone *et al.* 2011). For all of these, the latency period from the time of first inhalation of asbestos to detectable disease is characteristically long; for mesothelioma, the risk of disease plateaus around 50 years after first exposure (Reid *et al.* 2014).

ILO has a long history in the identification of diseases as occupational for the purpose of their prevention and compensation. The List of Occupational Diseases Recommendation, 2002 (No. 194), adopted by the International Labour Conference in 2002, annexed a list of occupational diseases, which was revised in 2010 (ILO 2010). The causal relationship between work and disease is established based on clinical and pathological data, occupational background and job analysis, identification, and evaluation of occupational risk factors and of the role of other risk factors (ILO 2009).

Environmental effects

When construction, demolition, mining and manufacturing activities release asbestos into the environment, it contaminates the air (where it can be inhaled) (Bautista Sierra and Lamus Delgadillo 2019; Pena-Castro et *al.* 2023), water (where it can be ingested) (Cunningham and Pontefract 1971; Murr and Kloska 1976; Andersen *et al.* 1993; Varga 2000; Wang and Cullimore 2010; Bunderson-Schelvan *et al.* 2011; Kim *et al.* 2013; WHO 2014a; Di Ciaula and Gennaro 2016; Di Ciaula 2017; Punurai and Davis 2017; Van Laarhoven *et al.* 2021; Avataneo *et al.* 2022a; Avataneo *et al.* 2022b; WHO 2022; Zavašnik *et al.* 2022; Pena-Castro *et al.* 2023) and soil (where it can easily be distributed and redistributed into the air and water) (Ricchiuti *et al.* 2020). Asbestos can remain suspended in the air for long periods of time and can be carried long distances by wind or water before settling, thus contaminating areas far away from its source. Asbestos does not break down or biodegrade (Indiana Department of Environmental Management 2023).

Studies on the impact of asbestos on wild fauna and flora is scarce. The findings from studies conducted on animals mirror the established health impacts of asbestos in humans. Various tests were conducted to assess the carcinogenicity of asbestos through different administration methods in rats, hamsters, mice and humans. Inhalation of amosite, anthophyllite and tremolite resulted in mesothelioma and lung carcinomas in rats, while intrapleural administration led to mesothelioma. Additionally, intrapleural administration of amosite and anthophyllite induced mesothelioma in hamsters. Mice and rats subjected to intraperitoneal administration of amosite exhibited peritoneal tumours, including mesothelioma. Similarly, when administered through the same route, tremolite and actinolite induced abdominal tumours in rats (IARC 1987; Soffritti *et al.* 2003). These experimental results provide insights into the carcinogenic effects of asbestos and its various forms across different animal species. Asbestos fibres were observed in several wild animal species such as rodents living in and around asbestos contaminated areas (Puleio *et al.* 2013; Campopiano *et al.* 2020; Ingravalle *et al.* 2020). The anatomopathological analysis conducted by the Campopiano *et al.* 2020 study showed that 60 per cent of the examined animals had macroscopic lesions affecting their lungs.

Deterioration of ecosystems is evident in many asbestos mines, particularly closed/abandoned sites. For instance, in southeastern Quebec, asbestos mining residues cover an area of 2308 hectares. About 800 million tonnes of tailings are vestiges of this mining industry, along with socio-economic and environmental impacts resulting from mine closure. Ecological restoration of asbestos tailings and waste rock involves many considerations, including high costs and health risks related to asbestos dust exposure during the process (L´evesque *et al.* 2020).

Social and economic effects

Living with an asbestos-related disease is a burden for patients and their families, who experience a compromised quality of life. Costs associated with reduced quality of life cannot be compared or added to other economic costs. Over the lifetime of all patients with an asbestos-related disease, burden of disease costs is estimated to be US$11 billion (Aljunid *et al.* 2020). For example, the annual global healthcare costs associated with asbestos are estimated to be US$2.4–3.9 billion, excluding the additional costs of pain, suffering and welfare losses. In the United States alone, asbestos litigation costs have been estimated at another US$2.3 billion per year (WHO 2018a).

Despite the significant costs of inaction on asbestos, some countries have not developed strong policies on asbestos phase out or control due to the assumed negative economic impact of such measures (WHO 2018a). However, an assessment of the economic costs to society of asbestos production and use, published by WHO and the economic consulting company National Economic Research Associates [NERA] in 2017, showed no significant negative economic impact from asbestos bans or declines in asbestos production or use (WHO 2018a).

On the other hand, costs arising from the victims' compensations and legal actions against companies are significant. In some specific cases these compensation claims can be for large sums and may place the very survival of the company in doubt. The scale of this reimbursement and its economic impact depends both on the quantities of asbestos used in a given country and, above all, on the social security provisions in place for workers (International Social Security Association [IISA] 2006). For example, European Union legislation has implemented regulations aimed at safeguarding against and preventing asbestos exposure risks in work environments, however the legal frameworks on compensation for victims vary across European countries[3] (Institute for International Research, Development, Evaluation and Counselling 2013).

Text box 1: Measures to support asbestos victims in Japan *(Source: Japan Research Office on Environment 2008, otherwise referred in particular)*

Two legal instruments address the health aspects of asbestos: the Industrial Accident Compensation Insurance Act (Industrial Accident Act), 1947, and the Act on Asbestos Health Damage Relief (Asbestos Relief Act), 2006. A worker who is exposed to asbestos and develops asbestos-related diseases such as asbestosis, lung cancer or mesothelioma is subject to compensation under the Industrial Accident Act. However, victims from household exposure or environmental exposure are not covered.

The Asbestos Relief Act was developed to fill the gap in the Industrial Accident Act to provide compensation to the asbestos victims and bereaved families. In fiscal year 2022, a total of 1,310 cases were covered under these two schemes (Japan Ministry of Health Labour and Welfare 2023).

Many countries have also introduced asbestos victim relief schemes to resolve the issue of victims of asbestos related diseases not receiving compensation through conventional legal orders (Lee *et al.* 2021).

Life cycle

The asbestos life cycle and value chain encompass the entire process – from mining to processing, manufacturing and distribution of asbestos and asbestos-containing materials. This also includes installation, use, maintenance, and renovation, covering the various stages that asbestos-containing materials undergo from extraction or manufacturing to disposal or removal.

Figure 2 highlights key facts and figures about asbestos along value chain.

[3] Most European Union Member States (except Estonia) have a specific occupational diseases compensation system. The specific systems give different benefits to those given for non-occupational diseases. In countries which have specific compensation systems, benefits are often more generous. Cash benefits may be higher, the way of calculating the pension (in case of permanent injury) is more favourable to the victim, and other benefits can be offered, such as rehabilitation. In those countries that do not have a specific system of compensation, a temporary loss of ability to work is covered under the general health insurance system, while disability and death are covered by the relevant disability or pension insurance provisions (European Commission 2013). Croatia and Slovenia, however, have a specific compensation system for occupational asbestos-related diseases (Institute for International Research, Development, Evaluation and Counselling 2013).

