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IMPACT ASSESSMENT

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Accompanying the document

[Mandatory element]

Proposal for a Directive of the European Parliament and of the Council amending Directive 2009/148/EC on the protection of workers from the risks related to exposure to asbestos art work

{COM(2022) 489 final} - {SEC(2022) 342 final} - {SWD(2022) 310 final} -
{SWD(2022) 312 final}

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Glossary

ACM	Asbestos-containing material
AM	Arithmetic mean
APF	Assigned Protection Factor
AWD	Asbestos at Work Directive
BAuA	Bundesanstalt für Arbeitsschutz und Arbeitsmedizin in Germany
CAD	Chemical Agents Directive
CDB	Current disease burden
CMD	The Carcinogens and Mutagens Directive
DG	Directorate General
EC	European Commission
EFBWW	European Federation of Building and Woodworkers
EEC	European Economic Community
ECHA	European Chemicals Agency
EODS	European Occupational Diseases Statistics
ERR	Exposure Risk Relationship
ETUI	European Trade Union Institute
FIEC	European Construction Industry Federation
EU	European Union
FoBiG	Forschungs und Beratungsinstitut Gefahrstoffe
IARC	International Agency for Research of Cancer
ISO	The International Organization for Standardization
LOD	Limit of Detection
LOQ	Limit of Quantification
MS	Member State
NACE	Nomenclature statistique des activités économiques dans la Communauté européenne, the Statistical Classification of Economic Activities in the European Community
n.e.c.	Not elsewhere classified
OEL	Occupational Exposure Limit
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PCM	Phase-Contrast Microscopy or Phase-Contrast Microscope
PPE	Personal Protective Equipment
RAC	Committee for Risk Assessment
RPA	Risk & Policy Analysts Ltd
RPA	Risk & Policy Analysts Ltd
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation
RMM	Risk Management Measure
RPE	Respiratory Protective Equipment
SDG	sustainable development goals
SEM	Scanning Electron Microscopy Energy
SEM/EDXA	Scanning Electron Microscopy Dispersive X-ray Analysis
SME	Small and Medium-sized Enterprise
TEM	Transmission Electron Microscopy
TLV	Threshold Limit Value
TWA	Time-weighted Average
UK	United Kingdom
WHO	World Health Organization

1 INTRODUCTION: POLITICAL AND LEGAL CONTEXT

A strong social Europe calls for constant improvements towards safer and healthier work for all. Over the last years, the European Union (EU) occupational safety and health (OSH) policy and rules have contributed to considerably improving working conditions, in particular workers' protection from exposure to carcinogens and other hazardous chemicals[1]. Limit values and other provisions have been set or revised for many substances or groups of substances under the Carcinogens and Mutagens Directive 2004/37/EC and the Chemical Agents Directive 98/24/EC[2].

The fight against occupational cancer remains a high priority in the area of OSH. The Commission announced in the European Pillar of Social Rights Action Plan and the OSH Strategic Framework for 2021-2027 the intention to present a legislative proposal to further reduce workers' exposure to asbestos. This was confirmed in the letter of intent of the State of the Union address 2021 and the Commission Work Programme for 2022. Furthermore, it is also highlighted as one of priorities under action 3 - A stronger economy, social justice and jobs – in the Commission Communication on the follow-up of the Conference on the Future of Europe (CoFE).

The Europe's Beating Cancer Plan supports the need for action in the field of protection of workers against carcinogenic substances. Improved protection of workers exposed to asbestos will also be important in the context of the green transition and the implementation of the European Green Deal, including in particular the Renovation Wave for Europe.The European Parliament adopted in October 2021 a resolution with recommendations to the Commission on protecting workers from asbestos (2019/2182 INL). In it, the Parliament calls for the lowering of the existing limit value (0.1 fibres/cm^3) for asbestos to 0.001 fibres/cm^3. The European Economic and Social Committee has put forward the same call in its own-initiative opinion "Working with Asbestos in Energy Renovation" adopted in 2019.

In response, the Commission has adopted its *Communication on working towards an asbestos-free future: a European approach to addressing the health risks of asbestos*[3]. It addresses the public-health risk stemming from asbestos in a holistic manner, presenting EU-level measures to tackle asbestos throughout its life cycle. This initiative covered by this impact assessment has therefore a limited scope. It aims to address the protection of workers at workplace.

[1] The EU OSH Strategic Framework on Health and Safety at Work 2014-2020, COM(2014) 332 final, 6.6.2014; the Commission Communication 'Safer and Healthier Work for All - Modernisation of the EU Occupational Safety and Health Legislation and Policy', COM (2017) 12 final, 10.1.2017; the Commission Communication 'A strong social Europe for just transitions', COM(2020) 14 final, 14.1.2020.

[2] Since 2017, **29** substances were addressed under the Carcinogens and Mutagens Directive 2004/37/EC and for the same period **41** substances under Chemical Agents Directive

[3] COM(2022) 488

Inadequate control of hazardous chemicals at the workplace not only causes diseases of workers, but it is also associated with significant costs to individuals and the society as a whole. Direct costs of work-related cancer alone in terms of healthcare and productivity losses have been estimated to amount to at least some EUR 4-7 billion per year in the EU[4]. The indirect costs may reach as much as EUR 334 billion each year[5]. The long-term care aspect is particularly important for occupational cancer. Good OSH is essential not only to minimise these costs, but also to reduce disruptions at work due to absenteeism and to contribute to productivity and competitiveness.

This initiative will contribute to the sustainable development goals (SDG) on good health and well-being (3rd goal), decent work and economic growth (8th goal), to industry, innovation and infrastructure (9th goal) and to responsible production and consumption (12th goal).

In the EU the protection of workers against risks related to exposure to asbestos is regulated by the Asbestos at Work Directive 2009/148/EC (AWD)[6].

This initiative aims at enhancing the effectiveness of the occupational exposure limit (OEL) value under the directive by updating it on the basis of new scientific knowledge. Since the last revision of the asbestos OEL in 2003, scientific evidence has demonstrated that asbestos does not have a safe exposure level, which means that any exposure to asbestos may eventually cause an asbestos-related disease.

It is supported by the last in-depth evaluation of the AWD and in line with the latest assessment of the implementation of the EU occupational safety and health (OSH) directives for the period from 2013 to 2017. In addition, the tripartite Advisory Committee for Safety and Health at Work (ACSH) unanimously agreed on the need to lower the current OEL.

For this impact assessment, the Commission contracted a study[7] to Risk & Policy Analysts Ltd (RPA), hereafter "external study" or "RPA (2021)", in order to collect the most recent information on asbestos with the view to analyse the health, socio-economic and environmental impacts of a possible amendment of the AWD. Due to the limitations of available data, the estimation for some sectors relies on few sources and needs to be taken with caution. The lack of data is also acknowledged in the most recent update[8] of

[4] RIVM Report 2016-0010: Work-related cancer in the European Union: Size, impact and options for further prevention, Jongeneel WP, Eysink PED, Theodori D, Hamberg-van Reenen HH, Verhoeven JK.
[5] Idem.
[6] Directive 2009/148/EC of the European Parliament and of the Council of 30 November 2009 on the protection of workers from the risks related to exposure to asbestos at work) (OJ L 330, 16.12.2009, p. 28–36).
[7] External Study. RPA (2021). European Commission, Directorate-General for Employment, Social Affairs and Inclusion, Lassen, C., Christens, F., Vencovska, J., et al., Study on collecting information on substances with the view to analyse health, socio-economic and environmental impacts in connection with possible amendments of Directive 98/24/EC (Chemical Agents) and Directive 2009/148/EC (Asbestos): final report for asbestos, Publications Office, 2021, https://data.europa.eu/doi/10.2767/981554.
[8] SWD(2021) 148 final

the national implementation reports where several Member States mention challenges in collecting data (incl. lack of available data). For example, Hungary, Malta, Portugal and Slovenia mention, in particular, the lack of data on the number of cancer deaths that can be attributed to occupational exposure to carcinogens such as asbestos.

Given the level of scientific and technical knowledge required to identify measures ensuring adequate protection of workers while being practically feasible for companies, the Commission bases its proposals in this area on opinions developed by the tripartite ACSH. The opinions of ACSH take into account the scientific basis, which is indispensable to underpin OSH legislation.

In order to establish this scientific basis for the ACSH, the Commission sought advice from the Risk Assessment Committee (RAC) of the European Chemicals Agency (ECHA). RAC-ECHA concluded in their scientific assessment[9] that asbestos is a non-threshold carcinogen and consequently, no health-based OEL was identified and no OEL was suggested. Instead, an exposure-risk relationship was derived, expressing the excess risk of lung cancer and mesothelioma mortality (combined) as a function of the fibre concentration in the air. The purpose of this impact assessment is to assess whether there is a need to revise the level of protection offered by the AWD, and if yes, which would be the most appropriate level to take this forward. The Commission will consider the opinion of ACSH together with the contributions received through the different channels for consultation as well the recommendations of the European Parliament resolution.

2 PROBLEM DEFINITION

2.1 What is the problem?

Occupational cancer is the main cause of work-related deaths in the EU[10], being primarily caused by exposures to carcinogenic substances such as asbestos. Asbestos is a highly dangerous carcinogenic agent. Its airborne fibres are very resistant and when inhaled could lead to, for example, mesothelioma[11] and lung cancer, with a lag between exposure to asbestos and the first signs of disease of as much as 30 years. 78% of cancers recognised as occupational cancer in the Member States are asbestos related[12].

[9] RAC Opinion on scientific evaluation of occupational exposure limits for Asbestos. ECHA/RAC/A77-O-0000006981-66-01/F

[10] Occupational cancer is, with a share of 52 %, the first cause of work-related deaths in the European Union, compared with circulatory illnesses (24 %) and injuries (2 %) and all other causes (22 %). 2017 data, thus EU27+UK. https://visualisation.osha.europa.eu/osh-costs#!/.

[11] Mesothelioma is a type of cancer that develops from the thin layer of tissue that covers many of the internal organs (known as the mesothelium).

[12] European Occupational Diseases Statistics (EODS) - Experimental statistics - Eurostat (europa.eu)

For mesothelioma, there is no cure and patients have an average life expectancy between 4 and 18 months after diagnosis[13]. Asbestos exposure is responsible for 92% of the mesothelioma cases[14].

Mesothelioma alone already accounts for approximately 15% of all work-related cancer deaths[15], 39% of the new work-related recognised cancer cases and 50% of asbestos related cancer cases[16].

Lung cancer, which is the second commonly diagnosed form of cancer for men and the third for women, is associated with relatively low survival rate after diagnosis when compared with other common cancer types for men (prostate) and women (breast and colorectal cancers)[17]. Lung cancer accounts for 44% of all new recognised occupational cancers with asbestos accounting for 88%[18] of total new recognised occupational lung cancers.

There were an estimated 66 808 deaths attributable to occupational exposure to asbestos for the EU-27 countries in 2016[19]. In 2019, the estimates show a total of 71 750 deaths in the EU-27 from occupational exposure to asbestos[20]. Those figures reflect the effect of past exposures, given the long latency of asbestos-related diseases, but also confirms the severity of the consequences of exposure to this hazard.

It is estimated that currently 4.1 to 7.3 million workers are exposed to asbestos, with the major share (3.5 to 5.5 million) being workers in a situation of sporadic and low intensity exposure[21].

The progressive restriction of the use of asbestos in the EU started in 1988 with the prohibition or restriction of crocidolite (also called blue asbestos)[22]. Since 2005[23], all forms of asbestos are banned in the EU. Despite of this, there is a substantial legacy problem since asbestos is still present in many older buildings. These are likely to be renovated, adapted or demolished over the coming years. The exposure of workers to

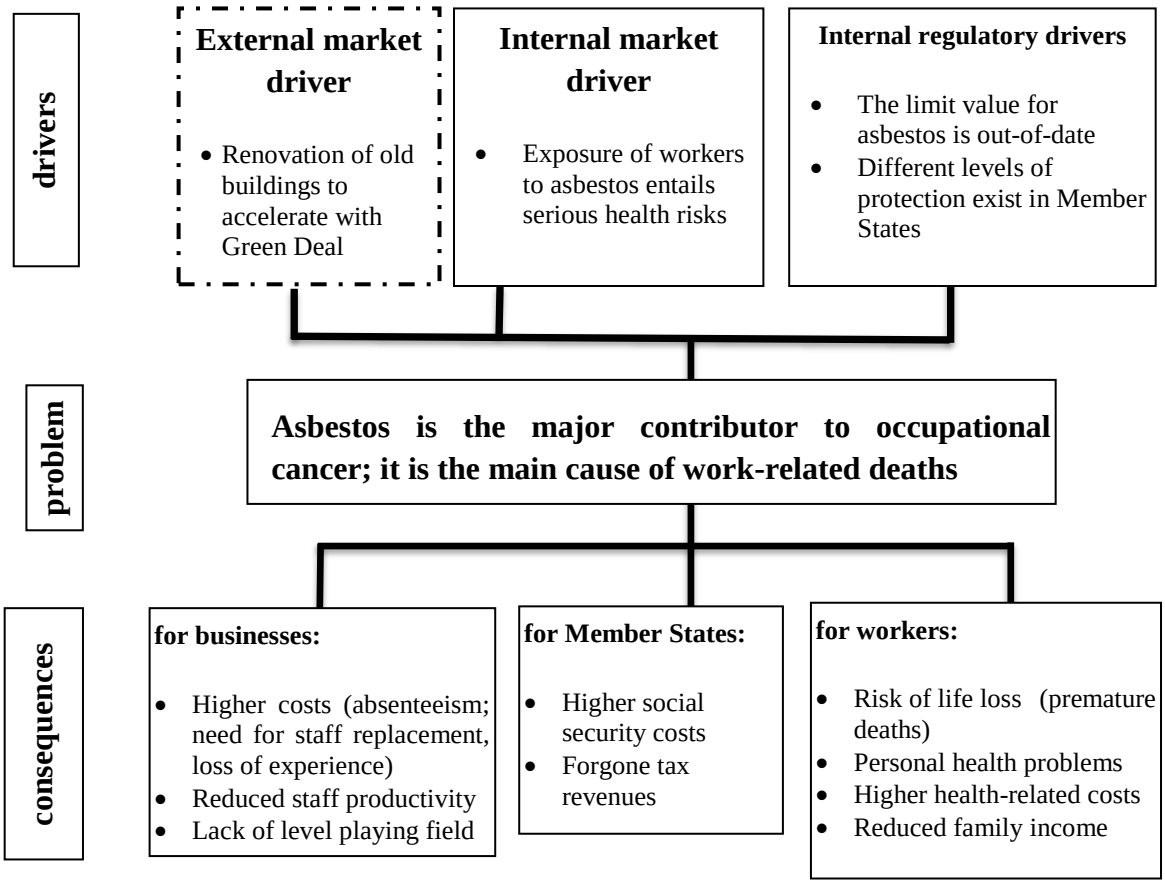
[13] Burgers JA, Damhuis RA. Prognostic factors in malignant mesothelioma. Lung Cancer. 2004 Aug;45 Suppl 1:S49-54. doi: 10.1016/j.lungcan.2004.04.012. PMID: 15261434.
[14] See footnote 12
[15] See footnote 4
[16] See footnote 12
[17] Health at a Glance: Europe 2020: State of Health in the EU Cycle
[18] WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury
[19] See Footnote 17
[20] Mesothelioma (7 510 deaths), ovarian cancer (2 032), tracheal, bronchus and lung cancer (61 035) and larynx cancer (1,173). RPA external study (2021) data from Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2019 database
[21] See footnote 7
[22] Directive 83/478/CEE du Conseil du 19 septembre 1983. http://data.europa.eu/eli/dir/1983/478/oj
[23] The manufacture, placing on the market and use of asbestos was banned in the EU by Commission Directive 1999/77/EC of 26 July 1999 adapting to technical progress for the sixth time Annex I to Council Directive 76/769/EEC on the approximation of the laws, regulations and administrative provisions of the Member States relating to restrictions on the marketing and use of certain dangerous substances and preparations (asbestos) repealed by through REACH Regulation. Regulation (EC) No 1907/2006. Annex XVII entry 6 on asbestos fibres. OJ L 396. 30.12.2006. p. 220.

asbestos is expected to increase in all EU countries as the Renovation Wave Strategy progresses[24].

Ineffective prevention of the exposure to asbestos also entails negative consequences for businesses. Companies that take appropriate measures may have a competitive disadvantage over those that do not. Moreover, although not immediately, due to the delayed consequences of ineffective prevention, future businesses are expected to bear higher costs and reduced productivity due to absenteeism and loss of expertise.

For Member States, it translates into increased social security costs (e.g. through higher costs for medical treatment and work incapacity) and missed tax revenues. Recent estimates indicate that the cost of work-related cancers[25] alone amounts to EUR 119.5 billion[26] every year, from which between EUR 35 to 76 billion are costs due to lung cancers caused by asbestos exposure[27].

The problem tree below summarises the main drivers behind the problem and the resulting consequences for workers, businesses, and Member States:



[24] Renovation Wave: doubling the renovation rate to cut emissions, boost recovery and reduce energy poverty. COM(2020) 662 final
[25] Reduced absenteeism, productivity losses and insurance payments
[26] EU-OSHA, The economics of OSH, 2017. Available at: https://visualisation.osha.europa.eu/osh-costs
[27] Applying percentages of lung cancer mentioned before to the costs.

2.2 What are the problem drivers?

2.2.1 Market drivers

Asbestos, due to its insulating properties, was used in the past (albeit in varying amounts) in almost all branches of trade and industry and is largely spread across Member States[28].

Asbestos is found in ships, train coaches, aeroplanes, and military vehicles, but more importantly, in public and industrial buildings and private homes. Before the asbestos ban, there were over three thousand uses of asbestos. The biggest share of asbestos in the EU was used for the manufacture of asbestos cement products (70-80%). The rest was used for other construction products, floor coverings, brake and clutch linings, asbestos textiles, asbestos cardboards, insulating board, spray insulation, filter materials, etc.

Consumption varied by Member State with a tendency to higher consumption in Western Europe in the 1950-1970s and higher consumption in Eastern European Member States in the 1990-2000s, as the ban on asbestos followed in some cases their accession to the EU. More detail on the historical trend in the use of asbestos per country is provided in annex 5.

According to the response from the German authorities to the stakeholder consultation carried out by RPA, it is estimated that in Germany approx. 25-30% of the building products containing asbestos are still installed. It is also estimated that, between 1952 and 1997, 1.75 million tonnes of raw asbestos were used in the manufacture of asbestos-containing products and in industrial installations in Poland and that some 1.2 billion m^2 of these products still existed in 2017[29].

Asbestos can be found in several forms in buildings all over the EU[30]. More than 220 million building units, representing 85% of the EU's building stock, were built before 2001[31] and, therefore, before the use of asbestos was banned in all EU Member States. Those buildings will be renovated (either for maintenance or aesthetic purposes or for energy efficiency reasons) or demolished and replaced by new construction. Figure 1 gives an indication of the age composition of the EU building stock, while figure 2 shows distribution of asbestos per dwelling across Member States.

The 'Renovation Wave' under the European Green Deal (external market driver), with a focus on making the buildings more energy-efficient and sustainable, will accelerate the

[28] Wilk, E. and Krówczyńska, M. 2021. Malignant mesothelioma and asbestos exposure in Europe: Evidence of spatial clustering. Geospatial Health. 16, 1 (May 2021). https://doi.org/10.4081/gh.2021.951

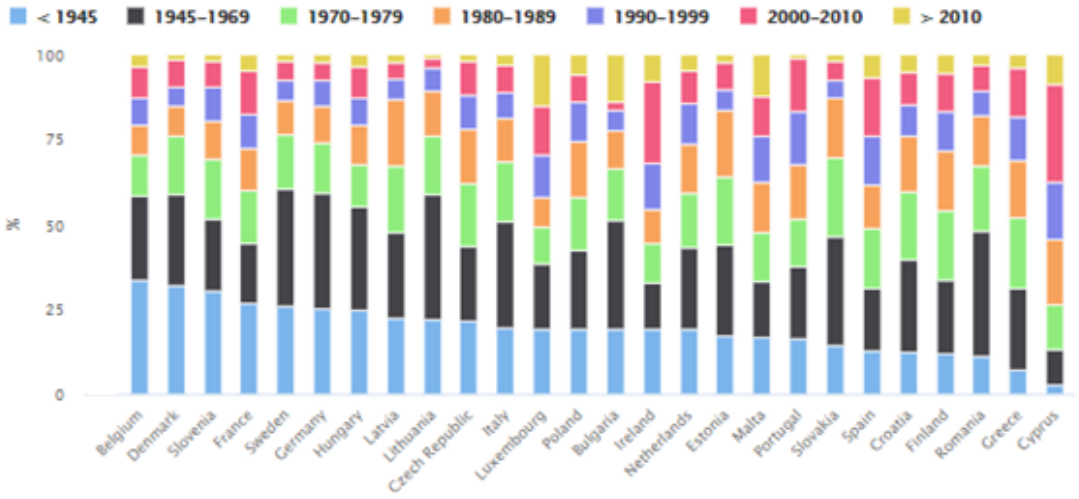
[29] Pawelec (2017). Rehabilitation of buildings and removal of asbestos. Presentation at BUILD2LC, Vilnius; as reported in RPA (2021).

[30] E.g.: flat roofing tiles, large and small facade panels, ceiling, and wall panelling; heat and soundproofing, as protection against fire and condensation on beams, smokeproof doors and gates, in kilns, boilers and high temperature installations, etc).

[31] A Renovation Wave for Europe - greening our buildings, creating jobs, improving lives. SWD/2020/550 final

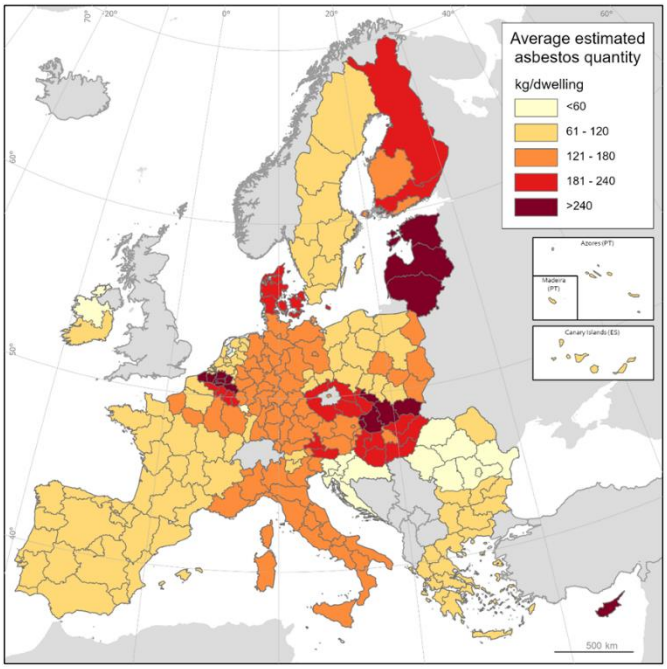
renovation works of the EU building stock. This would lead to an aggravation of the existing problem, as it would translate into an even greater number of workers exposed to asbestos in the near future, both who currently work and those whose jobs will be created thanks to the renovation wave (see section 2.3).

Figure 1 - Breakdown of residential building by construction year and EU Member State (2014 data)



Source: EU Buildings Factsheets | Energy (europa.eu)

Figure 2 - Estimated average quantity of asbestos in the residential building stock



Source: JRC, 2022

Further information on the presence of asbestos in the residential building stock at EU regional level is available in a JRC recent study[32].

To tackle the problem of building stock legacy the Commission announces in its *Communication on working towards an asbestos-free future: a European approach to addressing the health risks of asbestos* a legislative proposal on mandatory screening of asbestos in buildings.