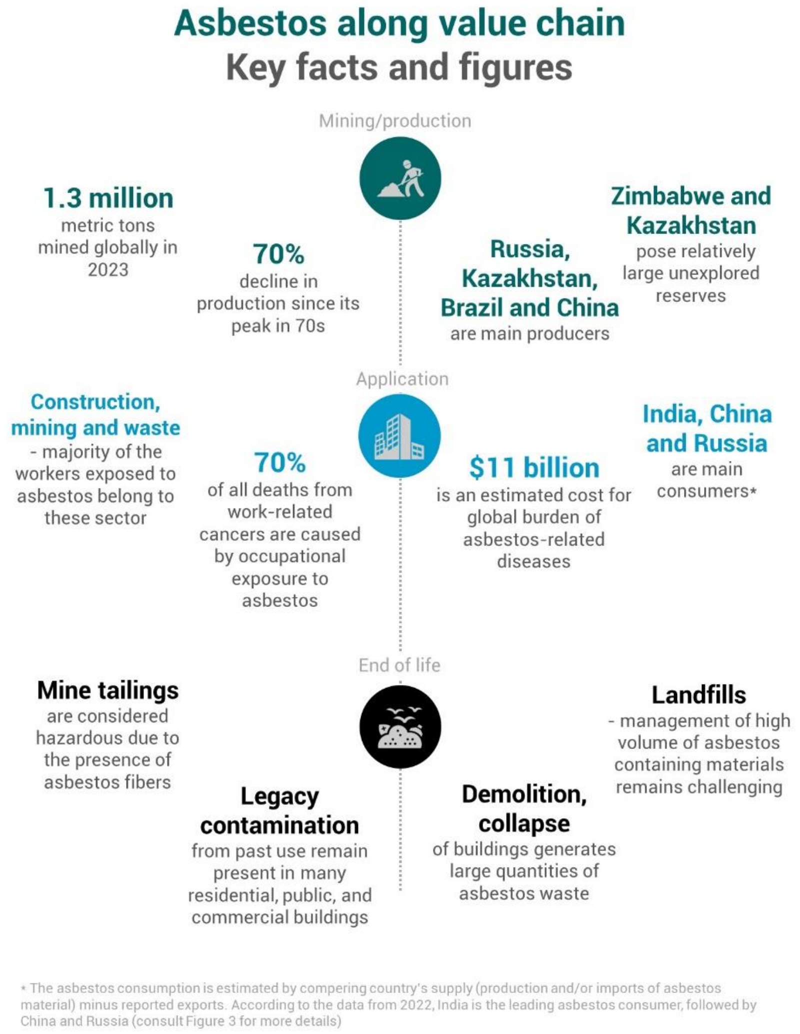

Figure 2. Asbestos along value chain – key facts and figures

(Sources: Godish 1989; LaDou 2004; Ramazzini 2010; International Agency for Research on Cancer [IARC] 2012; WHO 2014a; Henderson and Leigh 2017; Rackley 2017; Spasiano and Pirozzi 2017; Aljunid et al. 2020; United States Geological Survey [USGS] 2023; World Bank, United Nations Conference on Trade and Development, International Trade Centre, United Nations Statistics Division and World Trade Organization [WTO] 2023a and 2023b)

At its peak in the 1970s, global asbestos production was as high as 4.8 million metric tons. Thanks to accumulated knowledge on its adverse health effects, many countries strengthened the regulations on asbestos use. In 2023, the world mine production of asbestos was estimated to be approximately 1.3 million metric tons (United States Geological Survey [USGS] 2023). The Russian Federation and Kazakhstan produce the largest volumes of asbestos (700,000 and 230,000 metric tons respectively), followed by Brazil (with 190,000 metric tons) and China (130,000 metric tons) (USGS 2023).

Global asbestos reserves are estimated to be large, even though available information is insufficient to make accurate estimates for many countries (USGS 2023). In 2021, top exporters of asbestos were the Russian Federation (600,569 metric tons), Kazakhstan (232,366 metric tons) and Brazil (153,571 metric tons) (World Bank [WB], United Nations Conference on Trade and Development [UNCTAD], International Trade Center (ITC), United Nations Statistical Division (UNSD) and World Trade Organization [WTO] 2023a). Top importers of asbestos were India (409,987 metric tons), Indonesia (130,038 metric tons) and China (140,088 metric tons) (WB, UNCTAD, ITC, UNSD and WTO 2023b).

Zou *et al.* 2023 analysed 66,156 trade records from the United Nations Comtrade database for the period of 2004–2019 covering 46 chemicals or groups listed under the Rotterdam Convention to look into the continuing large-scale global trade and illegal trade of highly hazardous chemicals. From that study, the top trade flows of asbestos materials in 2022 can be estimated (see Figure 3).[4] Currently, the same HS code 2524.90 is assigned for actinolite, anthophyllite, amosite, chrysotile and tremolite. The crocidolite trade shows a clear declining tendency (for example, about 0.3 kilo tonnes in 2019, which is 2 per cent of the trade volume in 2010). By contrast, trade activities for the other five varieties remain constant since 2013 – at an annual trade of around 1 megaton – with chrysotile being dominant.

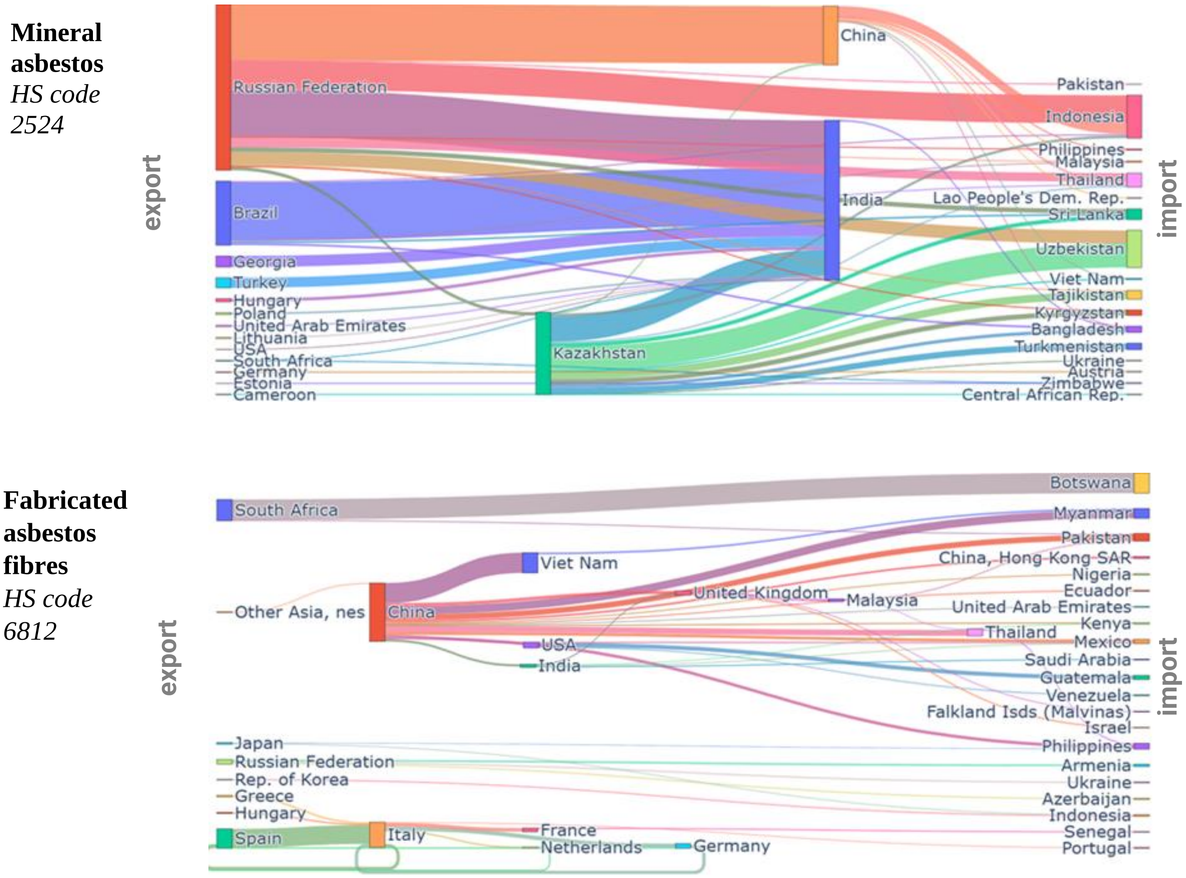

Figure 3. Top trade flows of asbestos materials in 2022

(Source: Zou et al. 2023)

The major use of asbestos globally is in asbestos cement construction materials such as cement pipe and roofing sheets (WHO 2014b; USGS 2023). To better understand the trends in use and trade of asbestos, the concept of material consumption could be applied. The asbestos consumption is estimated by comparing country's supply (production and/or imports of asbestos material) minus reported exports.

Figure 4, presenting data from 2022, shows India as the leading asbestos consumer, followed by China and the Russian Federation.

[4] Five varieties of asbestos are currently listed under the Rotterdam Convention (actinolite, anthophyllite, amosite, crocidolite and tremolite). The listing of chrysotile asbestos in the Convention has been considered by the governing body of the Convention since its 3rd meeting in 2006.

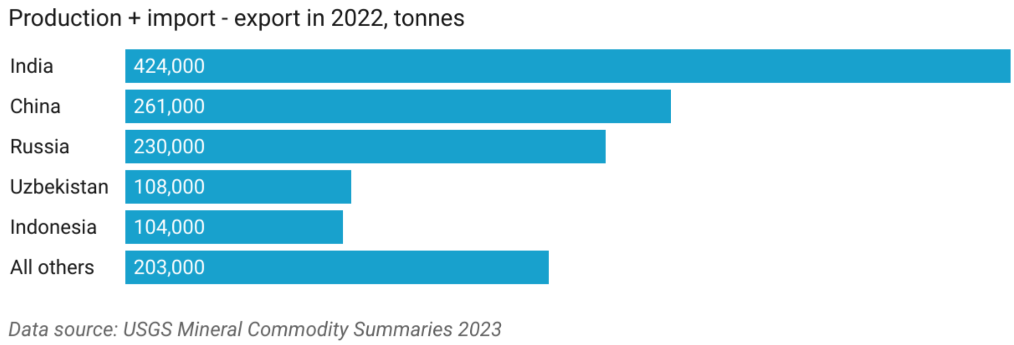

Figure 4. World asbestos consumption

(Source: USGS Mineral Commodity Summaries 2013)

The waste materials left over from asbestos mining operations include asbestos tailings, which are typically considered hazardous due to the presence of asbestos fibres (USGS 2023). The quantity of asbestos mine tailings available globally was estimated in 2017 to be in the range from two to six billion tonnes (Rackley 2017). In some cases, the tailings might be reprocessed to extract remaining asbestos (USGS 2023).

Asbestos is part of the daily life of the population as asbestos-containing materials are present in many buildings constructed and renovated before the 1990s (Thives *et al.* 2022). Large quantities of asbestos remain a legacy from past use in construction of many residential, public and commercial buildings (Ramazzini 2010). As of 2009, there were about 150 million m^2 of asbestos-based products in use and more than two thousand million m^2 of cement-asbestos roofings (Gualtieri *et al.* 2009). For example, Japan found substantial asbestos presence in public facilities including schools, hospitals, wholesale markets, train stations and bus terminals (Japan Research Office on Environment 2008). In the United States of America, there was asbestos in approximately 840,000 public and commercial buildings including schools (Powell *et al.* 2015). In the Republic of Korea, a large amount of imported asbestos was used in the roofing material of a government-led project to remodel old buildings during the 1970s (Choi *et al.* 1998), much of which was still in place as of the start of this decade (Kim *et al.* 2020). The Australian government estimated that the disposal flow of asbestos is estimated to peak at about 167 thousand tons in 2030 (Asbestos Safety and Eradication Agency of Australia [ASEA] 2021).

When buildings that were constructed or refurbished with asbestos containing materials, are demolished or collapsed it generates large quantities of asbestos waste, leading to the release of harmful asbestos fibres (Kim *et al.* 2015). For example, more than 5,000 tons of asbestos waste was discovered after the collapse of the World Trade Center in New York, and the amount of released asbestos fibres reached 555 times the acceptable limit (Klotter 2002).

Natural disasters further escalate the issue[5] by exposing firefighters, first-aid responders and clean-up workers to the harmful asbestos possibly present in the damaged buildings (Fire Safe Council Santa Barbara County 2023). According to a study conducted in Poland, at the current removal rate of asbestos-containing products, these materials are unlikely to be eliminated from the country by the established deadline (end of 2032) and are likely to persist for at least 27 years and up to 193 years, depending on the specific province. On a national scale, an average removal rate indicates that a total of 83 years would be required for the comprehensive elimination of asbestos products (Klojzy-Karczmarczyk and Staszczak 2022).