However, independently of the state and stock of asbestos in EU, there is a need to ensure workers protection. The risk of exposure is mostly related to the handling of asbestos and dispersion of asbestos fibres during construction works, such as during renovation and demolition. **97% of the workers exposed to asbestos belong to the construction sector.**

There is exposure to asbestos also in other economic sectors (e.g., waste management; mining and quarrying; tunnel excavation[33]; and maintenance and sampling and analysis), with waste management being the one with the highest number of estimated exposed workers among those (2% of all exposed workers). For the stakeholder consultation carried out in the framework of the supporting study, Hazardous Waste Europe, representing the hazardous treatment installations, indicated that exposure may typically take place when the waste is packed e.g. in waste collection points. Potential exposure of the workers in waste collection points may happen by cleaning procedures e.g. when waste is disposed in improper containment.

In addition, the risk of exposure also occurs when drilling platforms, ships[34], and other transport means (e.g. trains and aircraft) with asbestos insulation are repaired or disposed of. The Belgian railway company Infrabel estimated in 2020 that two-thirds of its fleet of 2,162 wagons contains small concentrations of asbestos fibres[35]. Madrid Metro adopted in 2018 an Asbestos Removal Plan, agreed with the main trade unions, to resolve the situation caused by the asbestos problem. The plan concerns both the rolling stock, and infrastructure/facilities[36].

Table 1 shows the estimated number of exposed workers as well as the route of exposure and health effects of asbestos exposure. In terms of gender, 97% of workers in the

[32] Maduta, C., Kakoulaki, G., Zangheri, P. and Bavetta, M., Towards energy efficient and asbestos-free dwellings through deep energy renovation, EUR 31086 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-52961-3, doi:10.2760/00828, JRC129218.
[33] According to responses from Austria, for the supporting study's stakeholder consultation, naturally occurring asbestos in rocks is an issue in tunnel excavation, and the potential for presence of asbestos-containing rocks is a part of the tender specifications for new tunnel projects.
[34] The HSA in Ireland noted, for the stakeholder consultation carried by RPA for the supporting study, that the difficulty with ships, especially for ships that travel around the world, is that if a ship needs parts, they can easily purchase parts that still contain asbestos because they come out of countries where asbestos is not banned or well regulated.
[35] See footnote 7
[36] Informe Corporativo 2020, Metro Madrid.

construction sector are men[37]. Although there is very few disaggregated data by gender[38], studies show that mesothelioma in women accounts for about 20% of the cases and that these are mainly due to domestic exposure to asbestos fibres brought into the home by exposed workers (family members)[39].

More information concerning uses, activities and exposures of asbestos is available in annex 5.

Table 1: Summary of estimates taken forward for the assessment of options

Exposed workforce (number of workers)	Health effects caused	Major occupational exposure route
4 100 000 - 7 300 000	Lung cancer Mesothelioma Laryngeal cancer Ovarian cancer	Inhalation

Source: External study. RPA (2021)

Asbestos can also cause other health effects, such as pulmonary fibrosis (asbestosis) and pleural plaques. According to the scientific assessment, asbestosis occurs only at exposure levels higher than the current exposure limit. Thus, it is assumed that new cases of asbestosis are due to past exposure to higher concentrations. Concerning pleural plaques, while they may occur already at lower exposure levels, their clinical relevance is unclear[40,41]. Therefore, neither asbestosis nor pleural plaques are health conditions covered by the below analysis.

Table 2 shows the estimated current and future burden of cancer related only to the existing occupational exposure to asbestos. Given the long latency period of the illnesses (on average 30 years), the future health burden in this impact assessment is estimated over a 40-year period. However, the disease burden on workers may have been underestimated due to several limitations of the data/calculations, i.e., the relation between exposure levels and the associated risk, the use of single disease latency value or the conservative approach to the exposure duration. For further explanations please refer to the analytical challenges section of the annex 4.

Furthermore, occupational cancers may develop decades after exposure – including during retirement – complicating the possibility of ascertaining a causal link to exposure

[37] Eurostat. Jobs still split along gender lines
[38] For example, PIVISTEA 2016 (Spanish Programme to follow asbestos exposed workers) data shows that 1.5% of the registered workers currently exposed are women (or 5.5% for those who were exposed in the past).
[39] Occupation and mesothelioma in Sweden; Dan Med J 61/9; Surveillance-Mésothéliome
[40] Clinical relevance indicates whether the results of a study are meaningful or not for several stakeholders.
[41] See footnote 9

at work and identifying them as occupational cancers, which could lead to underestimation of the disease burden.

Table 2: Current and future disease burden related to occupational exposure to asbestos due to existing exposure situations (number of cases in EU 27)

Health effects caused	Quantified current disease burden* (estimation based on 2020 data for current types of exposure situations)	Future disease burden estimated over a 40 years period**
Lung cancer and mesothelioma	336	804
Laryngeal and ovarian cancer	34	80
TOTAL	**370**	**884**

* Due to past exposure for those sectors and occupations where exposure to asbestos currently occurs
** New cases that will arise from current exposures, assuming full compliance to current OEL (0.1 f/cm^3)
Source: External study. RPA (2021)

The estimates above relate only to the sectors and occupations where exposure to asbestos currently occurs, mainly handling of asbestos and dispersion of asbestos fibres during construction works. The reason is that those sectors and occupations are the only ones relevant for the baseline scenario and the analysis of the options.

However, the actual number of cases is much higher if one takes into account the total burden of past occupational exposure to asbestos (i.e., in occupations where exposure does not happen anymore). Between 2013 and 2019, there were 9866 recognised cases of mesothelioma and 9816 of lung cancers due to exposure to asbestos in the EU[42]. The recognised cases are significantly lower than the actual number of deaths due to asbestos[43].

2.2.2 Regulatory drivers

While the extraction, manufacture and processing of asbestos is prohibited, the treatment and disposal of products resulting from demolition and asbestos removal is not. The AWD has as its aim the protection of workers against risks to their health, including the prevention of such risks, arising or likely to arise from exposure to asbestos at work. It lays down a number of specific requirements, as well as the limit value for this exposure. Thus, under the AWD, for all activities in which workers are or may be exposed to dust arising from asbestos or materials containing asbestos, a notification by the employer to

[42] See footnote 12
[43] The difference between the recognised and actual numbers is justified due to the difficulty to prove the causality of lung cancer from the occupational exposure to asbestos.

the responsible authority of the Member State is mandatory[44], and **exposure must be reduced to a minimum** and in any case below the fixed binding limit value. If the limit value is exceeded, the reasons must be identified, and the employer must take appropriate risk management measures (RMM) to remedy the situation before work restarts. It is also specified that in case the limit value cannot be observed by other means, employers shall provide adequate respiratory and other personal protective equipment.

The current occupational exposure limit value (OEL) in the AWD of 0.1 fibres/cm³ was set in 2003 based on the scientific and technology knowledge available at that time. The AWD further states that its minimum requirements should be reviewed based on experience acquired and on technology developments in the relevant areas.

As a direct consequence of the asbestos ban and provisions for protection of workers under the AWD, a reduction of the number of cancer cases and deaths from exposure to asbestos is already happening[45]. The downward trend is also reflected by the EU index (main indicator for the European Occupational Diseases Statistics (EODS) data collection) of occupational disease for lung cancer and mesothelioma which dropped to 86.3 in 2019 compared with the starting point (100) for the base year 2013[46].

Following the new scientific and technologic developments since 2003, the tripartite ACSH, in November 2021, reached a consensus on the need to substantially revise downwards the existing binding occupational exposure limit to better protect workers' health and safety[47] and thus reduce the probability for asbestos-related diseases to happen.

The most recent in-depth evaluation of the AWD (2017 *ex post* evaluation of the EU OSH directives[48]) concluded that the directive remains highly relevant and effective according to the available evidence. However, the evaluation supporting study concludes that there is evidence to support a lowering of the limit to increase the ongoing relevance and effectiveness of the AWD and it is suggested that this issue is explored in more depth. It also reports a very important reduction in the use of asbestos across the Member States[49].

The revision of the OEL is also in line with the latest assessment of the implementation of the EU occupational safety and health (OSH) directives for the period from 2013 to 2017, presented in the staff working document accompanying the EU strategic

[44] If the exposure of the worker is sporadic and of low intensity with exposure limit not exceeded, the activity does not need to be notified

[45] For example in France, the number of recognised cases decreased from 5,279 cases in 2009 to 2,881 in 2019. (L'Assurance Maladie, 2020, External study. RPA 2021).

[46] Eurostat, EU index of occupational diseases (2013=100) – experimental statistics [HSW_OCC_INA]

[47] DOC.008 21. ACSH Opinion on an EU Binding Occupational Exposure Limit Value for Asbestos under the Asbestos at Work Directive 2009/148/EC. Adopted on 24/11/2021

[48] SWD (2017) 10 final.

[49] The average per capita asbestos use, measured in kg per capita/year, diminished from an average of 1.7 in 1971-2000 to an average of 0.1 in 2001-2012. Evaluation of the Practical Implementation of the EU Occupational Safety and Health (OSH) Directives in EU Member States.

framework on health and safety at work 2021-2027 (SWD (2021) 148 final).The RAC-ECHA scientific opinion necessary to reconsider the asbestos OEL was adopted in June 2021[50]. According to it, asbestos does not have a safe exposure level, which means that any exposure to asbestos may eventually cause an asbestos-related disease. Thus, it is presented as the relation between exposure levels and the associated risk (exposure-risk relationship).

Acknowledging the development of the scientific knowledge, four EU Member States have already reduced their limit value. As shown in table 3, workers in the EU are subject to different levels of protection. Three Member States have implemented binding OELs below the current EU OEL, and in one Member State there is a limit value corresponding to an acceptable concentration in addition to the binding limit value. The remaining EU Member States have the same OEL as the current EU OEL.

Table 3: National OELs in EU Member States

Country	OEL (fibres/cm3)	Comments
European Union	0.1	Introduced in 2003
EU countries with stricter OEL:		
Netherlands	0.002	Asbestos fibres of the chrysotile type and amphibolic asbestos fibres, respectively, should not exceed this value. Introduced in 2017
Denmark	0.003	Introduced in 2022
France	0.01	Measured by Transmission electron microscopy (TEM) and thus including 'thin asbestos fibres'. Introduced in 2015
Germany	0.1 0.01(*)	Workplace exposure concentration corresponding to the proposed tolerable (binding limit value) cancer risk 4:1 000. Workplace exposure concentration corresponding to the proposed preliminary acceptable cancer risk 4:100 000. Introduced in 2008

(*) While the current binding OEL in Germany is 0.1 fibres/cm3, the mandatory guidelines require measures that are considered in practice to bring the exposure concentration below the 'acceptance level' (0.01 fibres/cm3).

2.3 How will the problem evolve?

In the absence of EU action, it is estimated that workers exposed to asbestos will continue to face a high risk of contracting occupational cancer or other adverse health effects.

[50] RAC Opinion. See footnote 9

On the basis of notifications received by national authorities[51], the current increasing trend in the amount of asbestos-containing waste, the number of certified workers and the lifespan of the asbestos cement materials (70-80% of asbestos in EU), it is assumed that the number of exposed workers will increase by 4% every year for the next 10 years. Then the level is assumed to stabilise in years 11 – 25 (2032 - 2046), and finally, the number of exposed workers will decrease fairly quickly with an assumed annual decrease of 10% in years 26 – 40 (2046 - 2061)[52]. By 2061, virtually all asbestos-containing materials will be removed.

The Commission's initiative on Renovation Wave, aiming at energy performance and consumption of buildings, improving air quality and health and living conditions, would lead to a 1% annual energy renovation rate for 2021-2022, and an increase to 1.2% per year in 2023-2025 before stabilising at least 2% per year in 2026-2029. To achieve these benefits and objectives and to achieve climate neutrality of the buildings stock, buildings need to be renovated. The Commission estimates the potential for an additional 160 000 green jobs in the construction sector in the EU by 2030. Since 85% of buildings, especially the worst performing buildings are constructed by using asbestos, this would lead to an increase in the number of exposed workers, although modest in comparison to the 4-7 million workers estimated to already being exposed to asbestos.

Estimations on the numbers of cancer cases and their associated health costs over a 40-years period in case no action is taken are contained in the table 4 (baseline scenario).

Table 4: Estimated number of exposed workers, expected number of cancers and related health costs in case no action is taken (baseline scenario), over a 40-year period

No. of currently exposed workers	Trend in no. of exposed workers	Expected no. of cancer cases	Expected no. of deaths	Estimated health costs (net present value)
4 100 000 – 7 300 000	Next 10 years: +4 % per year 11 – 25 years: no changes 26 – 40 years: -10 % per year	884	707	€228 million – €438 million

Source: External study. RPA (2021)

As a result of current exposure, 884 cases of cancer[53] will occur over the next 40 years (or on average 20 cases per year in the EU-27). It is also predicted that 707 workers will die from cancer attributed to occupational exposure to asbestos over the same period. In terms of health costs, between EUR 228 and 438 million are associated with the estimated cancer cases.

[51] According to Article 4 of Asbestos at Work Directive, the activities involving a risk of exposure to dust arising from materials containing asbestos must be covered by a notification system administered by the responsible authority of the Member State.
[52] See footnote 7
[53] Including mesothelioma, lung, laryngeal and ovarian cancer.

The objective was to define a baseline scenario as close as possible to the future situation. However, it is very challenging to anticipate all the developments over such a long period. Further demographic changes, together with progress in medicine and diagnostic methods will have an impact on the increase of the life expectancy of workers exposed and improved detection of illness, therefore, the expected number of illness cases may increase. More details on the baseline scenario and the aspects taken into account in its calculation are explained in section 5.1.

Regarding developments at national level, Member States usually do not inform the Commission about their intentions to revise the OEL in their legislation. However, national administrations are represented in the ACSH and are aware of the preparatory work at EU level. Therefore, it is likely that they will await its results in order not to duplicate efforts.

3 WHY SHOULD THE EU ACT?

3.1 Legal basis

Article 153 of the Treaty on the Functioning of the European Union (TFEU) empowers the EU to support and complement the activities of the Member States as regards improvements, in particular those related to the working environment to protect workers' health and safety and to adopt, by means of directives, minimum requirements for gradual implementation, having regard to the conditions and technical rules obtaining in each of the Member States.

The protection of workers' health against risks arising from exposure to asbestos is already covered by EU OSH legislation, in particular by the AWD, as well as under the REACH Regulation.

The AWD lays down minimum requirements, therefore, Member States can introduce more stringent protective measures, including a lower limit value. When Member States' protective measures go beyond the EU minimum level of health and safety at work protection, this has a positive impact on the effectiveness of the AWD, resulting in a higher level of protection for their workforce, which is the general objective of this Directive.

The setting of a lower OEL implies that companies might need to invest in better preventive measures, such as vacuum cleaning and dust suppression techniques and/or individual protective equipment (e.g. masks with different filtering levels) in order to comply with the lower level. Thus, the revision of the EU limit value aims at assuring the best possible protection for all workers in the EU taking into account socio-economic and feasibility factors.

3.2 Subsidiarity: Necessity and added value of EU action

Due to its many historical applications, asbestos is present in buildings all across the EU. While its removal could follow a different pace depending on the age of the building stock and the strategies for addressing asbestos in every country, the growing need to enhance energy efficiency means that workers in all Member States are affected.

Scientific knowledge about asbestos has developed since the last revision of the AWD in 2003. To ensure that the measures for protecting workers from exposure to asbestos are as effective as possible, the Directive needs to be kept up to date with that knowledge. Updating the AWD to take account of newer scientific evidence is an effective way to ensure that preventive measures would be updated accordingly in all Member States. Amending the AWD can only be done by action at EU level.

The revision of the exposure limit value under the AWD at the EU level will not completely eliminate the differences between Member States but will lead to a greater harmonisation of limit values across Europe, as the lower the EU OEL, the lower the scope for divergences. A revised EU OEL, therefore, contributes towards a more harmonised and better protection of workers, as well as to a more levelled playing field for economic operators across the EU.

The experience since 2003, when the current EU OEL was set, shows that deviations remain limited, as only a few Member States have adopted an OEL different to (lower than) the EU one.

Despite a very low integration for construction services market across borders (import and export of construction services across the EU in 2016 represent only 1% of the total turnover[54]), the level playing field for enterprises is expected to improve. Companies operating in the different EU Member States can further benefit from a streamlining of the applicable limit values, potentially providing for savings as common solutions can be adopted across facilities, as opposed to having to design site-specific solutions to meet different OEL requirements.

In the construction sector, workers move from one site to another, very often in different countries. The available figures on the number of posted workers show that of the 2.05 million posted workers in 2015, around 36% or 730 000 workers were in the construction sector[55]. Thus, EU-level action will likely bring fairer conditions for those workers and also a fairer distribution of healthcare costs for the different Members States (while posted workers would be exposed to asbestos in country A, related illness costs occurring years later are borne by their sending country B).

Furthermore, the revision of limit values is very complex and requires a high level of scientific expertise. An important advantage of the revision of the OEL at EU level is that

[54] Analytical Report - Strengthening the Internal Market for construction - November 2018.

[55] Posted workers in the EU

it eliminates the need for Member States to conduct their own scientific analysis, with likely substantial savings on administrative costs. These resources saved could instead be dedicated to improve further the OSH policies in each Member State.

4 OBJECTIVES: WHAT IS TO BE ACHIEVED?

4.1 General objectives

This initiative contributes to the improvement of health and safety of workers pursuant to Article 153 of the Treaty on the Functioning of the European Union[56,57]. It aims at ensuring workers the right to a high level of protection of their health and safety at work, as laid down in principle 10 of the European Pillar of Social Rights[58], and to prevent disease and death caused by work-related cancer and other health problems according to the second key objective of the new EU Strategic framework on health and safety at work 2021-2027.

4.2 Specific objectives

The specific objectives are:

- To enhance the effectiveness of the occupational exposure limit value under the AWD by updating it on the basis of scientific expertise;
- To achieve a more uniform and better protection of workers across the EU from the risks caused by asbestos exposure.

The specific objectives of the initiative contribute to the SDGs on good health and well-being (3rd goal) and decent work and economic growth (8th goal). A positive impact is also expected for the SDG on industry, innovation and infrastructure (9th goal) and on responsible production and consumption (12th goal).

4.3 Consistency with other EU policies

Charter of Fundamental Rights of the EU

The objectives of the initiative are consistent with Article 2 (Right to life) and Article 31 (Right to fair and just working conditions) of the EU Charter of Fundamental Rights[59].

REACH Regulation

The REACH Regulation[60], in force since 2007, establishes among others two distinct EU regulatory approaches that are restrictions and authorisations.

[56] OJ C 115, 9.5.2008, p. 114–116
[57] OJ C 326, 26.10.2012, p. 391–407
[58] See footnote 1
[59] OJ C 326, 26.10.2012, p. 391–407
[60] See footnote 20

Since 1988 the placing on the market and use of crocidolite and of products containing it has been prohibited, and the placing on the market of products containing other asbestos forms has been restricted. Several amendments took place until the 2005 ban on the manufacture, placing on the market and use of all forms of asbestos, and of articles and mixtures containing them added intentionally[61].

Together, the AWD and the REACH Regulation are relevant for workers protection from the risks of exposure to asbestos.

[61] Commission Directive 1999/77/EC of 26 July 1999 adapting to technical progress for the sixth time Annex I to Council Directive 76/769/EEC on the approximation of the laws, regulations and administrative provisions of the Member States relating to restrictions on the marketing and use of certain dangerous substances and preparations (asbestos) repealed by REACH Regulation (EC) No 1907/2006. Annex XVII entry 6 on asbestos fibres. OJ L 396. 30.12.2006. P 220

Prevention and reduction of environmental pollution by asbestos

The revision of the AWD will also contribute to the achievement of the objective of Directive 87/217/EEC (prevention and reduction of environmental pollution by asbestos), in particular in respect of activities involving the demolition of buildings, structures and installations containing asbestos and the removal of asbestos and of products containing asbestos involving the releases of asbestos fibres or dust.

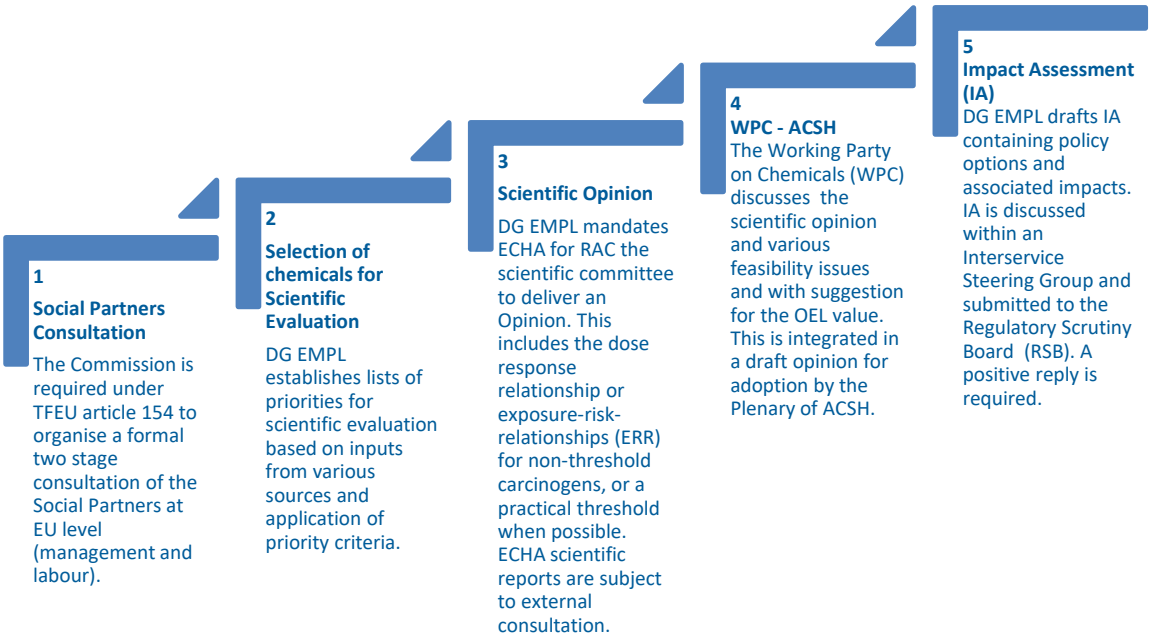
Europe's Beating Cancer Plan

Europe's Beating Cancer Plan is a key pillar of the European Health Union, presented by President von der Leyen in November 2020. The revision of the AWD contributes to Europe's Beating Cancer Plan, through its prevention pillar with the reduction of the exposure to carcinogens in the workplace.

5 WHAT ARE THE POSSIBLE POLICY OPTIONS?

As explained above, it was agreed by all relevant stakeholders, that the OEL for asbestos should be lowered on the basis of scientific expertise. The process leading to an OEL change is summarised in figure 3.

Figure 3 – Key steps in the setting/revision of Occupational Exposure Limits



As any exposure to asbestos may eventually cause an asbestos-related disease, the RAC scientific assessment opinion proposes the relation between exposure levels and the associated risk (exposure-risk relationship). This relationship, indicated in table 5, shows the risk for exposed workers at different OELs. For example, for an air concentration equivalent to the current OEL, there is a risk that 125 out of 100 000 exposed workers could develop lung cancer or mesothelioma.

Table 5: Exposure-risk relationship

Air concentration of asbestos (fibres/cm^3) as measured by PCM[62]	Excess life-time cancer risk (cases per 100 000 exposed workers)
0.001	1.2
0.002	2.5
0.005	6.2
0.01	12
0.02	25
0.05	62
0.1	125

While all the ACSH interest groups unanimously agreed on the need to lower the current OEL, no consensus was reached on the limit value to be proposed. The Government Interest Group (GIG) and the Employers Interest Group (EIG) agreed on the new limit value of 0.01 f/cm^3, while the Workers Interest Group (WIG) preferred a value of 0.001 f/cm^3 (the same value as proposed by the European Parliament).

5.1 Baseline scenario

The baseline or "no policy change" option includes all relevant EU-level and national policies and measures which are assumed to continue being in force in the absence of further EU action. It factors in the existing national OELs, the current number of workers exposed and its evolution over time, the current and future exposure levels. It also takes into account the current risk management measures (including the effectiveness of protective equipment), the voluntary industry initiatives[63], the development of new technologies[64] and any other relevant factors.

Under the baseline scenario, the EU OEL will remain at 0.1 fibres/cm^3. The summary of the no policy change option is presented in table 6.

[62] The exposure-risk relationship is based on fibre measurements according to the Phase Contrast Microscopy (PCM) method of WHO (1997).
[63] Mainly the development of guidelines for good practice for working with asbestos.
[64] Remote-controlled robots are already used for removal of materials from surfaces, confined spaces, ceilings and building walls. Further projects to robotise the removal of asbestos in the future (e.g., Bots2ReC) exist, although it is difficult to foresee, at this stage, what would be their uptake and if developments will allow for the use in small and narrow spaces. It is also important to note that the costs of such solutions might mean that only large companies (1% of the companies working with asbestos) would be able to envisage this as an option.

Table 6: Baseline scenario over 40 years

Types of cancer caused	Lung cancer Mesothelioma Laryngeal cancer Ovarian cancer
No. of exposed workers	4 100 000 - 7 300 000 *
Change in future exposure level	No changes
Change in future no. of exposed workers	Next 10 years: +4% per year 11 – 25 years: no changes 26 – 40 years: -10% per year
Current disease burden (CDB) – for current types of exposure situations	370 (new cases in 2021)
Future disease burden (FDB) - for current types of exposure situations	804 mesothelioma and lung cancers 80 laryngeal and ovarian cancers
Expected no. of deaths FBD cancer	707
Monetary value FDB cancer	€228 million – €438 million
Monetary value FDB other adverse health effects	Not quantified

Based on external study: RPA (2021)
*Workforce turns over at 5% p.a.
* More workers may be exposed by passive exposure[65] and exposure from naturally occurring asbestos at concentrations close to 0.001 fibres/cm^3 or lower

5.2 Options discarded at an early stage

5.2.1 Guidance documents

As non-regulatory alternatives, the existing guidance documents or examples of good practice could be revised and re-disseminated in cooperation with the EU-OSHA and/or the ACSH and its relevant working party. This could also include the re-launching of awareness raising campaigns for employers and workers alike on the prevention of risks arising from workers' exposure to asbestos. This option is favoured by some industry stakeholders[66].

However, guidance documents by themselves would not be considered effective enough in reaching the objectives of this initiative. They are complementary and provide an added value to OELs.

5.2.2 Revision of other provisions in the Directive

Workers' organisations have requested, during the social partners consultation, a broader revision of the AWD, where among other things, they suggested widening the scope of

[65] Passive exposure may take place in a large number of sectors as workers in any kind of building where asbestos is present may be exposed to low levels of asbestos. No data are available on which are the main sectors but the following sectors could be included among others: accommodation and food service activities, financial and insurance activities, administrative and support service activities, public administration and defence, education.
[66] See for example WKÖ reply to the initiative's call for evidence.

the AWD to include an updated list of all known forms of fibres with similar harmful effects on human health, to eliminate the concepts of sporadic exposure and low intensity exposure, and of friable and non-friable asbestos-containing materials, and to prohibit the encapsulation and sealing of asbestos. The same requests were mirrored in the European Parliament resolution 2019/2182 (INL) concerning workers protection.

While there were clear indications as to the need to update the OEL, the most recent evaluation of the AWD concluded that the directive remains highly relevant and effective. Therefore, the discussions with the ACSH and the scientific analysis focused on updating the OEL as a matter of urgency, rather than any broader review of the Directive. This does not exclude future assessments and possible revisions of the other provisions of the Directive. It should also be noted that Member States can always go beyond the minimum provisions of the Directive.

Nevertheless, those requests will be addressed, as appropriate, in guidelines, which would be made available by the Commission further to the adoption of this initiative to support its implementation.

5.2.3 Adapted measures for SMEs

Small companies, accounting for around 99% of companies working with asbestos, should not be exempted from the scope of the initiative. Their exclusion would mean that the majority of European workers at risk of exposure to asbestos would not be covered by health and safety at work legislation, with a clear distortion and inequality in the application of the EU legislative framework and with a risk of compromising the underlying social policy objectives and fundamental rights.

The impacts for SMEs are discussed further down in this report and it will be taken into account for the decision of the measures to be adopted. More information on SMEs is given in annex 6.

5.3 Policy options

In addition to the baseline scenario, options for different OELs, presented in table 6, have been considered taking into account the scientific assessment done by RAC of ECHA[67], the opinion from the ACSH[68], as well as the OELs in place in the different Member States. The scientific evaluation provides a solid evidence base while the ACSH opinion provides important information for the successful implementation of the revised OEL.

It should be noted that there is no OEL value below which workers would not be at risk when exposed to asbestos.

[67] See footnote 38 and section 4 in annex 1.
[68] DOC.008 21. ACSH Opinion on an EU Binding Occupational Exposure Limit Value for Asbestos under the Asbestos at Work Directive 2009/148/EC. Adopted on 24/11/2021

Table 7: Options matrix of OELs

	OEL Fibres/cm^3	Comments
Option 1: Baseline scenario	**0.1**	Current EU OEL
Option 2	**0.01**	Proposed by ACSH Employers and Governments interest groups
Option 3	**0.002**	Current strictest national OEL in EU
Option 4	**0.001**	Proposed by ACSH Workers interest group

Taking as reference the air concentration of asbestos mentioned in the scientific opinion (see table 5 above), intermediary levels of 0.05 f/cm^3 and 0.02 f/cm^3 were discarded, as they are not sufficiently protective of workers' health. This is supported by the fact that the Member States which have introduced a different national OEL have chosen lower levels. Moreover, ACSH members in their opinion expressed their consensus agreement on the need to substantially revise downwards the existing EU OEL.

Other OEL levels were initially discussed. Lower than 0.001 f/cm^3 levels do not seem to be technically feasible given the latest available technology. An OEL at 0 f/cm^3 is also not possible due to the existing background[69] levels. Asbestos is present in many settings and exposure can also take place through naturally occurring asbestos present in the environment[70]. Ambient asbestos concentrations in rural and urban areas in the EU are therefore expected to be higher than 0 f/cm^3[71]. Intermediate OEL values between the suggested ones by the ACSH were not considered by the steering group of the external study and thus no analysis of the costs and benefits of such OELs was possible. Such OELs were also not proposed by any stakeholder or Member State.

Setting an OEL below the current one implies that companies might need to move to more effective risk management measures in order to comply with the lower level. This means, in practice, investing in protective equipment (e.g. masks with different filtering levels) and/or implementing other measures, such as vacuum cleaning and dust suppression techniques.

Options 2 to 4 could also have another practical implication in relation to their monitoring, as they might require replacing the methodology for measurement of asbestos fibres in the air, from the broadly used phase contrast microscopy to the more sensitive electron microscopy methodology.

[69] The concentration of a substance in an environmental medium (air, water, or soil) that occurs naturally or is not the result of human activities. EEA glossary
[70] Refer to point 5.2.1 General population of the ECHA-RAC opinion Annex 1.
[71] i.e, in France the level of dust (asbestos) accumulation measured inside the buildings must not exceed the regulatory threshold of 5 f/l (0.005 f/cm3). (https://www.anses.fr/en/content/asbestos)

6 WHAT ARE THE IMPACTS OF THE POLICY OPTIONS?

6.1 Analytical methodology

The revision of the OEL is expected to result in a reduction in the occupational exposure to asbestos. The extent of such reduction depends on the value of the revised OEL, the current levels of exposure, as well as on the projected number of exposed workers in the absence of the proposed measure, i.e., the "baseline scenario". For a given reduction in exposure levels, the expected decrease in the incidence of cancer over 40 years was calculated. This required estimating the risks of carcinogenicity and other adverse health effects, derived from the existing toxicological and epidemiological literature, as well as information about the current level of worker exposure (number of workers exposed, level, duration and frequency of exposure).

The supporting study steering group (to which government, industry and worker representatives participate) discussed comprehensively the modelling underpinning the analytical part. This concerns the expression of the excess risk for lung cancer and mesothelioma mortality (combined) as a function of the fibre concentration in the air. The steering group agreed to base the calculations on the RAC-ECHA model, as this was the most up to date and appropriate[72].

The health benefits of avoided cancer cases and deaths have been expressed in monetary terms by applying standard valuation methods, in line with the Better Regulation Toolbox guidance. Method 1 is the application of a single willingness to pay (WTP) value to each case and Method 2 is the use of disability adjusted life years (DALYs) and their monetisation. Both estimates monetise the same number of avoided cases and use identical methods for the monetisation of direct (healthcare, informal care, disruption for employers) and indirect (productivity/lost earnings[73]) impacts but use different approaches to assign monetary values to intangible effects (reduced quality of life, pain and suffering, etc.). These health benefits of implementing the revised OEL are calculated in terms of the costs of ill health avoided. Not all health impacts could be monetised, due to a lack of available information allowing its quantification.

The estimate of the costs was made based on literature research and data obtained from stakeholders. It considers the following factors: the risk management measures (RMMs) needed to comply with the proposed OEL, the costs of these RMMs for each company, the life span of the RMMs and the number of companies. The costs of the RMMs are driven by the use of protective equipment[74] and the staff costs of operating vacuum

[72] However, the workers interest group of the ACSH criticised in the ACSH opinion the exposure risk relationship derived by ECHA because according to them it does not fit with the reality when asbestos victims are counted (i.e. number of asbestos victims should be higher).
[73] This is not the case where lost earnings are already taken into account in the willingness to pay estimate in published literature.
[74] Estimates rely notably on the prices and/or replacement assumptions used in Hamikian et al (2015) and Zeynep et al (2008), as well as discussion with stakeholders during the preparation of the supporting study.

cleaning and dust suppression equipment[75]. In addition, the monitoring costs for options 2 to 4 include the incremental costs of replacing phase-contrast microscopy (PCM) by electron microscopy (EM) analysis.

The benefits and costs of possible OELs are measured against the baseline, meaning that only marginal costs and marginal benefits are considered (i.e., additional costs imposed by the different OEL scenarios on top of those that businesses would already have to bear under the baseline in order to comply with their existing obligations). Unless the contrary is specified, they are expressed in net present values, using 2021 as a reference.

As the change to the Danish OEL intervened after the completion of the supporting study, the costs and benefits for option 2 are slightly overestimated.

More information about the analytical methodology, including the sensitivity analyses performed, is available in annex 4.

6.2 Impacts of the policy options

6.2.1 Social impacts

6.2.1.1 Health impacts for workers and families

Table 8 presents the estimates of the number of cancer cases that would be avoided under each option. Option 4 (0.001 fibres/cm^3) and option 3 (0.002 fibres/cm^3) would reduce the number of cancer cases over the next 40 years down to 26 and 53 respectively, i.e., 858 and 831 fewer cases than under the baseline (884 cases). Revising the EU OEL at the level of option 2 (0.01 fibres/cm^3) would also significantly reduce the number of cancer cases compared to the baseline (663 fewer cases).

Table 8: Cancer cases avoided and health costs saved (benefits)

		Option 1 Baseline scenario	Option 2 0.01 fibre/cm^3	Option 3 0.002 fibre/cm^3	Option 4 0.001 fibre/cm^3
Avoided cases		**No avoided cases in relation to the existing situation**	**663**	**831**	**858**
Benefits (€ million)	WTP (Method 1)	**No benefits in relation to the existing situation**	**323**	**405**	**418**
	DALYs (Method 2).	**No benefits in relation to the existing situation**	**166**	**208**	**215**

Source: External study. RPA (2021)

As presented in Table 8, important benefits can be expected under all options.

[75] It is assumed that no new vacuum cleaning and dust suppression equipment will be needed but that staff will spend more time using it.

In addition to the direct benefits to workers and their families described above, indirect benefits should also be mentioned although they have not been quantified or monetised.

- Family members of workers heavily exposed to asbestos face an increased risk of developing mesothelioma. This risk would result from exposure to asbestos fibres brought into the home on the shoes, clothes, skin and hair of workers. Therefore, the introduction of more efficient protective equipment and increased use of existing RMMs[76] that will be required in order to comply with options 2 to 4 could help to decrease such risks.
- Measures to prevent the generation and spread of dust in demolition works can also be positive for people living or working in the surroundings.

6.2.1.2 Impacts on employment

It is not expected that a significant number of companies would discontinue operations as a result of the introduction of the stricter OELs being considered. Consequently, no significant net loss of employment is predicted[77]. Nonetheless, it is possible that some jobs may move from companies not specialised in asbestos handling dealing with activities connected with sporadic and low intensity exposure (almost any type of craftsman, including plumbers, carpenters, electricians and bricklayers, as well as general caretakers of buildings) to companies specialised in demolition or more specifically in asbestos removal.

As companies not specialised in asbestos handling will most likely take on less of this work, there may be some resulting redundancies, but new jobs would be created in the more specialised companies that would likely carry out this work instead. The possibility for this to happen increases with the reduction of the OEL, with option 2 (0.01 fibre/cm^3) being the one that will have less impact and option 4 (0.001 fibre/cm^3) the one which can originate more transfer of work to specialised companies. Specialised companies may be able to carry out the work with greater economies of scale than the not specialised companies, and the net impact on employment may thus be small.

The impacts of job transitions could be felt by the unemployed (e.g., lost wages, difficulties in finding new job), by workers (e.g., new skills and training needs to adjust to new job) and employers (e.g., the costs of recruitment and training), in particular for options 3 and 4. However, it was not possible to determine the extent of these potential job transitions, and consequently, impossible to quantify.

On the other hand, the benefits of healthier staff and better working conditions can indirectly improve the reputation of the sectors and associated companies, as work with asbestos may be less perceived as a risky line of work associated with health issues. As a result of such an improvement in their public image, companies may have it easier to

[76] E.g., more time spent using vacuum cleaners or application of various other dust suppression techniques in the construction and building sector
[77] See footnote 7

recruit and retain staff, reducing the cost of recruitment and increasing the productivity of workers.

6.2.2 Economic impacts

6.2.2.1 Impact on businesses, including SMEs

The costs for businesses to comply with a stricter EU OEL for asbestos ('compliance costs') are mainly the result of the costs incurred to put in place the additional risk management measures. There is also a possibility that the reduction of the OEL will have an impact on activities subject to the AWD Article 3(3) waiver. This article waives the requirement regarding notification and health surveillance. The lowering of the OEL in the Netherlands and France did not result in a significant increase in the number of notified contracts[78] or workers under health surveillance. Danish authorities also do not expect a significant increase of the number of notifications (short-term and low impacts from asbestos) as a consequence of its recently lowered OEL. However, such potential impact has been quantified[79].

Both the costs of new RMMs and the costs related to the waiver (notifications and health surveillance) count for the vast majority of the total compliance costs. Other costs that could arise would be much more limited. These include the costs of training to ensure the correct use of the new protective equipment and the correct follow-up of the new risk management measures put in place, as well as, and monitoring costs[80]. The amount of estimated one-off costs is limited. Around 90% of the calculated costs are recurrent.

Table 9: Main costs for businesses (million EUR)

	Option 2 0.01 fibre/cm^3	Option 3 0.002 fibre/cm^3	Option 4 0.001 fibre/cm^3
Additional RMMs	**12 492**	**52 108**	**58 282**
Health surveillance	**7 290**	**14 570**	**21 860**
Notification Low estimate	**650**	**1 310**	**2 610**
High estimate	**2 180**	**4 350**	**6 530**

[78] This is the case, for example, when lowering the OEL might not involve changes to the risk categorisation system and therefore does not result in changes in the requirements concerning notification.
[79] In the case of notification costs, two estimations are done, a low estimate (based on the most recent experience at Member State level) where it has been assumed that increase in the number of contracts that would need to be notified is 10% for Option 2, 20% for Option 3 and 40% for Option 4, and a high estimate (presented in the external study) where the increase in the number of contracts that would need to be notified is 1/3 (33%) for Option 2, 2/3 (66%) for Option 3 and 100% for Option 4. In the case of health surveillance, it has been assumed that additional 0.5 million per year should be subject to health surveillance for Option 2, 1 million additional workers for Option 3 and up to 5 million workers under Option 4.
[80] Costs of planning, sampling, analysis and reporting.

The total costs for new protective equipment and other risk management measures (a) are estimated to be around EUR 12 billion under option 2 (0.01 fibre/cm^3). For options 3 (0.002 fibre/cm^3) and 4 (0.001 fibre/cm^3) they amount to some EUR 52 billion and EUR 58 billion, respectively. The estimated costs of notification and health surveillance are much lower. However, they are subject to more uncertainty for the reasons mentioned above. In addition, the notification system is administered by the responsible authority of the Member State (Article 4 AWD) and it is therefore difficult to assess if and to what extent lowering the OEL will significantly impact on the number of notified contracts or workers under health surveillance, nor is possible to anticipate the potential changes Member States might decide to introduce in their system to respond to a potential increase of notifications (or, more generally, due to the growing digitisation and development of eGoverment services).

In understanding the costs, it is also important to take into account that they spread over a period of 40 years and represent the total costs for all the companies dealing with asbestos in the EU (around 1.55 million companies). As shown in table 9, the average costs per company over 40 years are around EUR 15 000, EUR 46 000 and EUR 57 000 under options 2, 3 and 4, respectively. These average costs are expected to be higher for companies dealing more intensively and frequently with asbestos in articles such as trains, vehicles, vessels or aircraft (i.e. around 350 companies out of the total of more than 1.5 million companies dealing with asbestos). They would deal with costs between EUR 355 221 and EUR 2 577 759 over 40 years, depending on the options. On the other side, companies in the building and construction sector, not specialised in asbestos handling, dealing with activities connected with sporadic and low-intensity exposure would face significantly lower average costs over 40 years (between EUR 12 266 and EUR 38 280, depending on the options).

To assess the proportionality of such costs, total compliance costs are put in relation to the turnover ('cost/turnover ratio'[81]) at companies' level. The ratio of costs/turnover for small companies is greater than for medium and large companies under all options. As shown in table 6 of annex 6, under option 2, almost all companies would have a cost/turnover ratio lower than 1%, which means that that option should not have a significant impact on business. Only small companies from three sectors (repair of electrical equipment, repair and maintenance of ships and boats, and maintenance and repair of motor vehicles, i.e. 0.02% of all companies dealing with asbestos), would face a cost/turnover ratio between 2 and 4%. Under options 3 and 4, the impacts would be higher and some companies (namely in the repair of electrical equipment sector) might have to dedicate up to 28.5% of their turnover to compliance costs. The costs remain largely proportionate in the sector concentrating most of the concerned companies (construction[82]). In that sector, only for small companies under the NACE 'Other

[81] The 'cost/turnover ratio' is the compliance costs borne by a company divided by its turnover. The closer this ratio is to zero, the more the company will be able to meet the costs.
[82] 99% of the over 1.55 million companies that are estimated to be involved in work with asbestos belong to the construction sector.

building completion and finishing' activity category, the cost/turnover ratio would be over 10% for the two stricter options (12% for option 3 and 13% for option 4).

More information on the cost/turnover ratio per sector and size of companies is available in Annex 6.

The Netherlands, France, Germany and Denmark already have OELs at least 10 times lower than the current EU limit value. Companies operating in these three Member States should therefore not face additional costs under option 2[83]. With regard to option 3, companies operating in France and Germany and Denmark would face additional costs, while under option 4, companies in all Member States would have additional costs to comply with the associated OEL.

Although more limited in quantitative terms, setting a stricter EU OEL for asbestos could also bring benefits to businesses, such us decreasing payments related to sick leave, reduced absenteeism or decreasing insurance premiums. As shown in table 9, companies' saved costs are estimated between EUR 1.7 million to EUR 2.1 million, which means that the choice of the option would not have a strong influence on the level of benefits for companies. Furthermore, other benefits that cannot be easily monetised should also be considered such as the indirect effects on the reputation of the sectors and associated companies (asbestos could be less perceived as a risky line of work associated with health issues).

6.2.2.2 Impact on competition and the single market

Most companies should be able to assume the additional costs of complying with an EU OEL at the level of option 2, while some of them, in particular among the small and medium-sized enterprises, could face more difficulties under option 3 or 4.

Most of the costs are likely to be passed on to the customers[84]. Consequently, the latter could be forced to postpone or avoid asbestos removal, which could have an effect on some companies, in particular among the small companies, which could be forced to cease their activities. However, experience in Germany, where a stricter OEL is effective since 2008, does not seem to point in that direction. According to the external study, the increase in the amount of asbestos-containing waste in recent years would indicate a more general increase in removal activities.

Therefore, no significant number of companies is expected to cease their activities under the different options envisaged in this impact assessment. However, some companies operating on activities connected with sporadic and low intensity exposure (almost any type of craftsman, including plumbers, carpenters, electricians and bricklayers, as well as general caretakers of buildings) might decide not to make investments in risk

[83] DK changed its OEL (in January 2022) after the end of the supporting study. The costs and benefits estimated for option 2 do not take the national OEL change into account. Therefore, both costs and benefits are slightly overestimated for that option.

[84] International competition is very limited as, with the exception of asbestos containing articles that could be sent outside the EU, asbestos removal takes place in situ.

management measures, especially under the most stringent option. These activities would then be undertaken by specialised activities, leading to a more concentration of the market. Having said that, the impact on competition is expected to be limited.

Furthermore, since the costs to comply with any new limit value will be higher, it could have impacts on the single market since potential new entrants to the market could be deterred because of the compliance costs, in particular among SMEs under option 3 and 4. On the other hand, a more harmonised level of protection would facilitate businesses operations across borders, including those related to posting of workers in the construction sector, as they will not have to adopt different RMMs when they provide services in different Member States.

6.2.2.3 Indirect economic impacts

This section presents impacts on research and development, consumers, competitiveness. The assessment is qualitative as the required data to quantify those impacts was not available.

Research and development (R&D) are key activities in an industry's capacity to develop new products and produce existing ones more efficiently and sustainably, in a way that protects the safety of workers. The ability to engage in R&D activities is likely to be affected by the availability of financial resources to invest in R&D; the availability of human resources to conduct R&D activities; and regulatory environment conducive to investing in R&D activities.

In general, the investment in R&D in the construction sector is rather low. However, we could reasonably expect that options 3 and 4 could potentially weigh negatively on R&D expenditures as companies, in particular small and medium-sized enterprises, will have to dedicate a larger share of their turnovers in RMMs to meet stricter OEL. The impacts of option 2 would be smaller and more resources can be expected to remain available to invest in research and innovation.

Consumers may be impacted as it is expected that companies will pass on the additional costs arising from having to comply with stricter OELs to the consumers (see 6.2.2.1 for details). Consequently, it cannot be excluded that some consumers may be forced to delay or abandon their plans to remove asbestos. As the compliance costs for options 3 and 4 are much higher than for option 2, their negative impacts on consumers would also be higher not only in terms of higher prices, but also in terms of health impacts and missed energy savings of delaying renovations.

The risk of an increase in unauthorised work, due to the increase in prices for consumers, should also be noted.

The revision of the OEL would put the EU at the forefront in the protection of workers against asbestos as its OEL would be the strictest in the world. Presently, only

Switzerland (0.01 fibres/cm^3) and Japan (0.03$^+$ and 0.003^{++} fibres/cm^3)[85] have stricter OELs than the current EU OEL, while the US, Canada, China, India and Russia have less strict requirements.

The impacts on **international competitiveness of EU companies** under all options would be however limited. As most of the activities involving exposure to asbestos are required to be undertaken in-situ, third-country competitors would need to operate under the regulations of the EU. Consequently, they could not benefit from any competitive advantages from a less strict requirements in their country of origin. Only the very limited number of companies working with asbestos in articles (such as aircraft, trains, ships…) could see their international competitiveness affected (provided that third countries' lower prices compensate for the costs of moving the article there).