Asbestos waste materials from demolition or removal are often disposed of in landfills and rarely disposed of in its pure fibrous form – rather it is commonly combined within a building material matrix, e.g. concrete. This greatly increases the volume of asbestos containing materials to landfill. Assuming an average asbestos concentration of five per cent, the total contaminated waste ultimately requiring disposal is estimated to be about four billion tonnes globally (Wallis *et al.* 2020). Deteriorating asbestos-containing building materials and continuing use of asbestos in some countries will only add to this burden (Wallis *et al.* 2020).

[5] For example, the 2019 Tropical Cyclone Idai caused catastrophic damage and a humanitarian crisis in Mozambique, Zimbabwe and Malawi, leaving more than 1,300 people dead and many more missing. The cyclone left a high exposure of hazardous waste, primarily asbestos from lusalite sheets (ILO 2019). Construction workers were particularly exposed when clearing up older damaged buildings (ILO 2023).

Several factors drive continued asbestos mining and use and hinder its environmentally sound management. First, countries continue to use asbestos, claiming that it is economical and useful (Frank 2020). Weak or inadequate asbestos regulations can enable its continued use in certain industries or products (Rotterdam Convention Secretariat 2023). Secondly, asbestos-related diseases, such as mesothelioma and asbestosis, have a long latency period, sometimes spanning several decades (French Institute for Public Health Surveillance 2011; Huh *et al.* 2022). This delay can make it challenging to link current exposure to future health problems, leading to complacency (Luus 2007). Limited awareness about the dangers of asbestos exposure and the existence of safer alternatives also contributes to its continued use. While the awareness is lacking in some, in others, the issue of asbestos is seen as something of the past, even as many buildings and industrial facilities constructed before asbestos bans still contain asbestos-containing materials. Removing asbestos from existing structures is extremely costly and complex (Quezada *et al.* 2018).

Asbestos regulations and bans: status and lessons learned

The ILO Asbestos Convention, 1986 (No. 162), together with other international labour standards, including several relevant conventions and recommendations[6], provide a solid legal bases as well as practical guidance for comprehensive preventive measures at the national and enterprise levels to protect workers and prevent asbestos-related diseases. Convention No. 162 applies to all activities involving exposure of workers to asbestos in the course of work. The key provisions concern the replacement of asbestos or of certain types of asbestos or products containing asbestos with other materials or products evaluated as less harmful, the total or partial prohibition of the use of asbestos or of certain types of asbestos or products containing asbestos in certain work processes, and measures to prevent or control the release of asbestos dust into the air and to ensure that the exposure limits or other exposure criteria are complied with and also to reduce exposure to as low a level as is reasonably practicable. Furthermore, Convention No. 162 provides that "employers shall dispose of waste containing asbestos in a manner that does not pose a health risk to the workers" and "appropriate measures shall be taken by the competent authority and by employers to prevent pollution of the general environment by asbestos dust released from the workplace."[7]

The Rotterdam Convention includes all types of asbestos of the amphibole group (namely actinolite, amosite, anthophyllite, crocidolite and tremolite) in its Annex III of chemicals that have been banned or severely restricted for health or environmental reasons by two or more Parties and which the Conference of the Parties (COP) to the Rotterdam Convention has decided to subject to the prior informed consent (PIC) procedure. Chrysotile asbestos has been considered by the COP for inclusion in Annex III since its third meeting in 2006. However, Parties have not reached consensus on the listing of chrysotile asbestos, including at the eleventh meeting in 2023, when the COP decided to defer further consideration of the matter to its twelfth meeting.

Under the Basel Convention, Annexes I and VIII on categories of wastes to be controlled include entry Y36 Asbestos (dust and fibres) and entry A2050 Waste asbestos (dust and fibres). Wastes listed under any category contained in Annex I and Annex VIII are hazardous wastes, unless they do not possess any of the characteristics contained in Annex III and are subject to the Convention's provisions, namely that transboundary movements of these wastes are controlled through the Convention's prior informed consent procedure, the generation of these wastes is reduced to a minimum, and their environmentally sound management (ESM) is promoted.

The World Health Organization is also committed to working with countries along the following four strategic directions (WHO 2018a): 1) By recognizing that the most efficient way to eliminate asbestos-related diseases is to stop the use of all types of asbestos; 2) By providing information about solutions for replacing asbestos with safer substitutes and developing economic and technological mechanisms to stimulate its replacement; 3) By taking measures to prevent exposure to asbestos in place and during asbestos removal; 4) By improving early diagnosis, treatment and rehabilitation services for asbestos-related diseases and establishing registries of people with past and/or current exposure to asbestos.

[6] In particular the Occupational Cancer Convention and Recommendation, 1974, the Working Environment (Air Pollution, Noise and Vibration) Convention and Recommendation, 1977, the Occupational Safety and Health Convention and Recommendation, 1981, the Occupational Health Services Convention and Recommendation, 1985, the list of occupational diseases as revised in 1980 appended to the Employment Injury Benefits Convention, 1964, as well as the Code of practice on safety in the use of asbestos, published by the International Labour Office in 1984, and establishes the principles of national policy and action.

[7] ILO Asbestos Convention text available at: https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C162.

At the national level, a range of options for managing the import, manufacture, sale, use and reuse of asbestos and asbestos containing materials has been applied. According to the International Ban Asbestos Secretariat there are 69 countries that have banned asbestos to date (see Figure 5). In some other cases, countries have not officially banned asbestos but have ratified ILO conventions that aim to protect workers and prevent asbestos-related diseases.

To ensure the compliance with the ban and to manage the related asbestos issues, various measures have been documented at the national level, including:

- Development of national strategy roadmaps, including National Asbestos Profile (NAP)[8] as an internationally standardized instrument that is designed to define the baseline situation of a country and measure its progress towards eliminating asbestos-related diseases (Arachi *et al.* 2021) (see text box 2).
- Establishment of the national inventories, e.g. with an aim to 1) record exposure and health impacts[9,10]; 2) maintain public record of buildings that contain asbestos[11;] or 3) track companies that might produce.[12]
- Creation of the national coordinating committee on asbestos among relevant ministries (see text box 4).
- Awareness campaigns and providing public access to information on the asbestos contamination ways to prevent exposure.[13]
- Use of occupational disease lists (ODLs) as essential legal mechanisms for recognizing exposure to occupational hazards and assisting in settling compensations.[14]

[8] Including: Australia, Bangladesh, Bulgaria, Cambodia, Germany, India, Indonesia, Japan, Lao, North Macedonia, Mongolia, Nepal and Philippines. E.g. Australia developed a National Strategic Plan for Asbestos Awareness and Management (Asbestos National Strategic Plan) to eliminate asbestos-related diseases in by preventing exposure to asbestos fibres. The Asbestos National Strategic Plan 2019–2023 builds on the previous plan's progress. It complements and enhances existing asbestos policies, plans and actions at all levels of government. Its priorities are (1) asbestos awareness, (2) identification, (3) removal and (4) international collaboration (Asbestos Safety and Eradication Agency of Australia [ASEA] 2023).