6.2.2.4 Impact on public authorities

The benefits to the public authorities from the avoided costs of ill health relative to the baseline are composed of cost of treatment (healthcare treatment costs borne by public authorities) and tax revenue.

Costs to the public authorities will include transposing regulations to accommodate changes in OEL, changing guidelines (including recommended measures to ensure occupational exposure concentrations are well below the OEL) and enforcement, monitoring and adjudication costs.

Enforcement will take place according to already existing mechanisms for compliance improvement and enforcement, including informal conversations with employers as well as formal correspondence and legal enforcement action.

The costs under the enforcement, monitoring and adjudication costs category derive exclusively from the processing of new notifications[86]. Usually, national inspectors organise visits in companies to ensure the employers' compliance with several OSH provisions (for example, workplace transport, slips and trips, machinery safety, stress) rather than only checking the conformity with the OELs. Thus, is not expected that additional resources on enforcement, a Member State competence, are needed as a result of the adoption of a stricter OEL was not possible to determine although will receive (or demand) greater resourcing and priority because of an OEL being set. Table 8 below shows the estimated benefits and costs over a period of 40 years (2021-2061). While costs are higher than benefits for all options, it needs to be noted that annual net costs vary between EUR 35 and 105 million for all 27 Member States. In addition, as for the notification costs estimated for companies, the costs attributed to the processing of new

[85] Except chrysotile. For chrysotile the OEL is 0.15$^+$ and 0.015^{++}
$^+$ Reference value corresponding to an individual excess lifetime risk of cancer of 1 in 1 000.
$^{++}$ Reference value corresponding to an individual excess lifetime risk of cancer of 1 in 10 000.
[86] With the lowering of the OEL, certain activities that could benefit from the art 3(3) notification waiver (i.e., activities where the worker exposure is sporadic and of low intensity and the OEL is not exceeded) might be obliged to notify to the national authorities under the new OEL.

notifications by public authorities (the bulk of the estimated costs) needs to be treated with caution given the uncertainties regarding the actual impact of OEL changes on national notification systems. As in the case of businesses, a low and a high estimate have been calculated on the basis of the same assumptions regarding the potential increase in the number of notifications.

Table 10: Costs and benefits relative to the baseline for taxpayers/public authorities (present value over 40 years)

	Option 2 0.01 fibre/cm^3	Option 3 0.002 fibre/cm^3	Option 4 0.001 fibre/cm^3
Benefits	€3 400 000	€4 300 000	€4 500 000
Costs:			
Transposition	€750 000*	€1 300 000	€1 350 000
Guidelines	€750 000*	€1 300 000	€1 350 000
Enforcement, monitoring and adjudication costs:			
Low estimate	€ 420 000 000	€ 840 000 000	€ 1 680 000 000
High estimate	€ 1 400 000 000	€2 800 000 000	€4 200 000 000
Net benefit (benefits – costs)			
Low estimate	-€ 418 100 000	-€ 838 300 000	-€ 1 678 200 000
High estimate	-€ 1 398 100 000	-€ 2 798 300 000	-€ 4 198 200 000

* DK was included when calculating these figures. As DK has now a lower OEL, these figures would be €30,000 lower.
Source: External Study. RPA 2021

As to the impacts per EU Member State, countries with established OELs at the level or lower of the different options will be less affected than those having higher OEL in place. Transposition costs would incur in 24 Member States under option 2 (all except FR, NL and DK), 26 under Option 3 and in all MS under Option 4.

6.2.3 Environmental impacts

Releases of asbestos are believed to be relatively low, despite little measured data on this, based on the existing regulation on management of both asbestos waste and demolition/maintenance activities involving asbestos in buildings[87]. Due to these low release levels the environmental impacts of asbestos are believed to be relatively low in spite of asbestos fibres persistence and toxicity. In addition, further RMMs, due to comply with a stricter OEL may help to marginally improve environmental exposure to asbestos however significant differences are unlikely to be recognised.

[87] Waste Framework Directive (2008/98/EC) and the Landfill Directive (1999/31/EC) contain provisions to address the environmentally sound management of asbestos waste and EU Construction and Demolition Waste Management Protocol and Guidelines for the waste audits to assist operators in the safe removal and management of asbestos published by Commission

6.2.3.1 Climate Change impacts

Asbestos has the property of absorbing carbon dioxide molecules dissolved in rainwater or floating through the air[88], thus can play a role in climate change. However, as releases into the environment will be low, this initiative is not expected to have an impact on climate change.

On the other hand, extreme weather conditions due to climate change may increase erosion effects of the still existing asbestos materials (e.g. roofs sheets and other external building materials containing asbestos).

As companies could pass additional costs from stricter OELs to consumers, potential negative impacts on renovation and green objectives (e.g. postponed renovations and missed energy savings) should be considered. Those negative impacts will be greater the more stringent the OEL is.

6.2.4 Impacts on fundamental rights

All options align with the EU Charter of Fundamental Rights. Article 31 of the Charter, states that workers have the right to fair and just working conditions that respect their health, safety and dignity. The initiative for lowering the OEL will thus have a direct positive impact on fundamental rights, as it will further improve the protection of workers from the health risks posed by asbestos exposure. Taking into account the avoided deaths of the implementation of a stricter OEL the right of life (Article 2) will also be positively impacted.

6.2.5 Contribution to sustainable development

The initiative will contribute positively for SDGs on good health and well-being (3rd goal) and decent work and economic growth (8th goal). A positive impact is also expected for the SDG on industry, innovation and infrastructure (9th goal) and to responsible production and consumption (12th goal).

6.2.6 Impacts on digitalisation

While the impact on digitalisation was not analysed in detail, it can be expected to be positive with, for example, the development of artificial intelligence tools combined with measurement techniques for improvement on fibres counting or the development of robotic extraction of asbestos from buildings.

6.2.7 Administrative impacts

Public authorities could incur administrative costs if, for example, they have to do more reporting to the EU or there are other additional administrative burdens. According to the estimates, no significant additional reporting is anticipated and any other administrative

[88] https://www.technologyreview.com/2020/10/06/1009374/asbestos-could-be-a-powerful-weapon-against-climate-change-you-read-that-right/

burdens for Member States authorities than those already referred in table 10 could not be identified and, therefore, quantified.

Moreover, the revision of the OEL at EU level eliminates the need for Member States to conduct their own scientific analysis to independently determine the acceptable exposure level, with likely substantial savings in administrative costs. Exact costs of this type of exercise are difficult to establish but would be significant given the level of scientific and technical expertise required.

The administrative costs for companies would arise from the burden of arranging additional measurements. Those measurements are in majority performed by a specialised company and the costs related to the outsourcing of this activity are considered as compliance costs. The possible additional measurements associated with a lower limit value would therefore entail very limited additional administrative burden for the companies. Under option 2, those additional administrative costs are estimated at EUR 15 million over 40 years, while under options 3 and 4, it would costs EUR 30 million and EUR 60 million, respectively.

The planned revision of the AWD does not introduce changes to the notification system. Lowering the OEL can indirectly increase costs for MS and businesses if the number of notifications increase. This is discussed in the section 6.2.2.1 above.

Although most asbestos-related activities are performed by companies working in one Member State only, larger and to lesser extent medium-sized companies with facilities in different Member States could benefit from administrative simplification, owing to a harmonised set of compliance requirements.

6.2.7.1 ´One in, One out' approach

Following the commitment of the Commission to follow the 'one in, one out' approach, new administrative burdens should be compensated by reducing burdens in the same policy area.

As the initiative will not change any provisions of the AWD other than the OEL level, no additional administrative obligations will be introduced. However, as explained above, lowering the OEL could mean that more activities might not be able to comply with the waiver of the requirements regarding notification for sporadic and of low intensity exposures (AWD Article 3(3)). Thus, two estimations of the administrative costs linked to possible new notifications have been done and detailed in Table 9 and 10. Based on the experience of Netherlands and France, and the expectations of Danish authorities, it is concluded that additional notification costs, if any, would be closer to the lower estimate.

The other administrative costs presented in the above analysis (linked to measurements) do not fall under the one-in, one-out, as they are explicitly exempted from the offsetting by the Better Regulation Tool#58.

As regards to potential savings, companies active in Member States with different OELs could benefit from the greater harmonisation of protection levels. However, those savings

are not expected to be significant. No administrative cost savings are expected for citizens.

The table below summarises all the assessed impacts.

Table 11: Multi-criteria analysis on asbestos (all impacts over 40 years and additional to the baseline)

Impact	Stakeholders affected	OEL options (fibres/cm^3)		
		0.01	0.002	0.001
Economic impacts				
Direct costs – Compliance, monitoring and administrative costs				
Risk management measures and discontinuation costs (one-off and recurrent)	Companies	€ 12 492 million	€ 52 108 million	€ 58 282 million
Health surveillance	Companies	€ 7 290 million	€ 14 570 million	€ 21 860 million
Notification: Low estimate High estimate	Companies	 € 650 million € 2 180 million	 € 1 310 million € 4 350 million	 € 2 610 million € 6 530 million
Training costs (on the correct application of new RMM).	Companies	€ 530 million	€ 1 100 million	€ 2 000 million
Monitoring (sampling and analysis)	Companies	€ 110 million	€ 560 million	€ 640 million
Direct costs - administrative burdens (linked to monitoring)	Companies	€ 15 million	€ 30 million	€ 60 million
Total Direct Costs Low estimate High estimate	**Companies**	**€ 21 087 million** **€ 22 617 million**	**€ 69 678 million** **€ 72 718million**	**€ 85 452 million** **€ 89 372 million**
Total Direct costs (average per company)	**Companies**	**< € 15 000**	**< € 46 000**	**< € 57 000**
Direct costs - enforcement costs				
Transposition costs	Public authorities	€ 0.75 million	€ 1.3 million	€ 1.4 million
Costs of changing guidelines	Public authorities	€ 0.75 million	€ 1.3 million	€ 1.4 million
Enforcement, monitoring, adjudication costs Low estimate High estimate	Public authorities	 € 420 million € 1 400 million	 € 840 million € 2 800 million	 € 1 680 million € 4 200 million
Direct benefits				
Savings in relation to e.g. sick leaves, staff replacement	Companies	€1.7 million	€2.0 million	€2.1 million
Savings in terms of healthcare or lost taxes	Public authorities	€3.4 million	€4.3 million	€4.5 million
Other economic aspects				
Single market: competition	No. of company closures	No closures	No closures	No closures
Single market: consumers	Consumers	Customers of companies working with asbestos in each of the sectors (e.g. developers, public authorities, landowners, building owners, travel companies etc.) are therefore likely to face rises in prices at lower OELs. It cannot be ruled out that		

Impact	Stakeholders affected	OEL options (fibres/cm^3)		
		0.01	0.002	0.001
		some clients may delay or abandon plans to remove asbestos. There is some risk of increase in unauthorised work.		
Single market: internal market	Companies	Limited Negative impacts expected In some sectors, the costs of the lower two OEL options are significant (>20%), especially SMEs		
International competitiveness	Companies	Limited negative impact		
Specific MSs/regions	MSs that would have to change OELs	All MS except France and the Netherlands	All MS except the Netherlands	All MS
Social impacts				
Benefits				
Reduced cases of cancers	Workers & families	663	830	860
Savings of ill health, incl. intangible costs (M2 to M1)	Workers & families	€166 – 323 million	€208 – 405 million	€215 – 418 million
Employment	Jobs lost	No significant net loss of employment is being predicted at the OEL option of 0.01 fibres/cm3.		
Environmental impacts				
Environmental releases	Environment	No impact/limited positive impact		
Notes: All costs/benefits are incremental to the baseline (Present Values over 40 years)..				

7 HOW DO THE OPTIONS COMPARE?

The comparison tables used to compare the different options against the baseline scenario in terms of effectiveness, efficiency, feasibility and coherence apply the following ranking symbols: '0' – baseline, '≈' – similar to baseline, from '+' more efficient/effective or coherent than baseline to '+++' – much more efficient/effective or coherent than baseline; from '-' – less efficient/effective or coherent than baseline to '- - -' – much less efficient/effective or coherent than baseline.

With regard to the **effectiveness**, the options are analysed from the perspective of the prevention of deaths and other adverse health effects. Since the measurement methods needed to monitor compliance with the different OEL options have a direct impact on effectiveness, they will be considered for the analysis.

All the OELs options will significantly reduce the number of cancer cases. Taking into account the number of cancer cases avoided, option 4 would have the most positive impact on prevention of asbestos occupational exposure-related cancers compared to the baseline scenario. However, the ACSH governments and employers interest groups' endorsement of option 2 should facilitate the implementation and enforcement of this option, helping to achieve the objectives.

With regard to the measurements methods needed to monitor compliance with the different OELs options. Option 2 is possible using either PCM or EM. Option 3 measurement will require EM (in line with the Dutch experience). To measure compliance with option 4, the best currently available EM measurement technique must be used and even then, while it may be possible to measure such a low exposure level in clean rural environments, it is not necessarily the case in dusty environments[89] (see Annex 8).

Therefore, while option 4 and option 3 are slightly more effective (saving more 5-4 cancer cases per year compared to option 2) in terms of avoiding cancer cases, option 2 offers the best balance between prevention and practical implementation.

With regard to the **efficiency**, the options are ranked according to the increase on the protection of workers at the EU level while preventing closures and other severe disadvantages for the businesses. Strictly looking at the monetised impacts, costs outweigh the benefits for all the assessed options. The **cost/benefit** ratio for option 2 is **70** (EUR 24 bn cost vs. EUR 330 m benefit) while for option 3 is **190** (EUR 76 bn cost vs. EUR 410 m benefit) and for option 4 is **220** (EUR 94 bn cost vs. EUR 420 m benefit). As indicated above, costs and benefits are calculated in terms of net present value using a discount factor. Since the benefits materialise later in the future (due to the long latency period of cancer), they are particularly sensitive to the discount factor used. A sensitivity analysis calculated the impact of i) a declining rate (4% the first 20 years, 3% the remaining 20 years) and ii) a discount rate of 1.5% for the benefits (in line with the UK approach for risk to life values). In both cases, the relative increase in benefits leads to a better cost/benefit ratio for the option 2. In the first case, the ratio is reduced around 29%; in the second case, around 75%.

The efficiency is also analysed from the perspective of the costs/turnover ratios, as it is important to ensure that additional costs are bearable even for smaller businesses. This analysis shows a less negative picture, as explained above. Only for option 4, smaller business in certain sectors, might be seriously impacted. Consequently, option 4 is ranked as the least efficient. Option 2 is the most balanced option between adequate protection of workers at the EU level and direct costs for companies (including SMEs).

With regard to **coherence**, the options are analysed on the basis of how coherent they are with other EU policies (in particular the Charter for Fundamental Rights, the European Pillar of Social Rights and its Action Plan, the Europe's Beating Cancer Plan, the Zero Pollution Action Plan and REACH). Coherence with general EU priorities and policies, as well as with the Charter of Fundamental Rights, goes hand in hand with the level of the OELs. All the options ensure coherence of the AWD with other EU policy objectives and increase complementarity with REACH. More deaths could be prevented with stricter OEL levels so coherence could be assessed slightly better for options 3 or 4. However, companies could pass additional costs from stricter OELs to consumers with

[89] Annex 1 to RAC opinion. See footnote 38.

potential negative impacts for renovation and green objectives (e.g. delay of renovations and missed energy savings). Therefore, the stricter OEL options are assessed as slightly less coherent with the objectives of Green Deal or Renovation Wave in comparison to baseline. This leads to more or less the same total coherence of options.

Table 1: comparison of options

Criteria	**Option 1: Baseline**	**Option 2: 0.01 fibres/cm^3**	**Option 3: 0.002 fibres/cm^3**	**Option 4: 0.001 fibres/cm^3**
Effectiveness	0	++	++	+
Efficiency	0	-	- -	- - -
Coherence	0	+	+	+

8 PREFERRED OPTION

Taking into account the comparison of options as well as the positions of the different interest groups of the ACSH, the preferred option is:

Option 2. OEL equal to 0.01 f/cm^3 as an 8-hour time-weighted average (TWA).

In addition, taking note of the technical developments, as well as the need to measure much lower exposure levels to check the compliance with the potential revised OEL, all Interest Groups agreed that there is a need to stepwise replace the PCM (currently the reference method for quantification of asbestos fibres in the air at workplace) by a more modern and sensitive methodology based on EM.

As it is possible to measure an OEL equal to 0.01 f/cm^3 with PCM, no transition period is needed for implementation of the OEL. However, the Government Interest Group (GIG) and the Employers Interest Group (EIG) underlined that some time will be needed to implement a new measurement methodology since many Member States still use PCM. Therefore, such time would allow laboratories to acquire new equipment, to train the technicians and to organise interlaboratory comparison.

Thus, following the recommendation of the GIG and EIG, it is expected that a change of the preferred method (electronic measurement techniques) could occur in a time frame of 4-5 years. As explained in the section 6.1, costs calculations for option 2 already factor this change in. In any case moving from one method to another will remain voluntary as the proposal for a revised Directive will not impose EM as reference method.

8.1 Overall impact of the preferred option

8.1.1 Impact on workers

The preferred option should result in benefits in terms of avoided work-related cases of cancer, and related monetised health benefits including avoidance of intangible costs such as the reduced quality of life, the suffering of the workers and their family. It is estimated that 663 cases of cancer (lung cancer, mesothelioma, laryngeal cancer and ovarian cancer) could be prevented, and its monetised health benefit is assessed as between EUR 166 million and EUR 323 million. In addition, the wider public may benefit from reductions in the generation and spreading of asbestos dust in surrounding areas as a result of increased/improved RMMs.

8.1.2 Impact on business

As regards costs, the preferred option will affect operating costs for companies which will have to adjust the working practices to comply with the new OEL. Those costs will consist of incremental costs of RMMs (including RPE), cost of notification and medical surveillance, monitoring costs and training costs.

The compliance costs to business over the next 40 years are estimated to be about EUR 21 billion, although nearly half of those (EUR 8 billion) are related to notification and health surveillance obligations subject to the art. 3(3) waiver. Costs are likely, to a large extent, to be passed on to the customers. However, they may result in some companies abandoning the market and the transfer of the relevant activities to other companies. Despite this, the analysis of the preferred option did not identify those as significant impacts. As explained in section 6.2.2.1, only a few small companies in a limited number of sectors (e.g., repair of electrical equipment) are estimated to face a moderate negative impact.

The benefits of healthier staff could have indirect effects on the reputation of the relevant companies, as work with asbestos may be less perceived as a risky line of work associated with health issues. As a result of such an improvement in their public image, companies may find it easier to recruit and retain staff, reducing the cost of recruitment and increasing the productivity of workers.

8.1.3 Impact on SMEs

Small companies, which account for 99.32% of companies working with asbestos in all sectors, are the ones that will more likely be affected by the reduction in the OEL.

With the exception of the SMEs in the sectors of repair of electrical equipment, repair and maintenance of ships and boats, and maintenance and repair of motor vehicles (i.e. 0.02% of all companies dealing with asbestos), where the costs can have a small impact (between 2 and 4% of turnover) the big majority of SMEs will not be impacted by necessary cost increases.

Therefore, SMEs specificities, their limitations and particular challenges have been duly taken into account in the overall analysis presented in section 6.

8.1.4 Impact on competition and competitiveness

Companies already compliant with an OEL lower than the current EU OEL will be less impacted. This is particularly relevant for companies working in France, the Netherlands, and Germany where OELs are similar or lower than the preferred OEL option (0.01 fibres/cm^3).

However, whilst this would make them more cost-competitive against companies working elsewhere in the EU or beyond, most of the work done with asbestos is carried out in-situ.

8.2 Subsidiarity, proportionality and REFIT

In view of the available scientific evidence, it is necessary to review the OEL of asbestos. The protection of workers health against risks arising from exposure to asbestos is already covered by EU legislation, in particular by the AWD, which can be amended only at EU level. The preferred option builds on long and intensive discussions with all stakeholders (representatives from workers' associations, representatives from employers' associations, and representatives from governments), which helps to ensure that the principles of subsidiarity and proportionality are well respected.

Updating the AWD is an effective way to ensure that preventive measures would be updated accordingly in all Member States, providing a uniform level of minimum requirements designed to guarantee a better standard of health and safety and thus minimising the disparities in health and safety protection levels of workers between Member States.

Furthermore, the preferred option also offers a certain margin of flexibility to Member States. In accordance with Article 153(4) of the TFEU, setting or revising OELs at the EU level does not prevent Member States from maintaining or introducing more stringent protective measures (i.e. lower limit values). However, Member States cannot set a higher limit value than the EU OEL set in the article 8 of the AWD. Updating the AWD therefore complies with the principle of **subsidiarity**.

The **proportionality** principle is respected as the preferred option is limited to revising the limit value for asbestos by amending Article 8 to the AWD on the basis of the scientific and technical data available, as provided by the 3rd recital of the AWD. Companies have already the obligation to reduce to a minimum workers' exposure to asbestos (Article 6 of the Asbestos at Work Directive). The OEL provides a reference not to exceed but it is not a brand-new obligation. This initiative aims to make a step forward to achieve the objectives set to improve health and safety of workers.

Furthermore, the preferred option is endorsed by employers, meaning that although the quantified costs may be higher than benefits, businesses consider it a proportionate option. When considering the costs per company, in average, they will incur a cost of EUR 375 per year on average[90]. However as referred in section 8.1.3, small companies from a few specific sectors (repair and maintenance of electrical equipment, vessels, and motor vehicles) may face substantial new compliance costs. Despite this, as most of the costs are likely to be passed to consumers, no significant number of companies is expected to cease their activities.

The preferred option includes a recommendation for a change of the method to be commonly used for monitoring, which have also been discussed by the relevant stakeholders.

The preferred option has the better cost/benefit ratio and the estimated cost/turnover ratio is small for all companies and sectors.

The aim of this initiative is to ensure a balanced approach, i.e., to prevent companies from closures or severe economic disadvantages while providing an adequate protection of the workers at the EU level. The preferred option is considered the most balanced and justified in light of the accrued and longer-term benefits in terms of reducing health risks arising from workers' exposure to asbestos and saving lives.

Finally, regarding the **simplification** and the efficiency improvement of the existing legislation, the preferred option eliminates the need for Member States to conduct their own scientific analysis to revise the OEL. Employers also benefit from the simplification in ensuring legal compliance (more homogenous limit values across the EU), particularly those operating in different Member States.

9 HOW WILL ACTUAL IMPACTS BE MONITORED AND EVALUATED?

9.1 Monitoring arrangements

The table below presents the core indicators for each operational objective and the data sources for the monitoring of the core indicators.

Table 13: Indicators and monitoring arrangements/data sources

Operational objective	Specific Objective	Indicators	Monitoring arrangements/data sources for monitoring indicators
The reduction of occupational diseases and	To enhance the effectiveness of the	The number of occupational	The data sources for the monitoring of this indicator are: - data that could be collected under

[90] The cost per year per company was calculated on the basis of the total costs per company over 40 years, as shown in table 9. Taking into account the part of these costs which would be dedicated to capital expenses under option 2 (approximatively 13%), companies would pay €2276.25 during the first year, then €326.25 for the following 39 years.

occupational related cancer cases in the EU	occupational exposure limit value under the AWD by updating it on the basis of scientific expertise	diseases and occupational related cancer cases in the EU	European Occupational Diseases Statistics (EODS) - Experimental statistics of Eurostat, as well as on other non-cancer work-related health problems and illnesses in accordance with Regulation (EC) No 1338/2008[91]. - data notified by employers to the competent national authorities on cases of cancer identified in accordance with national law and/or practice as resulting from occupational exposure to asbestos in accordance with Art. 18 (2) of Directive 2009/148/EC, and which may be accessed by the Commission in accordance with Article 18 of Directive 2004/37/EC. - data submitted by Member States in the national implementation reports according to Art. 22 of Directive 2009/148/EC on the implementation of the Directive, submitted in accordance with Art. 17a of Directive 89/391/EEC. The next evaluation will cover the period from 2018-2022.
The reduction of costs related to occupational cancer for economic operators and for social security systems in the EU	To enhance the effectiveness of the occupational exposure limit value under the AWD by updating it on the basis of scientific expertise	The costs related to occupational cancer for economic operators (e.g. loss of productivity) and social security systems in the EU.	The monitoring of this indicator will require the comparison of the expected figures on the burden of occupational cancer in terms of economic loss and health care costs and the collected figures on these matters after the adoption of the revision. The productivity loss and health care costs can be established on the basis of the data on the number of occupational cancer cases and the number of occupational cancer deaths (the arrangements for the collection of the data on occupational cancer cases are described supra in this table).

A two-stage compliance assessment (transposition and conformity checks) will be carried out by the Commission for the transposition of the limit values. At workplace level, there is an obligation for employers to ensure that the exposure does not go above the limit value set out in article 8 of the AWD. The monitoring of application and enforcement will be undertaken by national authorities, in particular the national labour inspectorates.

[91] Regulation (EC) No 1338/2008 on Community statistics on public health and health and safety at work, OJ L 354/70, 31.12.2008

At EU level, the Committee of Senior Labour Inspectors (SLIC) informs the Commission regarding problems relating to the enforcement of Directive 2009/148/EC.

While collection of reliable data in this area is complex, the Commission and EU-OSHA are actively working on improving data quality and availability so that the actual impacts of the proposed initiative could be measured in a more accurate way and additional indicators could be developed in the future (e.g. in relation to mortality caused by occupational cancer). Ongoing projects include cooperation with national authorities on the European Occupational Diseases Statistics (EODS) data collection[92] and Workers' exposure survey on cancer risk factors to be implemented by EU-OSHA[93].

Legislative action needs to be followed up through effective implementation at the workplace. Companies have a broad range of tools, information and good practices provided by EU-OSHA in the context of a Healthy Workplaces Campaign on dangerous substances[94].

9.2 Evaluation arrangements

In accordance with Article 17a of Directive 89/391/EEC, every five years, Member States are required to submit a report to the Commission on the practical implementation of the EU OSH Directives, including Directive 2009/148/EC. Using these reports as a basis, the Commission is required to evaluate the implementation of Directive 2009/148/EC and, to inform the European Parliament, the Council, the European Economic and Social Committee and the Advisory Committee on Safety and Health at Work of the results of this evaluation and, if necessary, of any initiatives to improve the operation of the regulatory framework.

[92] https://ec.europa.eu/eurostat/web/experimental-statistics/european-occupational-diseases-statistics
[93] https://osha.europa.eu/en/facts-and-figures/workers-exposure-survey-cancer-risk-factors-europe
[94] The campaign pursued several objectives, including raising awareness of the importance of preventing risks from dangerous substances, promoting risk assessment, heightening awareness of risks to exposure to carcinogens at work or increasing knowledge of the legislative framework. It was carried out in 2018-2019.

Annex 1: Procedural information

1. LEAD DG, DECIDE PLANNING/CWP REFERENCES

Lead DG: Directorate-General Employment, Social Affairs and Inclusion, Unit C2 - Health and Safety at Work, EU-OSHA.

2. ORGANISATION AND TIMING

An Occupational Safety and Health Inter-services Steering Group (OSH ISG) was created involving twelve services (SG, SJ, BUDG, GROW, ENER, ENV, RTD, CNECT, EAC, SANTE, JUST, ESTAT) as well as EU-OSHA. The OSH ISG was consulted and invited to participate in a first meeting on 02/02/2022.

A second consultation of the OSH ISG on the revised draft IAR run from until XX March 2022. DG EMPL took most of comments into consideration in the revised version of the draft IAR. This revised version of the draft IAR was sent to the Regulatory Scrutiny Board (RSB) on 30 March 2022.

3. CONSULTATION OF THE RSB

The draft IAR for this initiative was submitted to the RSB on 30 March 2022 and the meeting with the RSB has taken place on 27 April 2022. Following this meeting, the RSB gave a positive opinion with reservations.

The table below summarises the RSB comments as well as the revisions introduced in response to them:

RSB opinion's comments	Corresponding changes to the draft IAR
The report should present clearly the rationale for intervention at this point of time. It should provide, upfront, the relevant evaluation findings and explain to what extent the current OEL has been effective and why there is a need to act now. It should explain the content of the Risk Assessment Committee of the European Chemicals Agency (RAC ECHA) scientific opinion. It should clarify what the new scientific evidence entails and what its implications are. It should indicate upfront the degree of consensus among stakeholders on the need to act.	Section 1 was further developed to give upfront information on the relevant evaluation findings and content of the scientific assessment done by ECHA-RAC. Information of the last in-depth evaluation of the AWD and latest assessment of the implementation of the EU occupational safety and health (OSH) directives for the period from 2013 to 2017 was included in section 1. The fact that there is no safe exposure level for asbestos is clarified in section 1. Information on the consensus agreement by the tripartite Advisory Committee for Safety and Health at Work (ACSH) on the need to lower the current OEL was introduced both in section 1 and section 2.
The report should be clear, upfront, on the limited scope of the initiative, given that the occupational exposure limit is only one aspect of the protection required to reduce workers' exposure to asbestos. Given the political expectations expressed in	The scope of the initiative, enhancing the effectiveness of the asbestos occupational exposure limit value, is more clearly indicated in section 1. A dedicated point (5.2.2 - Revision of other

particular by the European Parliament, it should explain why it discards other measures that would fall within the scope of the Directive.	provisions in the Directive) was included with further explanation on other measures discarded that would fall within the scope of the Directive.
Given that legal basis provides only for the setting of minimum harmonisation measures, the report should better explain how the revision of the exposure limit will lead to greater harmonisation of limit values across the EU. It should discuss how far Member States will be able to deviate from the EU OEL and how this may affect achieving a level playing field. It should examine how the legacy building stock and historic national building regulations have led to differing exposure risks across Member States.	The legal basis information on point 3.1 was complemented to better explain that the AWD lays down minimum requirements, therefore, Member States can introduce more stringent protective measures, including a lower limit value. The revised section also explains that when Member States diverge from the EU minimum level of health and safety at work protection, this has a positive impact on the effectiveness of the AWD, as this divergence translates into a higher level of protection for their workforce, which is the general objective of the Directive. Point 3.2 on subsidiarity was further developed to better explain that the revision of the exposure limit value under the AWD at the EU level will not completely eliminate the differences between Member States but will lead to a greater harmonisation of limit values across Europe, as the lower the EU OEL, the lower the scope for divergences. Information on the experience since introduction of current OEL was also referred to.
According to RAC-ECHA scientific opinion, asbestos does not have a safe exposure level, which means that any exposure to asbestos may eventually cause an asbestos-related disease. In designing options the report should be clear upfront that none of the proposed options can prevent all possible damages, thus fully addressing the problem of workers' exposure to asbestos, and explain why setting a zero fibres/cm3 OEL would not be feasible.	Section 5 was further developed. It now includes information on the process leading to an OEL revision. The revised text clarifies that any exposure to asbestos may eventually cause an asbestos-related disease, and further information on the scientific assessment were included, such as the exposure-risk relationship. Under point 5.3 information was added to make it clear that there is no OEL value below which workers would not be at risk when exposed to asbestos. In addition, information was further developed to better explain the choice of OEL options and why a zero fibres/cm3 OEL is not feasible.
The report should set out convincingly that the evidence it uses throughout is the best available. It should be clear how the literature and non-EU evidence was complemented by stakeholders' views and how stakeholders' alternative modelling assumptions were taken into account.	The information on section 1, was further complemented to evidence the constraints with availability of data. Stakeholder's views were further discussed through the document, namely on section 2, section 5 and section 6.
Given the limitations of the evidence base and stakeholders' feedback, the report should explain better the uncertainties of the impact analysis. In particular, it should account for the uncertainties of the key assumptions that drive the cost and benefit estimates by undertaking the sensitivity analysis. It should explain how the estimates are sensitive to alternative modelling assumptions	The uncertainty of the estimates was further explained in section 6.1 and section 6.2.2 of the report. Moreover, an additional sensitivity analysis section was added to annex 4 (analytical methods).
The analysis of the health impacts of the options should take into account that the most ambitious option (OEL of 0.001 fibres/cm3) faces technical measurement challenges in dusty environments, such as construction sites.	It was better explained in section 5 that an OEL at 0.01 fibres/cm3 or lower will require a change in the measurement method. In section 7 it is referred that the measurement methods needed to monitor compliance with the

	different OELs options has a direct influence in the effectiveness. It clarifies information concerning compliance for the assessed options.
The report should add a subsection on the 'one in, one out' approach and be clear on the costs in scope of that approach. The administrative costs should be presented with sufficient granularity	A dedicated section on the 'one in, one out' approach was included (6.2.7.1) and explanatory information on the costs in the scope were given. The administrative costs presentation was revised in order to provide a greater degree of granularity.
The comparison of options should better justify the scores for effectiveness, efficiency and coherence. The effectiveness score should be closely linked to the health impacts of 3 the options. When costs exceed benefits many times, an option cannot be ranked as being equally efficient as the baseline. The coherence analysis should explicitly analyse the coherence with the objectives of the Climate Law.	The information on section 7 was further developed to better explain the contribution of the measurement methods to the effectiveness of the options. The information on efficiency was also strengthened and the scores given in the comparison of options table reviewed. The coherence analysis was strengthened with analysis of the European Green Deal and Renovation wave influence.
The preferred option includes a set of transitional periods based on stakeholders' feedback but with no further analysis. It should include transition periods in the options' design and analyse their impacts, including cost and benefit implications, for all options. At minimum, it should provide such analysis for the preferred option.	Section 8 of the report was reviewed to better explain that, as it is possible to measure an OEL equal to 0.01 f/cm3 (preferred option) with the actual measurement method, PCM, no transition period is needed for implementation of the retained OEL.
Given the long latency for benefits to materialise and the high net costs, the discussion on proportionality should be more detailed, balanced and critical. Impacts on particularly affected SMEs should be better documented. The Board notes the estimated costs and benefits of the preferred option(s) in this initiative, as summarised in the attached quantification tables.	The analysis of proportionality in section 8 has been further improved, including by explaining that companies already have the obligation to reduce to a minimum workers' exposure to asbestos and that the OEL provides a reference not to exceed but it is not a brand-new obligation.

4. EVIDENCE, SOURCES AND QUALITY

Risk Assessment Committee's Opinions

The assessment of health effects of the carcinogens subject to this proposal is based on the relevant scientific expertise from ECHA's Committee for Risk Assessment (RAC).

RAC prepares the opinions of the European Chemicals Agency (ECHA) related to the risks of substances to human health and the environment. RAC examines among others the proposals for harmonised classification and labelling, evaluates whether the proposed restriction on manufacture, placing on the market or use of a substance is appropriate in reducing the risk to human health and the environment, and assesses the applications for authorisation of chemicals. Moreover, opinions from RAC also support Union regulatory

activity in the field of occupational safety and health. More information about what this committee does can be found on the website of ECHA[95].

RAC develops high quality comparative analytical knowledge and ensures that Commission proposals, decisions and policy relating to the protection of workers' health and safety are based on sound scientific evidence. Based on a Service Level Agreement (SLA) signed by DG EMPL and ECHA, this Committee assists the Commission delivering scientific evaluations, upon request, on the toxicological profiles of each of the selected priority chemical substances in relation to their adverse health effects on workers. These scientific evaluations shall, where appropriate, include proposals for Occupational Exposure Limit values (OELs), biological limit values/biological guidance values and/or notations. Based on such opinions, the Commission will propose occupational exposure limits for the protection of workers from chemical risks, to be set at Union level pursuant to Council Directive 98/24/EC, Council Directive 148/2009/EC and Directive 2004/37/EC of the European Parliament and of the Council.

Members of RAC are highly qualified, specialized, independent experts selected on the basis of objective criteria. They provide the Commission with Recommendations and Opinions that are helpful for the development of EU policy on workers protection.

For the purpose of this initiative, the Commission services have used the RAC opinion on an updated risk assessment for asbestos which is summarised in the following table. The opinion proposes an exposure-risk relationship expressing the excess risk for cancer (lung cancer and mesothelioma) mortality related to different levels of exposure. The relationship between the different concentration values and the risk for developing cancer (see the below table), shows the risk for exposed workers at different OELs. For example, for an air concentration equivalent to the current OEL, there is a risk that for 125 out of 100 000 exposed workers could develop lung cancer or mesothelioma.

[95] https://echa.europa.eu/about-us/who-we-are/committee-for-risk-assessment

Exposure/risk relationship derived on the RAC opinion

Air concentration of asbestos (fibres/cm3) based on fibre measurements according to the Phase Contrast Microscopy method of WHO (1997) and combined information from study populations exposed to different asbestos fibre types	Excess life-time cancer risk (cases per 100 000 exposed)
0.001	1.2
0.002	2.5
0.005	6.2
0.01	12
0.02	25
0.05	62
0.1	125

Studies performed by external consultants

The Commission launched a call for tender on 30 April 2020 an open call for tender[96] in order to collect information on substances with the view to analyse health, socio-economic and environmental impacts in connection with possible amendments of Directive 98/24/EC (Chemical Agents) and Directive 2009/148/EC (Asbestos).

The contract started on 28 October 2020 and lasted 10 months. The outcome of this study[97] provides the main basis for this Impact Assessment Report and is summarised in the relevant sections of this document.

[96] Call for Tender documents available at: https://etendering.ted.europa.eu/cft/cft-display.html?cftId=3559

[97] European Commission, Directorate-General for Employment, Social Affairs and Inclusion, Lassen, C., Christens, F., Vencovska, J., et al., Study on collecting information on substances with the view to analyse health, socio-economic and environmental impacts in connection with possible amendments of Directive 98/24/EC (Chemical Agents) and Directive 2009/148/EC (Asbestos): final report for asbestos, Publications Office, 2021, https://data.europa.eu/doi/10.2767/981554

Annex 2: Stakeholder consultation

The following consultation activities have been performed :

1. *Social Partners Consultation*: as required by the TFEU Article 154, a formal two-stage consultation of the social partners at EU level is required prior to submitting proposals in the social policy field. Such a two-stage consultation has been performed in 2020 and 2021. The first phase of social partners' consultation closed on 11 February 2021 with a confirmation of the support for the revision of the current occupational exposure limit value. The second phase consultation focused on the envisaged content of possible proposals closed on 30 September 2021. More information about these two-stage consultation is provided below in this annex 2.
2. *Tripartite consultation (ACSH)*: the tripartite Advisory Committee on Safety and Health (ACSH), composed of three full members per Member State, representing national governments, workers' and employers' organisations, is consulted on regular basis. It gives, taking into account the input of the RAC as well as socio-economic and feasibility factors, opinions which are used to prepare the Commission's proposal. More information about this tripartite consultation is provided below in this annex.
3. *Consultation of other stakeholders* (e.g., industry of employees associations specifically concerned): These consultations have been carried out in the context of the external study in order to collect detailed information on the potential impacts of establishing or revising OELs under the CAD and AWD that is not available in published literature and internet searches.

In line with the previous amendments of the OSH Directives (namely CMD), no *public consultation* on this initiative has been launched for the following reasons:

- A broad consultation of various stakeholders, social partners and Member States' competent authorities has been carried out in view of this initiative.
- This initiative concerns a very technical topic for which the general public does not have sufficient expertise. For that reason, a more targeted consultation was considered as a more proportionate approach.
- In the context of the scientific opinions carried out by RAC, stakeholders were allowed to express their views and concerns in the early phases of developing the scientific report on occupational exposure limit for asbestos.

A call for evidence was published on 22 February 2022 with deadline of 22 March.

1. SOCIAL PARTNERS CONSULTATION

1.1. Results of the first phase of the Social Partners consultation.

The first phase of Social Partners consultation closed on 11 February 2021.

The Commission consulted the Social Partners on the approach regarding the revision of a limit value for asbestos under the Asbestos at Work Directive, and the establishment or revision of binding occupational exposure limit values for lead and its compounds and diisocyanates under the Chemical Agents Directive.

Workers' organisations

Two trade unions replied to the consultation: the European Trade Union Confederation (ETUC) and the European Federation of Building and Woodworkers (EFBWW). They acknowledged the importance of the revision of the current occupational exposure limit value (OEL) and requested a broader scope of action under the Asbestos at Work Directive and beyond.

ETUC and EFBWW proposed that the Directive is updated further than the current OEL. Among other things, they suggested widening the scope to include an updated list of all known forms of fibres with similar harmful effects on human health, to cancel the concepts of sporadic exposure and low intensity exposure, and of friable and non-friable asbestos-containing materials, and to prohibit the encapsulation and sealing of asbestos. Other suggestions were also made on different aspects[98], most of which are already covered by the Directive.

Apart from the aspects related to the revision of the Asbestos at Work Directive, ETUC and EFBWW mirror the proposals of the European Parliament resolution, which go far beyond the scope of the occupational health and safety policy area.

In particular, they asked to create a new European legal framework for national asbestos removal plans, which should include a model with minimum standards for digital asbestos registries, a proposal for mandatory screening before selling or renting out a building and establish asbestos certificates for buildings built before 2005, and financial support to building owners for the save removal of asbestos. Furthermore, they called on the Commission to propose a targeted amendment to Article 7 of Directive 2010/31/EU[99] on the energy performance of buildings in the context of the Renovation Wave Strategy[100].

[98] For example, provision of technical minimum requirements to lower the concentration of asbestos fibres; representative sampling of the personal exposure of the worker and more.
[99] Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings. OJ L 153, 18.6.2010, p. 13–35
[100] COM(2020) 662 final

In addition, they expressed the need for a legislative proposal for robust European minimum standards for the recognition and adequate compensation for victims of asbestos related occupational diseases, although this is Member States' competence. They also asked for the update of Recommendation of 19 September 2003 concerning the European schedule of occupational diseases, to include all known asbestos related diseases [101].

Both trade unions also suggested that in the framework of the new EU Circular Economy Action Plan[102], the registration of asbestos in existing buildings and infrastructures should be a first step to eliminate asbestos from the circular economy

Furthermore, EFBWW expressed views that women workers are vastly underrepresented in research into the health risks that are associated with workplace exposure to asbestos and considered necessary that the Commission includes a specific focus on the gender differences in this and its future initiatives to improve workers' protection from risks related to asbestos.

The workers do not want to enter into negotiations under Article 155 TFEU concerning the revision of the Asbestos at Work Directive. However, they highlight the possibility for discussing issues together with employers and seeking converging positions on related matters.

Employers' organisations

Three employers' organisations replied to the first phase consultation: BusinessEurope, SMEunited (European Association of Crafts and SMEs) and the European Construction Industry Federation (FIEC).

They supported the objective to effectively protect workers from exposure to hazardous chemicals, including by setting OELs at EU level, where appropriate. They consider this is in the interest of workers and businesses and contributes to a level playing field. However, they also raised some concerns about the approach taken when setting such values.

The employers' organisations recognised that asbestos is a serious threat for workers, which needs to be addressed. BusinessEurope and SMEunited stressed that any revision of an OEL must be based on sound scientific evidence and a thorough assessment of technical and economic feasibility and socio-economic impact, for which the role of ACSH is central.

BusinessEurope further emphasised that any review should be restricted to a possible amendment of the limit values and not touch any other provisions in the directives. They are also of view that the impact assessment scenarios already developed, are based on the

[101] OJ L 238, 25.9.2003, p. 28–34

[102] European Parliament resolution of 10 February 2021 on the New Circular Economy Action Plan (2020/2077(INI))

limit value in one Member State, which is based on a different analytical model than those used in other Member States. They refer to the need of taking this into account when going forward since analytical models have an impact on the limit values set.

BusinessEurope mentioned the need to take into account the widely used protective measures. In addition, they referred to the additional costs and particular challenges for SMEs, a change of measurement method, as a result of a lower limit value would imply, i.e., additional analysis at workplaces, new requirements for PPE.

FIEC emphasised that the current EU legal framework is sufficient and does not support stricter occupational exposure limit values for the substances under consideration. They mentioned as well, that the European Commission's action should focus more on preventive measures to eliminate or minimise risks, rather than setting new binding limit values.

SMEunited underlined that before further tighten limits they would prefer a harmonised implementation of the existing OEL as for them, due to a very long delay of up to 40 years between exposure and occurrence of an asbestos-related disease it is difficult to assess the current OEL and the impact on the protection of workers.

Moreover, they added that reinforcing technical and financial assistance support for homeowners to assess the presence of asbestos in their dwellings before carrying out renovation works would contribute to the reduction of the exposure risk of construction workers.

The employers' organisations considered that the existing preparatory procedures already involve social partners, including the ACSH consultations. Therefore, they do not want to launch a negotiation procedure pursuant Article 155 TFEU.

1.2. Results of the second phase of the Social Partners consultation

The Commission launched a second phase consultation of the Social Partners which closed on 30 September 2021. This second phase consultation, focused on the envisaged content of possible proposals, as required under the Treaty.

Workers' organisations

Two workers' organisations replied to the second phase consultation: the European Trade Union Confederation (ETUC) and the European Federation of Building and Woodworkers (EFBWW). They both recognised the importance of further improving the protection of workers from exposure to asbestos and support the revision of the exposure limit value in the Asbestos at Work Directive.

Both worker's organisations repeated the same information given on the 1st stage consultation. That information call for the same actions as the European Parliament resolution.

The workers do not want to enter negotiations under Article 155 TFEU concerning the revision of the Asbestos at Work Directive. However, they highlight the possibility for

discussing issues together with employers and seeking converging positions on related matters.

Employers' organisations

Four employers' organisations replied to the second phase consultation: BusinessEurope, SMEunited (European Association of Crafts and SMEs), the European Construction Industry Federation (FIEC) and the Shipyards' & Maritime Equipment Association of Europe (SEAEurope).

The employer's organisations having already answered the first reconfirmed their statements. SEA Europe which only answered to the 2nd phase refers that encapsulation is during the lifetime of the ships the best and safest method for dealing with asbestos in the maritime industry. They refer yet that asbestos removal would cause more health risks than encapsulation.

The employers' organisations considered that the existing preparatory procedures already involve social partners, including the ACSH consultations. Therefore, they do not want to launch a negotiation procedure pursuant Article 155 TFEU.

2. CONSULTATION OF THE ACSH/WPC

The Advisory Committee on Safety and Health at Work (ACSH) has adopted, on 24 November 2021, an opinion on an EU Binding Occupational Exposure Limit Value (BOEL) under the Asbestos at Work Directive.

Although there is consensus agreement on the need to substantially revise downwards the existing binding occupational exposure limit (OEL) to better protect workers' health and safety, taking into account scientific and technical developments since the current OEL of 0.1 fibres/cm³ was adopted in 2003, no consensus was reached to the limit value to be proposed. Thus the Government Interest Group (GIG) and the Employers Interest Group (EIG), agreed that the new limit value should be set at 0.01 f/cm3 while the Workers Interest Group (WIG) prefer a new OEL equal to 0.001 f/cm3.

In addition, taking note of the technical developments, ACSH recommended replacing the phase-contrast microscopy (PCM), currently the most widely used methodology for measurement of asbestos fibres in the air at workplace, by a more modern and sensitive methodology based on electron microscopy (EM).

In terms of implementation, the GIC highlighted that once many member states still use PCM, there will be a need for a transition period to allow the laboratories to acquire new equipment, train the technicians and organise interlaboratory comparison. GIC added that based on the experience of the member states using EM, laboratories will need 2-3 years to be ready. Thus, the GIG recommends the new OEL to be implemented no later than 4 years after the entry into force of the amending Directive while the EIG refers to a larger (4 to 5 years) delay. The WIG demands the new OEL to be implemented as soon as possible after the entry into force of the updated AWD.