[9] E.g. Australian National Asbestos Exposure Register (NAER) that records information for members of the community who may have been exposed to asbestos, for their future reference (Asbestos Safety and Eradication Agency of Australia [ASEA] 2023a). However, as the NAER is voluntary and self-reported and the information recorded is based on each registrant's recollection of events, the data does not provide an accurate picture of asbestos exposures or asbestos-related disease in Australia (Asbestos Safety and Eradication Agency of Australia [ASEA] 2022a).

[10] The French National Mesothelioma Surveillance Program (NMSP) was established in 1998 by the National Institute for Health Surveillance (InVS). Its objectives are to estimate the trends in mesothelioma incidence and the proportion attributable to occupational asbestos exposure, to help improve its diagnosis, to assess its compensation as an occupational disease and to contribute to research (Goldberg *et al.* 2006).

[11] In Canada, the National Asbestos Inventory lists all buildings owned or leased by Public Services and Procurement Canada (PSPC) and indicates whether they contain asbestos as of December 2022 (Government of Canada 2023).

[12] In the United States, the Asbestos Information Act (Public Law 100-577) helped to provide transparency and identify the companies making certain types of asbestos-containing products by requiring manufacturers to report production to the Environment Protection Agency (US Environment Protection Agency [EPA] 2023).

[13] For example Worksafe New Zealand, the primary agency overseeing asbestos management in New Zealand, provides awareness resources on the official Worksafe government site, covering topics such as working with asbestos, guidance for homeowners and landlords, licensing for asbestos removal companies, asbestos disposal, importing asbestos-containing materials, and personal protective equipment - https://www.worksafe.govt.nz/topic-and-industry/asbestos/. Additionally, the New Zealand Demolition and Asbestos Association have established a website to furnish tradespeople and homeowners with clear information on mitigating the risks of asbestos exposure. The platform combines regulatory requirements with practical advice on asbestos identification and safe work practices to minimize exposure - https://www.asbestosawarenz.com.

[14] E.g. European Union (EU) Member States in Central and Eastern Europe (CEE) have adopted the EU list of occupational diseases into their own legal framework.

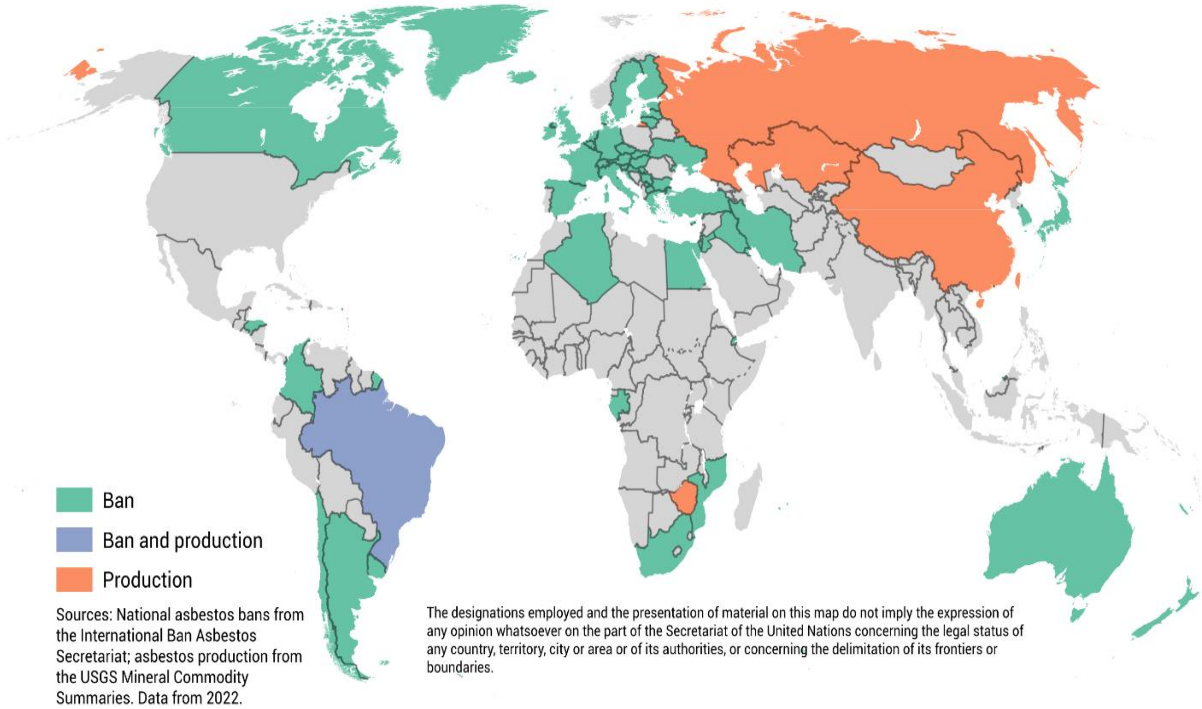

Figure 5. Global Asbestos Bans and Production[15]

(Sources: National asbestos bans from the International Ban Asbestos Secretariat 2022; Asbestos production from the USGS Mineral Commodity Summaries 2022)

Text box 2. National Action Plan to address asbestos and asbestos containing materials – Poland case study *(Source: Ministry of Development and Technology 2024)*

In Poland, a comprehensive legal framework[16] prohibits the production, trade and introduction of products containing asbestos within the national customs territory. Recognized in EU documents[17], Poland is acknowledged as a leader in endeavours to eliminate asbestos within its borders, reflecting the country's commitment to upholding high standards of environmental safety.

However, the significant challenge in the asbestos removal process lies in the widespread distribution of asbestos-containing products throughout Poland, particularly in residential and agricultural structures. This extensive dispersion poses a considerable obstacle to the overall asbestos removal efforts, complicating the task of addressing asbestos-related risks in various communities.

[15] Brazil imposed a ban in 2017, but a state law under dispute in the courts has been keeping the asbestos mine operational. On February 23, 2023, Brazil's Supreme Court (STF) upheld a decision banning the commercial exploitation of asbestos (source: Brazil Asbestos Ban Upheld! (ibasecretariat.org)).

[16] These regulations, outlined in the Act of June 19, 1997, the Labor Code of April 26, 1974, the Environmental Protection Law of April 27, 2001, and the Waste Act of December 14, 2012, and their associated implementing acts, establish stringent measures for asbestos protection.