3. CONSULTATION OF OTHER STAKEHOLDERS

In the context of the external study, consultation activities have been carried out to collect detailed information on the potential impacts of modifications to the AWD that is not available in published literature and internet searches. Although some information on OELs is available, limited information is available on the specific concrete risk management measures already in place, as well as those that would need to be implemented, should proposed limits be introduced.

The information sought via consultation therefore included sizes of companies, sectors and processes that would be affected, number of workers exposed, current air concentrations of substances concerned (both 8-hour time weighted averages (8-h TWA) and 15-minutes reference periods), risk management measures currently in place, as well as risk management measures that would need to be implemented should the OELs be modified and associated costs.

The information gathered was used as evidence base, complementing the available data in order to determine the most appropriate data or estimations to use by the external contractor. Consultation carried out for the purposes of the study consisted of the following main activities:

- Questionnaires;
- Email requests (possibly in combination with questionnaires);
- Telephone interviews;
- Site visits;

Mixed methods (combining e.g. questionnaire responses with telephone interviews and site visits) were adopted to ensure that a large number of organisations and individuals were able to provide data and provide their views within the time constraints and resource limits. Using mixed methods also enabled the study team to gather varying details of information and to explore information further where the need arose.

3.1. Targeted Online Questionnaires

Stakeholders were initially contacted via email. The e-mail provided an overview of the study and a link to the questionnaires. Stakeholders were also able to download a PDF version of the questionnaire via the website if they preferred (so that it could be shared among several colleagues, for example).

Three separate questionnaires were drawn up, each one created to gather information from different stakeholder groups:

- Questionnaire 1 was aimed at companies whose workers were exposed to asbestos;
- Questionnaire 2 was aimed at occupational health and safety experts; and
- Questionnaire 3 was aimed at Member State authorities.

The questions aimed to collect information on processes during which worker exposure to the substances in question is likely to occur, risk management measures that are already in place, current exposure concentrations, risk management measures that would need to be implemented should the limit be lowered, and any other impacts that could result from the lowering of EU level limit.

Although many of the responses provided a significant amount of useful information, many of them were not sufficiently detailed. Other methods of consultation, allowing experts to question and probe answers further (namely telephone interviews and site visits), were therefore required to obtain a more in-depth understanding of the potential impacts. This includes the above follow-ups.

3.2. Telephone interviews

Both national experts and substance experts were activated for the purposes of the telephone interviews. Telephone interviews were asked for in the online questionnaires as well as through direct email and phone contact.

The purpose of the telephone interviews was to gain more insight into the answers provided in response to the questionnaires. It enabled the collection of more detailed information on processes, to pinpoint exactly where exposure is likely to occur, investigating what types of risk management measures are already in place and how effective they are, as well as what risk management measures would be required if the limit was lowered and other potential ramifications for the company.

3.3. Email requests

As supplement to the interviews various information was obtained by email requests. The purpose and questions were similar to those explained above for telephone interviews.

3.4. Site visits

Companies whose activities are likely to be affected by the potential modifications to the AWD were also asked whether they would be willing to host a site visit, real or virtual. Companies to be visited, were identified via the questionnaire or the contact was established via EU trade associations.

The purpose of the site visits was to obtain a detailed operational understanding of the risk management measures that have already been implemented to protect workers from exposure to asbestos, as well as of the risk management measures that would be needed, and their associated costs should the limits be reduced.

Detailed notes from the site visit were drafted and sent back to the company to ensure that the information recorded was accurate. This process also enabled the company to add more detail and information to the study, where possible, and to confirm the level of confidentiality required to the information.

Due to the COVID-19 restrictions in place for the duration of the study, fewer physical site visits took place than for previous studies. Companies were furthermore reluctant to hold virtual site visits due to the confidential nature of the information to be shared.

3.5. Stakeholders targeted

The following table summarises information on stakeholder groups targeted and the interests represented. The table demonstrates that all relevant stakeholder groups have been reached out to.

Stakeholders targeted and interests represented

Stakeholder type	Interests represented
EU Associations	Interest of industry
MS Authorities	Interest of MS authorities
Manufacturers/users	Interest of industry
National industry associations	Interest of industry
Trade Unions	Interest of workers
Occupational Health & Safety Professionals	No particular interest - contacted in order to obtain scientific information
ACSH Working Party on Chemicals (WPC)	Interests of industry, workers and MS authorities
Laboratories	No particular interest - contacted in order to obtain information on sampling and analysis

Source: External study (RPA 2021)

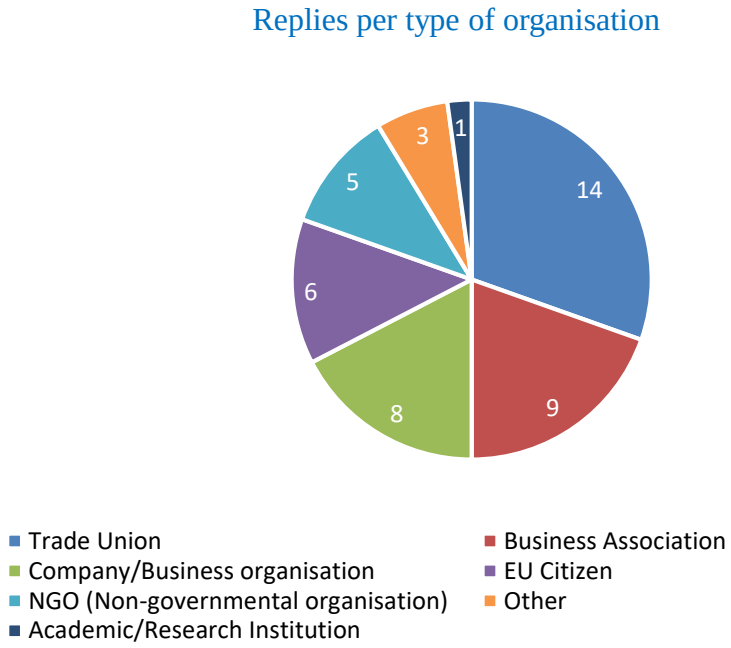
4. CALL OF EVIDENCE

A call for evidence was published on 22 February 2022 with the deadline for comments running until 22 March 2022. During this period, 47 formal submissions were received from a variety of stakeholders and also from individual citizens. From the 47 replies, 1 was disregarded as it did not relate to asbestos. The repartition of replies per country is shown in the table.

Replies per country

Country	No. of replies		Country	No. of replies
Belgium	13		Finland	1
Germany	8		Hungary	1
Italy	6		Ireland	1
France	5		Portugal	1
Netherlands	4		Romania	1
Austria	2		Spain	1
Denmark	1		United Kingdom	1
Grand Total	46			

15 replies arrived from large companies, 16 from small and medium companies and 10 from micro companies and are shared by type of organisation as follows.



Feedback from trade unions, reflects in principle the same concerns and opinions of the workers organisations as in their reply to the EU social partners' consultation. Trade unions in general call for a European Framework strategy for asbestos removal, mapping of asbestos, training of workers and lowering the current OEL to 0,001 f/ cm^3 (the same limit value as proposed by the European Parliament in its resolution). One Austrian trade union[103] focused on explaining Austrian situation considering important the general prevention, so that workers' dangers can be detected, averted or treated at an early stage.

Companies and business organisations feedback is in line with the position of the employers' organisations given during the EU social partners' consultation. They reiterate that the current EU legal framework is sufficient and would rather support non-legislative options as the revision of existing or elaboration of new guidelines. Some answers indicate that the revision of occupational exposure limit value should be realistic, as their application on the ground greatly depends on whether it is feasible for employers to measure and implement them. It is also added that if companies are not able to apply limit values, they will not be able to protect workers as intended.

The feedback from NGOs and other types of organisations is mixed with some replies defending the adoption of an OEL no stricter than 0.01 f/cm^3 and the development or revision of guidelines, and 1 reply[104] supporting an OEL of 0.001 f/cm^3. The only one

[103] Gewerkschaft Bau-Holz
[104] European Respiratory Society

research institution[105] replying indicates the importance to specify the width of fibres the OEL relates to.

The replies from citizens reflect their concerns with general protection from asbestos.

In addition to the replies received directly on the webpage, the French authorities have sent their contribution by letter. They propose a revision of the OEL for a value equal to the French OEL (0.01 f/cm3) and the use of electronic microscopy techniques. In their view, this will ensure an appropriated equilibrium between the protection of workers and economic feasibility.

[105] The Finnish Institute of Occupational Healthfootnote 3

Annex 3: Who is affected and how?

1. PRACTICAL IMPLICATIONS OF THE INITIATIVE

1.1. Consumers/Workers

- Due to the essential nature of the work, costs arising from working under stricter OELs will be more likely to be passed on to citizens/consumers as increased prices;

- Workers will have the duty to comply with the dispositions provided by the employers as regards the use of preventive and protective measures necessary to comply with OSH legislation (e.g. the newly established OEL).

1.2. Business

Employers:

- must adjust the working practices to comply with the OEL, in particular reinforcing existing risk management measures.
- may find it easier to recruit and retain staff, reducing the cost of recruitment and increasing the productivity of workers.

1.3. Administrations

Member States must transpose the amended Directive into national legislation.

2. SUMMARY OF COSTS AND BENEFITS

I. Overview of Benefits (total for all provisions) – Preferred Option		
Description	***Amount***	***Comments***
Direct benefits		
Savings for companies	€1 700 000	Reduced absenteeism, productivity losses and insurance payments. In addition, not quantified benefits include legal clarity, simplification in ensuring legal compliance and a more balanced level playing field for businesses across the EU.
Savings for public sector	€3 400 000	Having reduced health care costs. Avoidance of loss of productivity and mitigation of financial loss of national social security systems, reducing the costs of healthcare and the loss of tax revenue due to morbidity and mortality.
Savings for workers & families	Method 2: €166 000 000 Method 1: €323 000 000	More effective protection of their health, reducing suffering of workers and their families, increased length, quality and productivity of their working lives, avoiding premature deaths, less costs of informal care.
Administrative cost savings related to the 'one in, one out' approach*		
Savings for companies and citizens	n.d.	Administrative savings for companies operating in different Member States may occur however these are not considered to be significant. No administrative savings are foreseen for citizens

Note: Estimates are rounded and are relative to the baseline as a whole (i.e., the impact of individual actions/obligations of the preferred option are aggregated together).

II. Overview of costs – Preferred option					
		Businesses		**Administrations**	
		One-off	**Recurrent**	**One-off**	**Recurrent**
	Compliance costs	€3 billion	€17 billion	€1.5 million	
	Monitoring costs		€110 million		
	Administrative costs ▪ Measurements ▪ Notifications		 €15 million €650 million		€420 million
Costs related to the 'one in, one out' approach					
	Administrative costs (for offsetting) Notifications	n.a.	€ 650 million- to €2.18 bn		

Note: Estimates are rounded and are relative to the baseline as a whole (i.e., the impact of individual actions/obligations of the preferred option are aggregated together).

3. RELEVANT SUSTAINABLE DEVELOPMENT GOALS

III. Overview of relevant Sustainable Development Goals – Preferred Option(s)		
Relevant SDG	**Expected progress towards the Goal**	**Comments**
SDG no. 3 – Good health and well-being. Ensure healthy lives and promote well-being for all at all ages	The initiative will contribute to substantially increase health of workforce in European Union through the prevention of cancer disease and cancer deaths due to exposure to asbestos.	The initiative will avoid 663 cases of cancer to occur in the next 40 years from the exposure to asbestos.
SDG no. 8 - Decent work and economic growth. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Through the lowering the OEL the initiative will contribute directly to a decent work environment.	The benefits of healthier staff and better working conditions will contribute to an easier recruitment and retention of staff. Workers' productivity will likely also increase, as a result of lower absenteeism.
SDG no. 9 - Industry, innovation and infrastructure. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	The initiative will impact positively the development of new technology as a consequence of the need to implementation more efficient risk management measures to comply with the stricter OEL.	
SDG no. 12 - Responsible production and consumption. Ensure sustainable consumption and production patterns	A reduction of asbestos dust is expected as a result of risk management measurements put in place to comply with a stricter OEL. Thus, the initiative would have a limited positive impact, namely on environmentally sound management of chemicals and all wastes throughout their life cycle.	

Annex 4: Analytical methods

1. MONETISATION OF THE HEALTH IMPACTS

1.1. Health impacts

The revision of the OEL is expected to result in a reduction in the occupational exposure to asbestos. The extent of such reduction depends on the current levels of exposure, as well as on the projected future levels of exposure in the absence of the proposed measure, i.e. the 'baseline scenario'.

For a given reduction in exposure levels, it is then necessary to estimate the expected decrease in the incidence of cancer cases over a given timeframe.

The current and future cases of ill health have been estimated using the following inputs:

- The Exposure Risk Relationships (ERRs);
- The numbers of workers exposed;
- The exposure concentrations; and
- Trends in the exposed workforce and exposure concentrations.

On this basis, we can therefore calculate the health impact which can be defined as the number of persons ("cases"), suffering from cancer due to this occupational exposure.

It has to be kept in mind that the ERR only applies on the most critical cancer site, which is given by the assessment of the European Chemicals Agency / Committee for Risk Assessment (ECHA/RAC), and only comment qualitatively on further cancer sites, which may be linked to exposure to asbestos;

Therefore, the calculated health impact (e.g., in terms of "number of estimated cases with health impairments") is not identical to the "real" health impact, but is just an approximation, which may underestimate the full impact of the occupational exposure to asbestos. However, there are other uncertainties leading to under- or overstimates. These are further developed further in this annex.

Exposure Risk Relationships

The starting point for a cancer risk impact assessment is the OEL proposed by RAC and the respective RAC opinion, together with the annexed background report. Asbestos is a non-threshold carcinogen and consequently, no health-based OEL could be identified. Instead, an exposure-risk relationship (ERR) was derived, expressing the excess risk for lung cancer and mesothelioma mortality (combined) as a function of the fibre concentration in the air.

The exposure-risk relationship was calculated for all types of asbestos by combining all studies, regardless of the asbestos fibre type the working population are exposed to. The

exposure-risk relationship focuses on air concentrations, at and below the current OEL of 0.1 fibre per cm3.

The ERR was determined for a working life of exposure at several exposure levels for 8 hours per day and 5 days per week over a 40 years working life period (starting at 20 years). The excess risk was calculated until 89 years of age. The analyses focused on exposure levels at and below the current EU OEL.

Dose Response relationships

As asbestosis (fibrotic lung changes due to long-term asbestos exposure are expected at concentrations only above the current limit value set by the Asbestos at Work Directive of 0.1 fibres/cm3, no DRR for asbestosis is derived.

The number of workers exposed

It is important to calculate the number of workers potentially exposed to a substance in order to calculate the potential benefits of implementing any new measures.

Data on exposed workforce are available from national databases in a number of Member States. The data in general include exposed workforce from activities subject to notification. This data was then extrapolated to EU27 on a per capita basis.

1.2. Monetisation of the health impacts

Specific guidance is provided in the Better Regulation (BR) Toolbox for health impacts (BR Tool #32). This is summarised in the table below.

Table 1: Better Regulation Toolbox on health impacts

Aspect	Guidance
Health impacts	Direct impacts Indirect impacts: does the option influence the socio-economic environment that can determine health status? To assess direct and indirect health impacts monetary and non-monetary methodologies can be used. Non-monetary approaches: Quality adjusted life years (QALYs), Disability adjusted life years) (DALYs), Healthy life years (HLYs). Monetary approaches: preference-based approaches Willingness to pay (WTP), Willingness to accept (WTA) -> Value of Statistical Life (VOSL), Value of Life-Year (VOLY), accounting-style approaches (cost of illness method=only medical expenses, human capital method=loss of future earnings in case of disability or premature death)

Source: External study. RPA (2021) (*Source: Better Regulation (BR) Toolbox – Tool health impacts (BR Tool #32))*

Focusing on the example of cancer, the costs of cancer can be divided into:

- **Direct costs:** These are the costs of healthcare, in other words, the medical costs associated with the treatment of cancer and other costs, including non-medical costs. Other direct costs may be incurred by the patients (say, the cost of transport to attend appointments) but also by their family/friends, for example, through providing unpaid care.

- **Indirect costs:** These are the monetary losses associated with the time spent receiving medical care, including productivity losses due to time spent away from work or other usual activities and lost productivity due to premature death. Employers might also bear costs indirectly through *inter alia* loss of output; payments related to sick leave; administrative costs related to a worker's absence; additional recruitment costs; loss of experience/expertise; overtime working; compensation payments (although this may be covered by some form of employer's liability insurance); and insurance premiums. Depending on the national structure of social security provision, the government (tax payers) may also bear the costs of any disability/social security payments and will also suffer losses through foregone tax receipts.

- **Intangible costs:** These include the non-financial 'human' losses associated with cancer, e.g., reduced quality of life, pain, suffering, anxiety and grief.

In economic impact terms, the total social costs[106] of ill health are measured by the costs borne for health care provision, together with lost output (including productivity losses), gross wage and non-wage labour costs of absent workers (such as loss of experience), administrative costs and the intangible costs. These represent the direct and indirect resource costs and the non-market 'external' costs of illness. The other costs listed above (e.g,. insurance premiums) relate to what are commonly referred to as 'transfer payments', which do not give rise to net welfare effects. As a result, they are not considered in economic analyses, even though they may be important in financial terms to an individual worker or an employer.

1.3. Benefits Model

1.3.1. Introduction

The key endpoints for asbestos are lung cancer and mesothelioma.

The key model inputs are summarised below. The inputs are those parameters whose variation changes the results and for which the model is run multiple times to derive a benefits curve.

[106] From a welfare economic perspective.

Table 2: Key model inputs

Parameter	Explanation
Rx: Estimate of the risk or fraction of workers affected	Exposure-Risk Relationship (ERR)
ExW: Exposed workforce	Number of workers exposed at different points in time
Cx: Exposure concentration	8-hr TWA (time-weighted average) that the workers are exposed to (real concentration, i.e. if personal protection equipment (PPE) is currently worn, the measured concentrations are adjusted to take into account PPE where possible)

Source: External study. RPA (2021)

In addition to the inputs, the model is underpinned by a range of default assumptions regarding the onset of the disease and its effects. Some of these assumptions are a simplification of complex real life scenarios or best estimates (where authoritative evidence could not be identified from readily available literature).

The key areas in which assumptions had to be made to enable the calculations are set out below.

Table 3: Key assumptions and their consequences for the sensitivity analysis

Parameter	Explanation
Onset of the disease	
MinEx	The minimum exposure duration required to develop the endpoint
MaxEx	The time needed to reach the maximum risk (i.e. after the MaxEx has been reached, the risk of effects do not increase)
Lat	The latency with which the effect is demonstrated
Dist	The distribution of cases over the relevant period
The effects of the disease	
Mortality	Mortality rate as a result of the relevant condition
Value of a case	Monetary value of a case taking into account the direct, indirect, and intangible costs

Source: External study. RPA (2021)

The model provides a good approximation of the order of magnitude of the expected impacts and the core calculations are supported by sensitivity analysis. The outputs of the model include:

- The number of new cases for each health endpoint assigned to a specific year in the 40 year assessment period;
- The Present Value (PV) of the direct, indirect, and intangible costs of each case.

1.3.2. Key model inputs

i. Rx: estimate of the risk or fraction of workers affected

The risk of developing the relevant effect is estimated by combining exposure concentrations with the excess risk of developing cancer due to lifetime occupational exposure to a substance (taken here to mean 40 years).

ii. ExW: Exposed workers

Exposed workforce was estimated through the analysis of available national databases[107] in a number of Member States and extrapolated to EU27 on a per capita basis.

Two distinct issues are usually covered under the term 'turnover'. Primarily, turnover refers to the natural turnover rate resulting from workers leaving their employer and new workers joining. In addition, it can refer to the turnover triggered by those that are absent from work due to illness and replaced by others.

However, turnover refers to the rate by which workers change employment type as it is considered that often workers when leaving one employer are employed for similar work by another employer. As consequence workers may be exposed for longer time in similar jobs that indicated by the average times workers are employed by the individual employer.

It is assumed that there is a turnover of 5% per year. The 5% per year is lower than the turnover ratios in most of the published literature and Eurostat, which are typically derived at the level of individual companies rather than sectors. However, it is common that, e.g., construction workers would continue to work within construction for a major part of their work life, but it is uncertain to what extent they would continue with a job function with a specific exposure situation. It is considered, in accordance with the assumptions in previous studies, that a ratio of 5% is deemed appropriate to account for the fact that some workers may continue to work in the same sector and continue to be exposed to the same substances.

iii. Cx: Exposure concentration

One or more exposure scenarios have been modelled based on data sourced from literature and consultation – these scenarios are used for the estimation of the costs and benefits (cost savings from reduced ill-health) of the OEL options.

The number of workers exposed at levels of relevance for the assessment of establishing an OEL is derived from consultation with relevant companies and industry associations, databases, literature, workers' associations and other sources. For each of the relevant sectors, distributions of workers over exposure levels were established. In general, it is assumed that the exposure concentrations are lognormal distributed, and exposure data collected are fitted to a lognormal distribution for which the key parameters such as the

[107] The data in general include exposed workforce from activities subject to notification according AWD.

50th, 75th, 90th and 95th percentiles are estimated (please note that these parameters may differ between substances).

When the main parameters (different percentiles) of a lognormal distribution have been estimated, the exposed workforce is divided into several (typically five) exposure bands and each of these exposure bands is assigned a representative exposure or biomonitoring concentration. For the band with the lowest exposure, the highest exposure concentration in that band is typically taken as representative. For the highest exposure band, the geometric mean (GM) of the concentrations in that band is taken as representative. For the intervening bands, the arithmetic mean (AM) of each band is taken as representative.

Where such information is available, it was tried to establish for all reported data whether these are a result of personal or stationary sampling and whether they reflect exposure with or without wearing personal protective equipment (PPE).

1.3.3. Key assumptions

i. MinEx and MaxEx – The minimum exposure duration required to develop the endpoint

The model assumes that no cases arise until the minimum exposure duration required to develop the endpoint (MinEx) has expired. The default MinEx is two years for cancer, a standard assumption for a chronic condition. The MaxEx reflect the time needed to reach the maximum risk (i.e. after the MaxEx has been reached, the risk of effects do not increase). The MaxEx for asbestos was assumed at 40 years.

ii. Dist – the distribution of cases between start of exposure and Year 40

Valuing the cost of occupational illness involves applying discounted costs to future cases which requires that the estimated cases over a 40 year period are assigned to specific years. However, the ERR developed is for 40 years of exposure.

'Dist' refers to the distribution of cases between start of exposure and Year 40, also taking MinEx into account.

iii. Cancer

For reasons of simplicity, the following approach is used to distribute the total 40-year cancer **risk** (i.e., not incidence but risk since incidence is delayed due to latency) over the 40 year period: It is assumed that no risk arises until MinEx has been reached. It is assumed that, subsequently, the distribution is linear, i.e. 0% of the excess risk arises in year 2 and 100% of the excess risk arises by year 40.

iv. Latency

Cancer endpoints

By way of simplification, a single latency value is used for the calculation of the core scenario. According to Rushton et al. (2012), all solid tumours are expected to have a latency of 10-50 years, meaning that the average latency is 30 years. A latency of 30 years is used as a default for Lung cancer and mesothelioma.

As a summary, the method used in the model to estimate the incidence of disease and the relevant costs over time is shown graphically below.

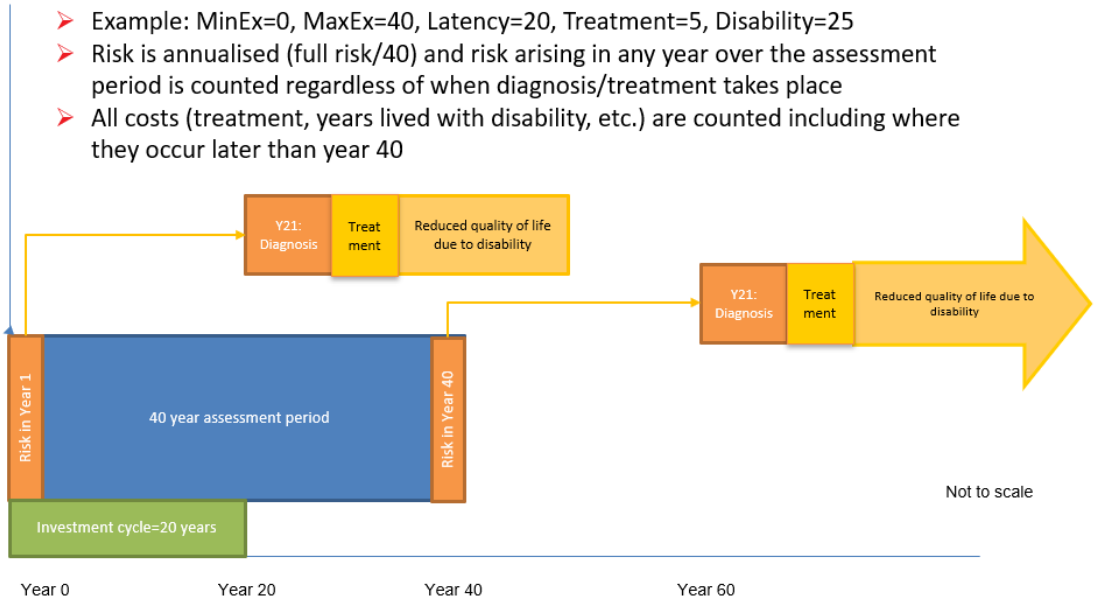


Figure 1 - Incidence and costs of disease over time. Source RPA study 2021

v. ModEX - the modelled exposure duration

The ERRs is for a 40-year period. The modelled exposure duration is thus 40 years.

Whilst it is unlikely that a single worker is exposed to a substance at a constant concentration throughout their whole working life, the 40 year period has been chosen in order to be protective to workers by assuming a worst-case scenario. The evidence used for the development of the ERR means that the greatest certainty about the ERR is at lifetime exposure, i.e., 40 years.

It is highly likely that the real exposure duration is shorter than ModEx (the modelled exposure duration) and this have been taken into account by use of the staff turnover for the estimations as described elsewhere.

vi. MoR – mortality rate

Mortality rate as a result of the relevant condition is important since different monetary values are applied to mortality and morbidity. The mortality rate for lung cancer and mesothelioma is 80% (External study. RPA 2021)

vii. Treatment period

It was estimated a treatment period of 5 years.

viii. Monetary value of the relevant endpoint

The approach to the monetisation of ill health effects is based on the following approach.

Table 4: Benefits framework

Category	Cost	Notes
Direct	Healthcare	Cost of medical treatment, including hospitalisation, surgery, consultations, radiation therapy, chemotherapy/immunotherapy, etc.
	Informal care[108]	Opportunity cost of unpaid care (i.e. the monetary value of the working and/or leisure time that relatives or friends provide to those with cancer)
	Cost for employers (e.g. liability insurance)	Cost to employers due to insurance payments and absence from work
Indirect	Mortality – productivity loss	The economic loss to society due to premature death
	Morbidity – lost working days	Loss of earnings and output due to absence from work due to illness or treatment
Intangible	Method 1 WTP: Mortality	A monetary value of the impact on quality of life of affected workers
	Method 1 WTP: Morbidity	
	Method 2 DALY: Mortality	
	Method 2 DALY: Morbidity	

Source: External study. Analysis by RPA, COWI & FoBiG

Two Methods to the monetisation of intangibles have been adopted:

- Method 1: Application of a single WTP value to each case; and
- Method 2: Use of DALYs (Disability adjusted life year) and their monetisation.

1.4. Benefits assessment

The health benefits of implementing new or revised OELs are then calculated in terms of the costs of ill health avoided.

1.4.1. Benefits to workers & families

The direct and indirect resource costs are estimated using market-based information, for example, data on health care costs, and estimates of lost output (i.e. the value of a day's work).

[108] A decision has been taken to include informal care costs in this analysis even though some elements of these costs may also have been included in individuals' willingness to pay values to avoid a future case of ill health. This decision may result in a slightly overestimation of the benefits.

Added to these are the 'human' or intangible costs associated with a case, which are measured in terms of an individual's willingness to pay for the reduction in the risk of mortality or morbidity (Method 1) or monetised DALYs (Method 2).

Under Method 1, the most commonly used means of estimating individuals' WTP for a reduction in the risk of an illness is through the use of experimental markets and survey techniques (e.g. contingent valuation or contingent ranking studies) to directly elicit individuals' WTP for a reduction in the risk of death or morbidity.

The key measures are the value of a statistical life – a VSL – and the value of a case of morbidity (value of cancer morbidity VCM or value of morbidity VM). The VSL is essentially a measure of a change in the risk of fatality, where this is found by determining individuals' willingness to pay for a small change in risk which is then summed across the population at risk.

1.4.2. Benefits to employers

The revision of OELs have obvious benefits for workers, namely in terms of their health but also, indirectly, on their earnings. Employers will also reap benefits from their employees being less at risk of occupational illness. Such benefits include:

- higher labour productivity resulting from reductions in absenteeism and associated production losses;
- reduced administrative or legal costs relating to employees who are ill;
- reduced insurance premiums;
- reduced reputational risks; and
- reduced sick leave payments.

1.4.3. Benefit to employers and workers – lost earnings and productivity losses

Individuals will incur costs associated with their inability to work in terms of a loss of earnings, including losses linked to days of for treatment as well as days off due to illness. Luengo-Fernandez et al. (2013) developed estimate of the magnitude of such costs by Member State in terms of an average cost per fatal or non-fatal cancer. These included what are referred to as "productivity losses" due to early death and then lost working days due to morbidity effects. Across all cancers, an average figure of €5,047 is given for productivity losses and €1,118 for the costs associated with lost working days due to morbidity effects (with these based on lost wages as the measure of lost output).

There are difficulties in including the type of estimates generated by Luengo-Fernandez et al. (2013) for lost working days within the analysis carried out here due to the potential for double counting. It is not clear whether the figures adopted in the external study to reflect the intangible or human costs of cancer mortality and morbidity (i.e., €4 million and €400,000 respectively) also include an element related to the loss of income. If they do, then to include a separate cost item to reflect lost income would result in a double-counting of impacts.

1.4.4. Benefits to the public sector – cost of healthcare

Key data from Luengo-Fernandez, et al[109] have been used for the calculation of the avoided healthcare costs of illness. EUR 7 200/year is used in the model as the average cost for 'all cancers'.

2. COST MODEL

2.1. Compliance cost assessment

2.1.1. Introduction

This section describes the methodology for compliance cost assessment.

The exposure situations for asbestos differs significantly from the general exposure patterns for most other hazardous substances as the activities are not located at specific sites, but the workers are moving from site to site and undertake many different activities, each with its specific exposure characteristics. The work is in this respect more like the work undertaken by maintenance workers for other substances. Even if the RPE in the general hierarchy of the RMMs is the last resort, in practice most workers exposed to asbestos use RPE in combination with other RMMs to keep the breathing concentration below the OEL. This is recognised in the AWD, Article 12: *"In the case of certain activities such as demolition, asbestos removal work, repairing and maintenance, in respect of which it is foreseeable that the limit value set out in Article 8 will be exceeded despite the use of technical preventive measures for limiting asbestos in air concentrations workers shall be issued with suitable respiratory and other personal protective equipment, which must be worn."*

It is expected that the measures taken by each company in response to a new OEL would include a combination of more efficient RPE (for some workers) and more efficient technical/organisational RMMs. In order to reflect this, a specific cost model has been developed for asbestos that relies on asbestos specific packages of measures to control exposure.

Furthermore, the information in the baseline is divided into relevant exposure groups which typically encompass more than one sector with the exception of the construction and demolition sector which is spread across several exposure groups.

2.1.2. Key model inputs and assumptions

The model includes the following types of inputs:

- OEL options;
- Existing OELs in Member States;
- Number of workers exposed by exposure group;
- Sectors in each of the exposure groups and numbers of companies in these sectors at exposure levels at or above 0.002 fibres/cm3;

[109] Luengo-Fernandez R, Leal J, Gray A, Sullivan R. Economic burden of cancer across the European Union: a population-based cost analysis. Lancet Oncol. 2013 Nov;14(12):1165-74. doi: 10.1016/S1470-2045(13)70442-X. Epub 2013 Oct 14. PMID: 24131614.

- Number of small, medium and large enterprises in each of the exposure groups and sectors at exposure levels at or above 0.002 fibres/cm3;
- Estimated breakdown of RPE used;
- Effectiveness of RMMs (in particular RPE);
- Cost of RMMs;
- Discount rates;
- Existing level of compliance with the target OEL (i.e. national OELs in France, Germany and the Netherlands);
- Estimated training needs;
- Costs of analysis for compliance monitoring at the different reference levels; and
- Need for compliance monitoring measurements.

The output is the costs of implementing the OEL split by:

- Exposure group;
- Company size: small, medium and large; and
- Capital expenditure (one-off) and operating expenditure (recurrent) costs.

2.1.3. Relevant RMMs

The following RMMs are considered for the assessment of compliance costs for companies:

- Various RPE (need for applying RPE with a higher protection factor).
- Installation of local exhaust ventilation by use of tools.
- Further use of vacuum cleaners.
- Further use of wetting agents and use of wetting agents of higher efficiency.
- Use of various enclosures (part containment, full containment).
- Further training of staff.
- Further need for monitoring.

Furthermore, for activities currently not subject to notification, the following RMMs are included in the cost assessment:

- Health surveillance.
- Notification.

2.1.4. RPE use in the model

For the estimations of distribution of the current use of RPE, it is assumed that for all workers, the exposure concentration when the RPE is taken into account should be below the OEL (so at a maximum 95% of the workers are exposed at concentrations below the OEL).

It is assumed that RPE with a higher assigned protection factor (APF) would be applied in order to bring the breathing concentration down if the OEL is lowered and that the use of more efficient RPE is combined with use of other RMMs. The costs are calculated on the basis of the exposure concentrations for each exposure group and the differences between the baseline use of RPE and the use of RPE for each reference OEL scenario.

2.1.5. RMMs other than RPE

The RMMs other than RPE considered in the model is the staff time due to increased use of vacuum cleaning and dust suppression techniques.

It is expected that the measures taken by each company in response to a new OEL would include a combination of more efficient RPE (for some workers) and more efficient technical/organisational RMMs. More specifically, it is expected that increased costs would be incurred for more extensive use of dust suppression and vacuum cleaning techniques – it is assumed that no new equipment would be needed but staff would have to spend more time using existing vacuum cleaning and dust suppression equipment. These costs are therefore approximated by focusing on the share of staff costs in the total cost of asbestos control.

3. LIMITATIONS AND SENSITIVITY ANALYSIS

The different types of key limitations and uncertainties and their significance for the results is summarised below.

Exposure to asbestos does not immediately result in visible negative health impacts and there is a latency period for effects to emerge once workers are exposed. Consequently, introducing a stricter EU OEL which reduces exposure would not see benefits arising in terms of reduced incidence of lung cancer, mesothelioma, laryngeal cancer and ovarian cancer until sometime in the future. The latency period for lung cancer and mesothelioma arising from exposure to asbestos is estimated at 30 years. Cases arising from exposure in year 40 but which do not become visible until after the 30-year latency period are also included in the benefits modelling.

On the other hand, the introduction of lower EU OELs will require companies to implement measures immediately in order to comply with the regulations. The cost model assumes an investment cycle of 20 years for the sectors with workers exposed to asbestos. Consequently, it is assumed that the capital expenditures required will be made at the start and then again after 20 years to update and improve equipment further. Operational expenditures will be carried out throughout the 40-year assessment period.

Given that the assessment period is relatively long, the estimates are particularly impacted by the rate used to discount future costs and benefits. The sensitivity analysis explored therefore the effect of different assumptions regarding the discount rate. The effect of declining discount rate is considered to be less noticeable in case of costs as they are realised from the beginning of the assessment period and are therefore not as heavily discounted as benefits (resulting from costs savings of avoiding cases of mesothelioma, lung cancer, laryngeal cancer and ovarian cancer). The below two tables present the results of the sensitivity analysis performed in relation to discount rate.

In the first (declining discount rate), a rate of 4% is used for the first 20 years and then decreases to 3% for the remaining 20 years. In the second table, the impacts of a 1.5% discount rate applied to risk to life values are shown.

Table 5 - Sensitivity of declining discount rate on the cost, benefits relative to the baseline and CBR, for each OEL & benefit methods (€ million)

fibre/cm^3	0.001	0.002	0.01	0.1
Main				
Benefits M1	€ 420 million	€ 410 million	€ 330 million	€0 million
Benefits M2	€ 220 million	€ 210 million	€ 170 million	€0 million
Cost	€ 94 000 million	€ 76 000 million	€ 24 000 million	€0 million
CBR M1	220	190	70	0
CBR M2	430	360	140	0
Declining discount rate				
Benefits M1	€ 630 million	€ 610 million	€ 490 million	€0 million
Benefits M2	€ 330 million	€ 320 million	€ 250 million	€0 million
Cost	€ 97 000 million	€ 78 000 million	€ 25 000 million	€0 million
CBR M1	150	130	50	0
CBR M2	290	240	100	0

Table 6 - Sensitivity of 1.5% discount rate applied to risk to life values relative to the baseline and CBR, for each OEL & benefit methods (€ million)

fibre/cm^3	0.001	0.002	0.01	0.1
Main				
Benefits M1	€ 420 million	€ 410 million	€ 330 million	€0 million
Benefits M2	€ 220 million	€ 210 million	€ 170 million	€0 million
Cost	€ 94 000 million	€ 76 000 million	€ 24 000 million	€0 million
CBR M1	220	190	70	0
CBR M2	430	360	140	0
1.5% discount rate				
Benefits M1	€ 1 700 million	€ 1 600 million	€ 1 300 million	€0 million
Benefits M2	€ 850 million	€ 830 million	€ 660 million	€0 million
Cost	€ 94 000 million	€ 76 000 million	€ 24 000 million	€0 million
CBR M1	55	48	18	0
CBR M2	110	92	36	0

Source: External study, RPA 2021

A common ERR is derived for lung cancer and mesothelioma. However, the latency period is different for the two endpoints with significantly longer latency period for mesothelioma than for lung cancer. The estimation is done so that all cases that will occur over the assessment period are included in the benefit estimation. However, the longer the latency the more heavily discounted are the benefits. A median 30-year latency has been assumed. The sensitivity analysis explores the effect of a shorter latency, which is more characteristic for the lung cancer endpoint. Assuming a 10-year latency increases the benefits significantly. The impacts are shown in the following table.

Table 7 - Sensitivity of a shorter latency period on the cost, benefits relative to the baseline and CBR, for each OEL & benefit methods (€ million)

fibre/cm^3	0.001	0.002	0.01	0.1
		Main		
Benefits M1	€ 420 million	€ 410 million	€ 330 million	€0 million
Benefits M2	€ 220 million	€ 210 million	€ 170 million	€0 million
Cost	€ 94,000 million	€ 76,000 million	€ 24,000 million	€0 million
CBR M1	220	190	70	0
CBR M2	430	360	140	0
		Shorter latency		
Benefits M1	€ 1,000 million	€ 990 million	€ 790 million	€0 million
Benefits M2	€ 530 million	€ 520 million	€ 410 million	€0 million
Cost	€ 94,000 million	€ 76,000 million	€ 24,000 million	€0 million
CBR M1	90	80	30	0
CBR M2	180	150	60	0

For exposure situations subject to Article 3(3) waiver, 'incidental' exposure (building and construction sector), in addition to the uncertainty on the total number of exposed workers, a major uncertainty is linked to the fact that many of the workers are only exposed sporadically, which influences both the benefits and costs estimated for this group. To take this into account a 50% reduction factor has been applied for this group for both benefits and costs.

Costs and benefits estimated for Exposure Group 2 for a reduction factor of 75% and 25% are given below. It will not affect the cost benefit ratio significantly, but it will affect the total costs.

Table 8 - Sensitivity of sporadic exposure (25% or 75%) on the cost, benefits relative to the baseline and CBR, for each OEL & benefit method (€ million)

fibre/cm^3	0.001	0.002	0.01	0.1
Low (75% reduction factor)				
Benefits M1	€ 260 million	€ 250 million	€ 200 million	€0 million
Benefits M2	€ 140 million	€ 130 million	€ 100 million	€0 million
Cost	€ 81,000 million	€ 64,000 million	€ 20,000 million	€0 million
CBR M1	310	260	100	0
CBR M2	580	490	200	0
Main (50% reduction factor)				
Benefits M1	€ 420 million	€ 410 million	€ 330 million	€0 million
Benefits M2	€ 220 million	€ 210 million	€ 170 million	€0 million
Cost	€ 94,000 million	€ 76,000 million	€ 24,000 million	€0 million
CBR M1	220	190	70	0
CBR M2	430	360	140	0
High (25% reduction factor)				
Benefits M1	€ 590 million	€ 570 million	€ 460 million	€0 million
Benefits M2	€ 310 million	€ 300 million	€ 240 million	€0 million
Cost	€ 113,000 million	€ 92,000 million	€ 30,000 million	€0 million
CBR M1	190	160	65	0
CBR M2	370	310	130	0

Source: External study, RPA 2021

4. APPROACH TO THE ASSESSMENT OF THE ENVIRONMENTAL IMPACTS

Potential changes in the OEL may subsequently lead to additional or lower environmental impact.

The approach to the assessment of the environmental impacts includes the following steps:

- Persistent, bio-accumulative, and toxic (PBT) screening: this step involves screening for Persistent, Bio-accumulative, and Toxic (PBT) properties. To be classified as PBT, all three criteria must be fulfilled.
- Current environmental exposure: this step includes consideration current environmental exposure, including its sources, background exposure levels,

environmental (air and water) levels in relation to hazard data; leading to a conclusion on the environmental presence of asbestos.

- Waste management and disposal: this step first considers the classification of asbestos as hazardous waste and its final treatment (disposal or recovery) routes. Subsequently, the potential for releases of asbestos and human health risks during waste management and disposal is considered.
- Impact of introducing new risk management measures (RMMs) on environmental exposure: this step assesses whether the new RMMs are likely to reduce or increase the overall environmental exposure to asbestos.

An analysis of the above-mentioned aspects supports a conclusion on the impact of the additional RMMs on environmental exposure to asbestos.

Annex 5: Uses, activities and exposures

1. WHERE IS ASBESTOS STILL ALLOWED?

The manufacturing, use and production of new products with asbestos and use of asbestos fibres in mixtures and articles (where asbestos fibres are added intentionally) has practically been banned since the early 2000s in most EU countries and, it is banned at EU level via REACH (Annex XVII entry 6). In line with this, there are no REACH registration data for asbestos.

However, a few derogations/exemptions/conditions apply with implications for the analysis in the impact assessment:

- Two companies (AarhusKarlshamn Sweden AB and Dow Deutschland Anlagengesellschaft mbH) still benefit from a derogation (until 2025) for the use of asbestos in diaphragms for electrolysis installation[110]. According to restriction[111], the use in diaphragms for electrolysis installation already in use by 2016 are allowed until 2025. This derogation was revisited in 2016. Due to the small number of companies benefitting from this derogation, the low likelihood of exposure in this application (in a diaphragm matrix) and the fact that the use according to this derogation will have to cease by 2025, this use is not further investigated in the current study.
- The continued use of asbestos-containing articles on the market before 2005 is still to some extent allowed according to paragraph 2 in the restriction entry. The paragraph sets out how Member States can restrict this or allow placing on the market of such 'old articles' under certain circumstances. Such national measures had to be communicated to the European Commission by June 2011. By 2011 six Member States had some national exemptions[112].
- Buildings are not considered articles and the presence of asbestos historically incorporated in buildings is not restricted in any Member State via REACH. Entry 6 on asbestos thus prohibits, since 1 January 2005, the incorporation of new asbestos into buildings, but it does not regulate asbestos already incorporated in buildings before that date. The presence of asbestos in buildings, if incorporated before 1 January 2005, is not governed by any provisions of REACH Restriction entry 6.

[110] Registry of restriction intentions until outcome. available at: https://echa.europa.eu/da/registry-of-restriction-intentions/-/dislist/details/0b0236e18051c125

[111] Commission Regulation (EU) 2016/1005 of 22 June 2016 amending Annex XVII to Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) as regards asbestos fibres (chrysotile) (Text with EEA relevance). ELI: http://data.europa.eu/eli/reg/2016/1005/oj

[112] DK, FI, FR, DE, IE, PL. Exemptions to the Asbestos Restriction, available at: https://ec.europa.eu/docsroom/documents/13166/attachments/1/translations/en/renditions/native

2. ASBESTOS IN BUILDINGS AND IN ARTICLES PLACED ON THE MARKET BEFORE 2005

The properties of asbestos fibres have historically been used in many applications (more than 3,000 applications/products in the era of peak use) including roofing, insulation (thermal and electrical), cement pipes and sheets, flooring, gaskets, brakes, shoes, coating, plastics, textiles, paper, mastics, thread, fibre jointing and millboards. Asbestos is still to a large extent present in buildings (and in building installations), as well as other infrastructures, where it has historically been used for its insulating properties. This includes presence in the following building materials and articles[113]:

- Floor tiles
- Boiler insulation
- Ceiling tiles
- Fireproofing
- Linoleum
- Tank insulation
- Adhesives
- Acoustical finishes
- Floor tile mastic
- Gaskets
- Fume hood liners
- Plaster
- Pipe insulation
- HVAC duct wrap, laboratory countertops
- Roofing
- Pipe fittings
- Fire doors
- Chalkboard glue
- Siding shingles.

In the practical guidelines for information and training of workers involved with asbestos removal or maintenance work[114], the most important uses are identified as:

- Asbestos cement products (asbestos content approx. 15 %)
- Sprayed asbestos (asbestos content up to 85 %)
- Loose asbestos lagging (asbestos content up to 100 %)
- Asbestos fabrics, tapes and cords (asbestos content variable; 3 – 90 %)
- Asbestos panels (asbestos content 5-50 %)
- Asbestos papers, cardboards, and gaskets (asbestos content 50-90 %)

[113] Environmental Health And Safety: UK - University of Kentucky. Undated. Fact Sheet - Asbestos in Building Materials. Available at: https://ehs.uky.edu/docs/pdf/env_fs_asbestos_bm.pdf

[114] https://ec.europa.eu/social/BlobServlet?docId=7478&langId=en

- Asbestos-containing construction chemical products such as bitumen/tar products, coatings, paints, sealants and casting products (asbestos content up to 20 %)
- Asbestos-containing floor coverings (asbestos content 15 – 90 %)

The derogation specified in paragraph 2 of REACH Restriction Entry 6, allows continued use of articles already installed and/or in service before 1 January 2005. From the six Members States which somehow restricted the use of such historical articles, it appears that the following types of articles might still be relevant to consider:

- Historical/veteran vehicles
- Ethylene/acetylene bottles (containing filters with asbestos)
- Various spare parts
- Shafts used for glass drawing
- Certain offshore installations
- Brakes
- Insulation or lagging for e.g. cooling water in trains
- Fire resistant materials and fire blankets in laboratories
- Lift shafts and lift doors
- Boilers and tanks and tanks at certain power stations
- Certain military uses
- Friable vs. nonfriable ACMs

The AWD and many guidelines distinguish between friable vs. nonfriable ACMs; the synonymous terms un-bound and bound are used in some contexts. In general, friability means that an ACMs is less resistant to mild abrasion or damage and is more likely to release inhalable fibres. So, the type of material and asbestos fibre type and condition are critical to determine friability.

The table below was derived from the guidelines from the Health and Safety Authority in Ireland to provide general guidance on friable vs. non-friable ACMs.