[17] Opinion of the European Economic and Social Committee on 'Freeing the EU from asbestos' (2015/C 251/03) – "Today, Poland is the only EU country that has established a nation-wide programme for the removal of all existing asbestos estimated at EUR 10 billion up to 2030, with a clear timeframe and the corresponding financing through a mixture of public (State, EU programmes) and private (owners, territorial associations, etc.) means. This type of initiative needs to be launched in all EU countries." Opinion of the European Economic and Social Committee on 'Working with Asbestos in Energy Renovation' (own-initiative opinion) (2019/C 240/04) – "Poland is a notable exception: the country has an ambitious asbestos abatement programme that enjoys public support and is facilitated by the existence of a publicly accessible register for asbestos." European Parliament resolution of 20 October 2021 with recommendations to the Commission on protecting workers from asbestos (2019/2182(INL)) – "Welcomes the fact that several Member States and regions are currently pursuing ambitious plans to remove asbestos from the built environment with clear timelines, including the Netherlands, Poland and Flanders."

From 2004 to 2013, extensive research assessed asbestos fibres concentrations in the air across 949 municipalities in Poland, encompassing 1634 measurement points.[18]

The Programme for Asbestos Abatement in Poland, executed from 2009 to 2023, has demonstrated significant achievements. This programme involved extensive training, reaching 196 thousand individuals, subsidies for inventory initiatives, clean-up of former asbestos-producing plants, financial support programmes for product removal, and educational activities for construction-related fields. The Amiantus initiative targeted former employees to detect asbestos-related diseases, contributing to occupational health reporting.

As of January 2024, the Asbestos Database has inventoried 8.6 million tons of asbestos-containing products, with 1.7 million tons of asbestos waste neutralized, reflecting the programme's substantial impact on reducing asbestos-related risks and enhancing environmental and public health in Poland.

Lessons learned

An examination of the economic effects of asbestos bans (using country-level data) concluded that as countries have shifted away from asbestos, no observable negative economic impact; and that continued use of asbestos is expected to result in substantial costs, including health costs as well as remediation/removal costs and potential litigation costs (Allen *et al.* 2018).

Text box 3. Economic transition after the asbestos ban in Quebec, Canada *(Source: Allen et al. 2018)*

At its peak in 1970, Canada produced 1.5 million metric tons of asbestos (43 per cent of the world total). Most of the Canadian asbestos production took place in one province – Quebec. The last two asbestos mines in Canada, both located in Quebec, closed in 2011. After mines closure, the Government of Canada launched initiative to support the economic transition of communities economically linked to the chrysotile asbestos industry. The initiative was in effect until 2020 and had a budget of C$50 million for projects to create jobs in the secondary and tertiary sectors. The town of Asbestos in the Estrie (Eastern Townships) region, for example, received funding for construction of a new road to facilitate expansion of an industrial park and the renovation of regional park reception centre to help accommodate visitor traffic and develop the tourism industry.

In some cases, endeavours at the national level—frequently led by health authorities and local experts—have encountered challenges in implementing effective controls and/or bans on asbestos use, due to a lack of consensus within the government, underscoring the complexities of multisectoral governance (Kanchanachitra *et al.* 2018).

Text box 4: Whole of government approach to eliminating asbestos-related diseases - case studies

In Australia, the Asbestos Safety and Eradication Agency was established as an independent entity through the Asbestos Safety and Eradication Agency Act 2013. This demonstrates a dedicated commitment to allocate sufficient resources for the eradication of asbestos-related diseases. Its role is to coordinate the implementation of the Asbestos National Strategic Plan. This Plan outlines a phased approach to eliminating asbestos-related diseases in Australia and establishes a framework for all governments to work together to improve asbestos awareness and the safe and effective management, removal and disposal of asbestos. On the 7 December 2023, the agency's functions were expanded to include silica through an amendment of the Asbestos Safety and Eradication Agency Act 2013. The agency's name was also changed to the Asbestos and Silica Safety and Eradication Agency (ASEA 2024).

[18] The results indicated that approximately 38 per cent of locations had low concentrations (up to 400 fibres/m3), 44 per cent exhibited moderate concentrations (400 to 1000 fibres/m3), and 18 per cent recorded high concentrations exceeding 1000 fibres/m3. These findings provide crucial insights into the distribution and levels of asbestos fibres, informing efforts to manage and mitigate airborne asbestos exposure.

In Finland, the Finnish Institute of Occupational Health serves as the lead agency for implementing the Asbestos Programme, owing to its primary role in handling issues related to asbestos exposure in the workplace. Despite being the lead agency, they opted for a collaborative approach, forming a multi-agency task force composed of representatives from six relevant ministries and government agencies to shape and execute the legal reform process (Secretariat of the Pacific Regional Environment Programme [SPREP] 2021).

In the United States of America, the Environmental Protection Agency (EPA) enforces laws and issues regulations aimed at safeguarding the public from asbestos exposure. EPA's mandate covers toxic substances, hazardous air pollutants and hazardous waste. Other agencies, such as the Occupational Safety and Health Administration, Consumer Product Safety Commission and Mine Safety and Health Administration also implement asbestos regulations in line with their respective mandates (US EPA 2024).

Even if intentional commercial uses of asbestos are banned and handling of legacy products is regulated, exposure is possible when handling other minerals (e.g. talc, dolomite and olivine) where asbestos occurs as an impurity[19]. As an illustration, a study in 2004 revealed that due to the methods and locations of talc mining, mineral deposits used in the production of goods sold in the United States of America consistently shown contamination with amphibole asbestos, including tremolite and anthophyllite (Van Gosen *et al.* 2004). Asbestos contamination was found in powdered cosmetics (such as eyeshadows), baby powder (US PIRG 2018), crayons and some vermiculite products[20] (United States National Cancer Institute [NCI] 2023). For instance, European Union, following the ban on all use of asbestos, in 2021 adopted a supplementary measure – a resolution calling for a European strategy for the removal of all asbestos (European Commission 2022). It is therefore essential to monitor and control any unintentional asbestos contamination of consumer goods, e.g. by requesting sellers of talc and soapstone to provide proof that no asbestos can be detected in the material with the specified analytical methods (European Commission 2022).

Exploring safer alternatives

Since many countries have banned or heavily regulated asbestos use, safer alternatives[21],[22] have been developed for most applications. As in any case of chemical substitution, supplementary research (including life-cycle assessments (LCA)) and monitoring of the asbestos alternatives is warranted to avoid any unintended health and environmental consequences and regrettable substitutions. To make well-informed decisions on asbestos replacement, it is essential to conduct a LCA of potential alternatives. This assessment aims to comprehensively evaluate the environmental, economic, and technical performance of materials free from asbestos.

Recently, the health hazards of asbestos substitutes have been considered and much additional research is required. However, only some of the substitute materials have been assessed for health hazards, and health hazard data has not been sufficient in many cases. The examination of alternatives in a study conducted by Park (2018) concluded that initiatives should be undertaken to reduce workers' exposure to replacement materials devoid of asbestos.

[19] For example: A Dutch investigation of talc in cosmetic products analysed 232 cosmetic products for the presence of asbestiform talk. Two of the products were found to contain asbestiform tremolite fibres in concentrations up to 230 mg/kg and 40 mg/kg product, respectively (Netherlands Food and Consumer Product Safety Authority [NVWA] 2018). And a German investigation of 57 talc powders (technical and cosmetic), asbestos fibres were detected in 13 samples. In ten of the samples the weight content of asbestos ranged from 0.001 to 0.073%. In one talc powder analysed at two occasions, weight contents of 0.18 and 0.19% respectively (European Commission 2022).

[20] Mining of asbestos-contaminated vermiculite in Libby, Montana, resulted in an epidemic of asbestos-related disease in that community, and output from the mine is estimated to be installed as insulation in an estimated 15 to 30 million homes (US Food and Drug Administration 2023).

[21] http://www.ibasecretariat.org/bc_subst_asb_cem_constr_prods.php

[22] In the context of this paper, a safer alternative means replacing a hazardous substance with one which poses less or no risk. This may mean changing a production process, substituting a chemical or material, redesigning a product, or making a system change. The safer alternative transition is to identify functionally equivalent alternatives that meet the performance needs of a product while eliminating the hazardous chemical. Transitioning to safer chemicals can be complex. It is crucial that any change towards safer alternatives is made while avoiding regrettable substitution, meaning the replacement of a toxic chemical with one that has either unknown or greater toxic effects.

According to patent data[23] from the United States and Europe, fibrous materials may be considered as an alternative to asbestos. There are many kinds of fibrous materials, which can be classified into synthetic and natural fibres[24]. However, recent studies brought to lights evidence on health hazards, including links to cancers, of fibrous materials used as asbestos substitutes.[25]

The substitutes for asbestos material, as identified by Leprince in 2007, include:

a) In the building sector:
   - Mineral wool and ceramic fibre as substitute for asbestos containing insulation or soundproofing.
   - Synthetic vitreous fibres or clay as a substitute for sheets and boards containing asbestos.
   - Cellulose, polypropylene, polyvinyl alcohol fibre, aramid and glass fibres as substitute for asbestos products in cement (Park 2018).

b) In the textile sector:
   - Polyethylene, polypropylene, polyamide, carbon and glass fibre as substitutes for textile containing asbestos.

It is important to note that these alternatives have not been fully assessed for their overall environmental impacts (e.g. with LCA), so while they are not asbestos, and for some exists evidence of reduced health hazards, they might generate trade-offs with other environmental impacts (e.g. increased greenhouse gas emissions, impacts on biodiversity and water scarcity).

The WHO has assessed the hazards of 14 types of asbestos substitute materials, including para-aramid, attapulgite and carbon fibre (WHO 2005). Also, Harrison *et al.* 1999 has discussed the health hazards of para-aramid, polyvinyl alcohol and cellulose in comparison to chrysotile. According to the studies, the major characteristics related to the health hazards of fibre are its dose, dimensions (especially diameter) and durability.

In summary, even though some substitute materials have been assessed for health hazards, efforts should be enhanced to further assess and to ensure that the substitutes themselves do not have other negative environmental, social or health impacts (Park 2018).

[23] According to patent resources in the United States and Europe, asbestos substitutes have constantly been developed since before 1980 (Forte *et al.* 1975; Fox *et al.* 1979; Bartram *et al.* 1980; Harper *et al.* 1981; Limdeman *et al.* 1982; Malcolm *et al.* 1982; Albertson *et al.* 1983; Brunt *et al.* 1983; Mudd 1983; Tracy *et al.* 1983; Washabaugh 1983; Lancaster *et al.* 1985a; Lancaster *et al.* 1985b; Dougherty *et al.* 1986; Pallo *et al.* 1986; Genba *et al.* 1987; Bauer *et al.* 1990; Wargin 1990; Attard *et al.* 1994; Bachot *et al.* 1995; Bauer *et al.* 1995; Kusuyama 1995; Nakao 1995; Santaren Rome *et al.* 1996; Bachot et al. 1997; Latty *et al.* 1997; Bruno Hennecken *et al.* 2002; Velayutha 2002; Krowl 2005). An asbestos-free drywall joint compound was developed in 1975 (Forte *et al.* 1975), an asbestos-free tape sealant was developed in 1979 (Fox *et al*. 1979), and an asbestos-free friction material was developed in 1980 (Bartram *et al.* 1980). An asbestos-free gasket was developed in 1982 (Limdeman *et al.* 1982) and a method of manufacturing an asbestos-free glass fibre reinforced product was developed in 1983 (Brunt *et al.* 1983). Flexible sheet material suitable for use in the manufacture of asbestos-free gaskets was developed in 1985 (Lancaster *et al.* 1985b) and a method of manufacturing aramid-containing friction materials in 1986 (Dougherty *et al.* 1986). In 1996, a fibre-reinforced building material was developed using sepiolite (Santaren Rome *et al*. 1996); in 2002, a press pad composed of an asbestos-free material was developed (Bruno Hennecken *et al*. 2002).

[24] Synthetic fibres can be classified into organic and inorganic fibres; synthetic organic fibres include polyamide fibre, polyolefins fibre, polyester fibre, polyurethane fibre, and polyvinyl fibre, and synthetic inorganic fibres include glass filaments, glass wool, refractory ceramic fibres, rock wool, and slag wool fibre. Natural fibres include natural organic fibres such as cotton and hemp and natural inorganic fibres such as attapulgite, erionite (zeolite), nemalite (fibrous brucite), sepiolite, and wollastonite (International Life Sciences Institute [ILSI] 2005, Park 2018)

[25] Erionite fibre, which is a mineral fibre, causes malignant mesothelioma and has been classified into Group 1 (carcinogenic to humans) by the International Agency for Research on Cancer (IARC) (International Agency for Research on Cancer [IARC], 2012). Also, refractory ceramic fibres are classified into Group 2B (possibly carcinogenic to humans) by the IARC (IARC 2002) and Group A2 (suspected human carcinogen) by the American Conference of Governmental Industrial Hygienists (ACGIH) as they can cause lung fibrosis (American Conference of Governmental Industrial Hygienists [ACGIH] 2016).

Existing evidence of the adverse impacts of asbestos calls for urgent action

Considering the existing evidence, five options for addressing asbestos contaminants in products and the environment have been suggested to guide relevant stakeholders such as governments, national agencies, industry, academia, civil society organizations and international organizations.

These five options are aligned with the strategic objectives and targets of the Global Framework on Chemicals (GFC). The GFC provides a multi-sectorial and multi-stakeholder platform that is essential in addressing asbestos contamination. It is driving the transformational shift towards innovation to supply safer and more sustainable products and advancement of sustainable consumption and production patterns, including through resource efficiency and circular economy approaches.

In considering the options presented below, it should be noted that legally binding obligations apply for Parties to relevant multilateral environmental agreements, including the Basel and Rotterdam Conventions, and the ILO Conventions, as explained earlier in this paper. Parties may wish to take further action to strengthen capacities for the implementation of relevant provisions.

Integrating these five options–customizing them to suit specific regional and national conditions–is crucial for the efficient handling and alleviation of risks linked to asbestos contamination in both products and the environment.

Option 1: Reinforcing legal frameworks and institutional mechanisms to bolster the elimination of asbestos-related diseases by stopping the use of all types of asbestos and by managing asbestos risks across its entire life cycle. While advancements have been achieved, as indicated by the spread of asbestos bans and restrictions, it is noteworthy that only 69 countries currently enforce asbestos prohibitions (see Figure 5). This emphasizes the need to intensify efforts in implementing asbestos bans in the remaining nations, and further enhance effective implementation of the asbestos related provisions under Basel and Rotterdam Conventions and ILO Conventions. Asbestos containing materials are still responsible for severe human diseases, particularly in areas where there is a lack of coordinated asbestos management plans, reduced awareness about asbestos health risks, or even a delay in the implementation of asbestos-ban. Such issues may be more prevailing in developing countries (Thives *et al.* 2022).

The management of asbestos at the national level typically involves diverse government agencies responsible for regulations, enforcement, labour and health-related aspects. The structure and responsibilities of these agencies can vary across countries. Some nations may even have a dedicated national agency or department exclusively addressing asbestos-related issues (Secretariat of the Pacific Regional Environment Programme [SPREP] 2021). Nevertheless, government agencies are at different stages of maturity in relation to a systematic approach to asbestos removal and only a few have planned, prioritised removal schedules (ASEA 2022b). Hence, fostering enhanced coordination among relevant agencies is imperative for the implementation of a comprehensive and effective asbestos management.

Option 2: Investigating and adopting safer alternatives to asbestos and incorporating innovative and sustainable solutions throughout product value chains, using a life cycle approach. This approach aims to maximize benefits to human health and the environment while actively mitigating risks. In instances where prevention is not feasible, the focus is on minimizing potential risks. Many nations have either prohibited or tightly regulated the use of asbestos, with safer alternatives, having been devised for various purposes. Nonetheless, there is growing concern about the health hazards associated with some asbestos substitutes, necessitating further research due to insufficient health hazard data in many instances. Hence, it is imperative to conduct a thorough life cycle assessment to evaluate the environmental, economic, and technical attributes of materials that are asbestos-free. Also, alternative technologies for dealing with legacy asbestos are available, but it is worthwhile to explore innovative and sustainable options for asbestos waste management. This exploration should take place where these alternatives are proven to be viable and are accompanied by suitable policy and regulatory changes (Khatib *et al.* 2023).

Option 3: Adopting evidence-based strategies to deal with asbestos already in use and to tackle the legacy uses and exposure to asbestos. This includes meticulous asbestos identification, the implementation of safe removal and disposal practices, conducting public awareness campaigns, and providing support to affected communities through rehabilitation efforts. A significant amount of asbestos persists as a historical legacy from its past use in the construction of residential, public, and commercial structures (Ramazzini 2010). Proactive environmentally sound asbestos removal is essential to mitigate the ongoing risk of asbestos contamination and exposure resulting from deteriorating, disturbed or damaged asbestos containing materials (ASEA 2023b, Khatib *et al.* 2023). This is expected to lead to health and environmental benefits by minimizing asbestos exposure and its impact (ASEA 2023b), but also to improve the long-term sustainability of construction, playing a role in sustaining limited resources overall (Khatib *et al.* 2023). The provision of government incentives is vital for accelerating the environmentally sound and proactive removal of asbestos (ASEA 2023b).

Option 4: Cultivating partnerships and improving resource mobilization, to reinforce capacity-building and advance awareness-raising efforts about the risks of asbestos. This is intended to bolster the effective management of asbestos and materials containing asbestos. Partnerships at the national level exist within the asbestos value chain, for example providing solutions for asbestos removal (Duregger 2021) and conducting research programs (Winters *et al.* 2014). Further exploration is required to enhance collaboration with industry and other key stakeholders. This is crucial for developing effective and efficient strategies related to identification, safe removal, transition to safer alternatives, and proper waste management of asbestos (Vincenten *et al.* 2017). There is a necessity to enhance the mobilization of financial resources, encompassing government grants and subsidies, fostering public-private partnerships, utilizing insurance products, accessing loans and grants from community development financial institutions, and leveraging environmental trust funds. This is crucial to facilitate the removal of asbestos and asbestos-containing materials, including from legacy use. There is a need to enhance capabilities to conduct the identification, removal, replacement and management of asbestos waste securely and cost-effectively, while concurrently launching awareness campaigns to educate consumers, local industries and vulnerable populations about the associated risks. Emphasis is to be placed on the significance of adopting environmentally sound practices.

Option 5: Enhancing the generation of comprehensive knowledge and data, strengthening early diagnosis, treatment, and rehabilitation services, and ensuring access to information concerning asbestos to support informed decision-making and actions. While a considerable amount of information and data is already accessible, certain gaps emerged in the course of preparing this summary paper, such as: a) impact of asbestos and potential effects on ecosystems and wildlife; b) remaining global uses of asbestos; c) magnitude of global asbestos contamination; d) magnitude of asbestos exposure in the aftermath of natural disasters and armed conflicts; e) difference in magnitudes of occupational exposure and environmental exposure to asbestos; f) unintentional asbestos contamination of consumer products, including their origins and pathways of contamination; g) economic factors related to the continued use of asbestos, including the cost of inaction; h) availability of safer alternatives to asbestos; i) trade-offs between minimizing or eliminating asbestos pollution in the construction sector and ensuring energy-efficient buildings within the context of a climate-neutral future; j) potential differential toxicity and carcinogenicity among different types of asbestos fibres; k) existence of systematic surveillance systems at the national level to identify and record the number of mesothelioma cases. Therefore, there is a need to step up the efforts in generating sufficient data and information to underpin informed decision-making and actions.

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