Table 1: Friable vs. nonfriable ACMs

Friable ACMs	Non-friable ACMs
• Asbestos-containing dust (ACD) • Sprayed coatings, laggings and loose asbestos fill • Millboard • Insulating Boards • Ropes, yarns and cloths • Paper products • Vinyl flooring backed with asbestos paper • Compressed Asbestos Fibre (CAF) gaskets • Asbestos cement products in degraded state	• Asbestos cement products in non-degraded state • Asbestos bitumen roofing felts & damp proof courses, semi-rigid asbestos bitumen products and asbestos bitumen-coated metals • Unbacked vinyl & vinyl floor tiles • Textured decorative coatings and paints containing asbestos on plasterboard • Mastics sealants, putties and adhesives • Asbestos-reinforced PVC and plastics

Source: Practical Guidelines on ACM Management and Abatement. Health as Safety Authority, Dublin

As indicated from the table, the state of degradation also influences the degree to which the ACM is friable, e.g. for asbestos cement.

Spaan et al.[115] have summarised how notifiers in the Netherlands have classified the different materials as friable and non-friable based on 632,346 notifications to the Dutch asbestos management system (SMArt)). According to the authors, it should be noted that determining the degree of friability of the material, and thus making the distinction 'friable' and 'non-friable' material, is optional in the analysis of materials, and is generally assessed visually.

The overall pattern is well in accordance with the general view presented in the table above, but for some material/application groups, the data demonstrate that the division between friable and non-friable is not clear-cut but depends on various factors such as the specific material and the state of degradation. Overall, the following division into three groups can be derived:

- Non-friable - Less than 10 % friable ACMs: Asbestos cement, glue, kit, bitumen, vinyl tile, polymer bound ornamental stone and imitation asbestos cement;
- Friable - More than 90 % friable ACMs: insulation materials, spray asbestos, board, asbestos paper, asbestos felt, asbestos chord; and
- In between - More than 10 % of both friable and non-friable: Polymer bound coatings, asbestos-containing dust, stucco work, gaskets, friction materials.

The asbestos cement materials accounted for about 50% of the notifications.

In Spain in 2017, asbestos cement represented 94.6 % of the materials handled by companies notifying the activities, the remaining part consisted of sprayed asbestos and asbestos coatings on walls, ceilings and structural elements (0.26%), heat insulation (1.05%), other friable materials: panels, fabrics of asbestos, cardboard, felts, etc.

[115] Span S, Tromp PC, Schinkel JM (2019). Aanknopingspunten voor differentiatie in risico's van werkzaamheden met asbest ten behoeve van beheersregimes. TNO 2019 R11239 | Eindrapport .TNO for Ministerie van Sociale Zaken en Werkgelegenheid . (In Dutch)

(3.21%), and other non-friable materials: putties, paints, adhesives, etc. (0.02%)[116]. In total, the friable materials accounted for about 5%.

3. NATURALLY OCCURRING ASBESTOS

Asbestos is a naturally occurring mineral and exposure can occur during activities related to work in bedrock and soil in areas where asbestos fibres naturally occur. Exposure to naturally occurring asbestos in mining, quarrying, tunnel construction, and construction materials has gained attention in a number of Member States (among these Finland, Germany, Austria, Italia, and France) but exposure may also occur in many other Member States.

As noted in the Scientific report done by ECHA[117], asbestos fibres are widespread in the environment, and are found in many areas where the original rock mass has undergone metamorphism. Whereas rock types in Scandinavia in general have not undergone metamorphism, such rock types are widespread in other parts of Europe.

According to the German technical rule TRGS 517[118] in the mineral deposits found when mining in Germany, for particular types of rock the occurrence of the asbestos minerals, chrysotile, tremolite, actinolite and to a lesser extent also anthophyllite needs to be taken into account. The occurrence of asbestos minerals is limited to particular rock types but this does not mean that they always occur in them. The following rock types should in particular be considered to be asbestos-containing:

- Ultrabasite/peridotite (e.g. dunite, lherzolite, harzburgite),
- Basic effusives (e.g. basalt, spilite, basanite, tephrite, phonolite),
- Basic intrusives (e.g. gabbro, norite, diabase),
- Metamorphic and metasomatically influenced rocks (e.g. metasomatic talc occurrences, green schist, chlorite and amphibole schist/bedrock (e.g.: nephrite), serpentinite, amphibolite).

In special geological circumstances in individual cases other rocks can possibly contain asbestos. Asbestos or asbestos minerals (fibrous and non-fibrous) can occur in the rock formations in two distinct forms[16]:

- Asbestos/asbestos minerals in crevices,
- Asbestos/asbestos minerals in "compact" undisturbed rocks. The first form of occurrence is easy to recognise in quarry inspections.

The asbestos minerals contained in the rock itself can, as a rule, only be identified by petrographic studies. Frequently, the asbestos fibres "come about" in the second form

[116] Informe resumen del estado de situación de la población expuesta a amianto en 2016 y 2017. Instituto Nacional de Seguridad y Salud en el Trabajo

[117] ECHA Scientific report for evaluation of limit values for asbestos at the workplace. European Chemicals Agency, Helsinki.

[118] TRGS 517. Federal Institute for Occupational Safety and Health (BAuA

mentioned only due to mechanical loads on the rock (processing) from non-fibrous asbestos minerals[119].

In Italy, exposure to asbestos in serpentine rock[120] and feldspar[121] has been reported and several studies have demonstrated that dust containing asbestos minerals generated from tunnelling in various rock types is a major issue with impacts upon the environment, human health, worker safety and productivity of underground construction. [122]

In a Finnish geological survey, fibrous minerals, including asbestos (e.g. tremolite and actinolite), were detected in many limestone mines and rock aggregate quarries (Junttila et al., 1994). Finnish guidelines on the management of asbestos in mining and quarrying have recently been developed[123].

The main geological areas in France in which rocks contain asbestos correspond to the chain of the Western Alps and its extension into Corsica, to the external crystalline massifs of the Alps, the Massif Central, the Vosges, the Armorican Massif and the Pyrenees chain[124].

A guideline from the Health and Safety Security in the UK[125] on asbestos in some types of marble and other stone indicates that these materials include some sources of dolomite, basalt, marble (including green marbles or 'Verde' stones) and vermiculite.

As stated by ECHA even if intentional commercial uses are banned and handling of past commercially used products is regulated, exposure is possible when handling other minerals (e.g. talc, dolomite and olivine) where asbestos occurs as an impurity. Some of these minerals are in granular or powder form and they relatively easily aerosolise during handling. Therefore, caution is needed in such industries.

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[126].

A German investigation of 57 talc powders (technical and cosmetic) with regard to asbestos, asbestos fibres were detected in 13 samples[127] 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. The report notes that it is

[119] BAuA - Information on Substances - Asbestos - Federal Institute for Occupational Safety an Health
[120] Airborne concentrations of chrysotile asbestos in serpentine quarries and stone processing facilities in Valmalenco, Italy.
[121] Asbestos contamination in feldspar extraction sites: a failure of prevention? Commentary1
[122] Airborne asbestos fibres monitoring in tunnel excavation
[123] Asbestos risk management guidelines for mines. Finnish Institute of Occupational Health. 1
[124] Identification des sources d'émission et proposition de protocoles de caractérisation et de mesures. Avis de l'Anses. https://www.anses.fr/fr/system/files/AIR2016SA0034Ra.pdf
[125] Asbestos-related disease statistics in Great Britain, 2020.
[126] Asbestos in cosmetic products. Study of asbestos in talc-containing cosmetic products.
[127] Asbestos in talc powders and soapstone - DGUV

essential to request sellers of talc and soapstone to furnish proof that no asbestos can be detected in the material with the specified analytical methods.

According to Eurotalc, the talc industry's representative body, "Thanks to high standards of quality control and selective mining methods where necessary, the commercial talcs supplied by EUROTALC Members do not contain asbestos as defined by the European directive 2009/148/EC, when analysed by conventional methods."[128]

4. VOLUMES / TONNAGE

As described in previous sections, 'new' asbestos is no longer legally manufactured or imported.

4.1. Historical use of asbestos

Exposure to asbestos from buildings, installations and older (<2005) articles is linked to historical use of asbestos. Various Member States have banned asbestos in various years before it was generally banned in the EU via various Council Directives and later the REACH Annex XVII entry 6. The historical use of asbestos as well as the status of national bans fourteen EU Member States is summarised in the table below. The indication of ban year is somewhat simplified as bans were generally introduced stepwise as also described for the EU restrictions. Asbestos was banned by thirteen[129] European countries before the year 2000 and further fifteen[130] countries have adopted the ban between the years 2001 and 2013[131].

One conclusion to draw is that the consumption varied by Member State with a tendency to higher consumption in Western Europe in the 1950-1970s and higher consumption in Eastern European Member States in the 1990-2000s. For some of the Member States, the ban on asbestos followed their accession to the EU. The differences may be reflected in difference in the presence of asbestos in e.g. means of transport (trains, vessels, vehicles, etc.) today as articles produced in countries where asbestos was banned 20-35 years ago to a higher extent would have reached their end-of-life than articles produced in countries where asbestos was banned after 2000.

[128] Health and Safety of Talc

[129] These are Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Poland, Slovenia, Sweden and the United Kingdom.

[130] These are Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Luxembourg, Malta, Portugal, Romania, Slovakia and Spain.

[131] Asbestos: use, bans and disease burden in Europe

Table 2: Historical trend in use of asbestos (kg per capita/year) and status of national bans in 15 EU countries

Country	1950s	1960s	1970s	1980s	1990s	2000s	Ban year *
Austria	1.16	3.19	3.92	2.08	0.36	0.00	1990
Denmark	3.07	4.80	4.42	1.62	0.09	NA	1986
Croatia	0.39	1.13	2.56	2.36	0.95	0.65	2013*
Czech Republic	1.62	2.36	2.91	2.73	1.30	0.14	2005 *
Finland	2.16	2.26	1.89	0.78	ND	0	1992
France	1.38	2.41	2.64	1.53	0.73	0.00	1996
Germany	1.84	2.60	4.44	2.43	0.10	0.00	1993
Hungary	0.76	1.23	2.87	3.29	1.50	0.16	2005 *
Lithuania	ND	ND	ND	ND	0.54	0.06	2005 *
Luxembourg	4.02	5.54	5.30	3.23	1.61	0.00	2002
Netherlands	1.29	1.70	1.82	0.72	0.21	0.00	1994
Romania	ND	ND	1.08	0.19	0.52	0.55	2007 *
Spain	0.32	1.37	2.23	1.26	0.80	0.18	2002
Sweden	1.85	2.30	1.44	0.11	0.04	NA	1986

Sources: IARC, 2012; Kameda et al., 2014

ND: No data available; NA: not applicable because of negative use data; 0.00 when the calculated data were <0.0005.

* The date follow the countries accession to the EU. A simplified view as some forms or applications may have been restricted before that day.

It can be noted that while asbestos has long been banned in the EU, it is still used in other parts of the world. World production of asbestos in 2020 is estimated at approximately 1.2 million tonnes with Russia, Brazil, Kazakhstan, and China as the largest producer countries. Asbestos-cement products, such as corrugated roofing tiles, pipes, and wall panels, are expected to continue to be the leading global market for asbestos[132]

4.2. Asbestos in use today

A key question for the assessment of the future trend in exposed workforce is how much of the asbestos used in the past still remains in buildings, installations and products.

Some information on products still in use has collected through the stakeholder consultation. This information was only available from Germany, Poland and Lithuania.

Germany. According to response from the German authorities, it is estimated that approx. 25-30 % of the building products containing asbestos are still installed. If there is no risk for the users of the building, there is no obligation to remove the materials. The national asbestos profile for Germany[133] contains information on asbestos-cement still in use in Germany as summarised in the table below. The table, however, indicates that in

[132] Mineral Commodity Summaries - Asbestos. US Geological Survey
[133] Germany national asbestos profile (BAuA)

2016 up to 86% of the produced asbestos cement was still in use in the society. The national asbestos profile notes that the sum will overestimate remaining asbestos cement since also before 2001 some asbestos waste disposal took place.

As indicated in the table, 70% of the asbestos was used for asbestos cement production. According to the profile about 90% of the asbestos was used in buildings. For the part of asbestos used for other materials than asbestos cement, estimates on remaining amounts are not available.

Table 3: Estimated tonnage of remaining asbestos cement products in Germany

Import of asbestos (GDR & FRG):	5.7 million tonnes asbestos
70% used for asbestos cement production:	4.3 million tonnes asbestos
Asbestos cement production (10% crude asbestos):	43 million tonnes asbestos cement
Asbestos waste disposal: Asbestos-containing building materials (waste code 17 06 05):	6.1 million tonnes asbestos cement (2001 – 2016)
Asbestos cement - remaining*	37 million tonnes asbestos cement (2016) **

* This sum will overestimate the remaining asbestos cement since also before 2001 some asbestos waste disposal has prevailed. **BAuA 2020 indicates the year to be 2011, but this seems to be a missing update from previous profile, so it is here corrected to 2016.
Source: External study. RPA 2021 based on Germany national asbestos profile

The estimated remaining volume of asbestos cement products is in the profile used to estimate the remaining roof area containing asbestos in 2016. Using different assumptions regarding the share of the asbestos cement used for corrugated roofing it is estimated that in 2016 between 223 million m2 and 1,308 million m2 was still in use corresponding to 4 to 22% of the total corrugated roof area in Germany[107].

As a result of the ban of asbestos in 1993, the use of asbestos in brake pads and clutches for the production of new vehicles on the roads in Germany was prohibited. In the former GDR, production of asbestos-containing brake pads and their use continued until 1989/90. Due to the nearly complete renewal of the vehicle fleet over a time span of about 20 years, it is expected that asbestos almost no longer occurs in vehicles[107].

Poland. It is estimated that from 1952 to 1997 1.75 million tonnes of raw asbestos were used in the manufacture of asbestos-containing products and in industrial installations in Poland[134],. The largest share of asbestos (some 65%, mostly chrysotile) was used for asbestos-cement products assigned for the construction industry (such as flat and corrugated roofing sheets and wall linings). According to the author, some 1.2 billion m^2 of these products still existed in 2017. Crocidolite was used mostly for the manufacture of pressure pipes, one of more than 1,500 asbestos-containing products. In 2002, there was 15 million tons of inventoried asbestos in Poland. In addition, only 30 percent of asbestos-containing products in Poland are thought to have been inventoried, meaning

[134] Rehabilitation of buildings and removal of asbestos

that it is uncertain as to where the asbestos is located[108] Most of asbestos was used as roofing in private households.

According to the current statistics of the Polish database on asbestos-containing products, 8.3 million tonnes of products have been inventoried; of these 7.1 million tonnes remain to be neutralised (removed and disposed) corresponding to 85% of the inventoried asbestos-containing products, see table below. Flat and corrugated sheets for construction account for 97% of the inventoried and remaining asbestos-containing products. The percentage accounted for by the sheets may be over-represented as inventories of other asbestos-containing products likely are more difficult to survey.

Table 9_ Data from the Polish asbestos database

Product code	Description	Weight of products in 1,000 tonnes			Percent remaining
		Inventoried	Neutralized	Remaining	
W01	Flat asbestos-cement plates used in construction	665.94	164.60	501.33	75%
W02	Corrugated asbestos-cement sheets for construction	7 405.84	1 017.01	6 388.86	86%
W03.1	Asbestos-cement pipes and joints for removal	106.04	6.83	99.22	94%
W03.2	Asbestos-cement pipes and joints to be left in the ground	79.46	4.63	74.83	94%
W04	Spray insulations with asbestos-containing agents	21.44	7.73	13.71	64%
W05	Asbestos-rubber friction products	0.03	0.01	0.01	56%
W06	Special yarns, including processed asbestos fibres (protective fabrics and clothing)	0.12	0.08	0.05	37%
W07	Asbestos sealants	0.37	0.20	0.17	45%
W08	Woven and braided tapes, cords and strings	0.59	0.07	0.52	88%
W09	Asbestos and rubber products, except friction products	0.01	0.00	0.01	98%
W10	Paper, cardboard	0.21	0.06	0.15	72%
W11.1	Asbestos-cement covers	10.68	2.14	8.54	80%
W11.2	Asbestos-cement construction fittings (ventilation ducts, window sills, flue gas covers)	0.32	0.17	0.15	47%
W11.3	Asbestos-cement electrical insulating fittings	0.00	-	0.00	100%
W11.4	PVC tiles	0.05	0.03	0.02	46%
W11.5	Fireproof boards	0.57	0.04	0.53	93%
W11.6	Roofing felt, putties and waterproofing compounds	0.02	0.00	0.02	95%
W11.7	household appliances	0.00	0.00	-	0%
W11.8	Work clothes, masks, filters contaminated with asbestos	0.04	0.01	0.03	82%
W11.9	Other not mentioned above	5.40	0.67	4.73	88%
W12.1	Secured roads	0.15	0.15	0.00	0%

Product code	Description	Weight of products in 1,000 tonnes			Percent remaining
		Inventoried	Neutralized	Remaining	
W12.2	Unsecured roads	0.01	0.01	0.00	34%
	Total	8,297	1,204	7,093	85%

Extracted 15 March 2021

Source: Polish Asbestos Database.

According to the database on asbestos-containing products in **Lithuania**, some 1.2 million tonnes of asbestos-containing products in buildings were present in the country in 2018[135]

The technical lifespan of the ACMs can be used as an indicator of when the materials are expected to be removed. According to the Spanish association of asbestos-removal companies[136] 65% of the ACM would have reached the end of their technical life in 2020, 87% in 2030 and 100% in 2040. [115]

The past trend in the quantities of waste containing asbestos may be used as an overall indicator of the past trend in activities involving removal of asbestos and may be used as background for the estimate on future trends. Data from the Danish Waste statistics for the five specific asbestos-containing waste categories, for which data are reported, show for the period 2011 to 2019 an increasing trend in the total quantities from 73,000 tonnes in 2011 to 97,000 tonnes in 2019 (Table 5). For brake pads containing asbestos a decreasing trend is observed and in 2019 asbestos-containing brake pads still accounted for approximately 20% of the total registered amount of brake pads. In addition to the listed categories some ACMs may incorrectly be disposed of in other waste categories, but no data are available on the asbestos content of other categories. If the per capita remaining quantities of asbestos cement in Denmark is similar to the quantities reported for Germany above (the overall consumption in the countries was similar), then it would take about 25 years at the 2019 level of activity to dispose of all remaining ACMs in Denmark.

A similar increasing trend in total quantities in asbestos-containing building waste is observed in Germany, but for brake linings the registered tonnage in Germany has been zero since 2007. In 2017 the total amount of asbestos-containing waste was 475,000 tonnes. The remaining quantities of asbestos-cement in 2016 correspond to disposal for a period of 77 years at the 2017 level. As quoted above, according to the Spanish association of asbestos-removal companies, nearly 100% of the ACMs would have reached the end of their lifespan in 2040 and it is expected that the majority of the remaining asbestos will have been removed within the next 20 years.

[135] Aplinkos apsaugos agentūra - database on asbestos-containing products in Lithuania
[136] Guía sobre amianto

Table 5: Development in the quantities of asbestos-containing waste in 1,000 tonnes/year in Denmark

Waste code	Description	2011	2012	2013	2014	2015	2016	2017	2018	2019
06 13 04	Wastes from asbestos processing	0.001	0	0	0	0	0	0	0	0.002
16 01 11	Brake pads containing asbestos	0.09	0.04	0.06	0.04	0.06	0.11	0.05	0.02	0.02
17 06 01	Insulation material containing asbestos	0.04	0.00	0.04	0.14	0.27	0.04	0.67	0.60	0.48
17 06 05	Construction material containing asbestos	58	53	62	73	75	76	84	85	90
17 06 06	Construction material containing asbestos - dusty	14	9	8	8	8	4	3	4	6
Total		73	62	70	81	82	80	88	89	97

Source: extract of raw data from the Danish Waste Statistics (2019)

5. WORKERS EXPOSURE

5.1. Current workers exposure situation

Current critical exposure is related to process-generated airborne asbestos fibres. These can originate from natural sources (asbestos being a mineral in some soils and bedrock) or from ACM due to historical use of asbestos.

5.1.1. Exposure to asbestos in buildings and infrastructure materials and installations

Exposure to in situ asbestos in buildings and infrastructure materials and installations is assumed to be the main source of asbestos exposure today.

The French Agency for Food, Environmental and Occupational Health & Safety lists the following as the main professions at risk of inhalation of asbestos dust[137]:

- Workers in asbestos removal companies;
- Building and public works employees;

[137] Presentation, health effects, exposure and regulatory framework

- Building and public works (construction sector) personnel involved in demolition or refurbishments;
- Light work building professionals, repair and maintenance staff (plumbers, electricians, heating installers, painters, etc.);
- Workers in waste treatment activities;
- Workers at asbestos-bearing sites.

Levels of exposure will depend on the activity around the asbestos and the applied risk management measures will depend on whether the involved workers are aware of the presence of exposure. The exposure situations most relevant for the EU workforce are therefore divided into the following categories:

- Exposure situations during renovation and demolition of buildings and other infrastructure with ACMs which are subject to notification to the authorities. Potentially exposed workforce includes workers in companies specialised in demolition or more specifically in asbestos removal, but especially for renovation activities, also general construction workers and other craftsmen can be involved. Data on these activities (concentrations and exposed workforce) are available from databases with notified asbestos work.
- Exposure situations during renovation and demolition of buildings and other infrastructure subject to the Article 3(3) of the AWD exemption. In these situations, the authorities are not notified and data for these exposure situations would not be included in databases of notified asbestos work. Potentially exposed workforce could be almost any type of craftsman, including plumbers, carpenters, electricians and bricklayers, as well as general caretakers of buildings.
- 'Incidental' exposure. In these situations, the worker might not beforehand be aware that asbestos is present, and some workers might not know when they encounter asbestos. Examples of 'incidental' exposure could be drilling through insulation materials of ceilings containing asbestos. Potentially exposed workforce could be the same occupations mentioned under the bullet above. In the case where the worker becomes aware of the asbestos-containing products, the work should be stopped, and a risk assessment should be undertaken to clarify which of the two situations mentioned above applies.
- 'Passive' exposure. Working in structures/buildings with asbestos-containing products may lead to exposure to asbestos from ACMs.

5.1.2. Exposure to asbestos in trains, cars, vessels, aircraft and other articles

Occupational exposures to asbestos releases from old (<2005) articles may still be relevant in some situations. This could be, for example, during repair work of brakes in old vehicles.

There might also be release of asbestos from brakes in old trains leading to passive exposure of train personnel. Exposure to asbestos in trains and ships might resemble the above situations, although it shall be noted that demolition of ships will normally not take place in Europe.

Guidelines from The Industry's Work Environment Council in Denmark on asbestos in ships[138] describe the various ACMs in ships and the exposure situations. The guidelines note that asbestos and ACMs have been used extensively on ships. It was used in particular as insulation against heat, cold, moisture and fire. Furthermore, it was also used for sound insulation and vibration inhibition. It was used in engine parts, in flooring, oil and water pipes and as a spark arrestor in electrical switchboards, in fire doors and as elevator brakes, surface cladding in relation to constructive fire protection of crew hatches, on the bridge, in galleys and to an extensive extent as parts in engines (friction linings, gaskets, impellers, liners, etc.). Finally, asbestos is seen in relation to all kinds of pipe systems, boilers and containers. The guidelines note that asbestos in many Eastern European countries, and in particular in Russia, was used in ships until 1990.

Contrary to the uses in buildings, asbestos cement was not used in significant amounts in ships and other means of transport and the exposure situations when removing asbestos from articles are estimated mainly be similar to high-exposure situations in buildings.

5.1.3. Exposure by waste management

Council Decision No. 573 of 23 July 2001, amending Commission Decision 2000/532/EC as regards the list of wastes, classifies construction waste containing asbestos as a hazardous. This includes construction waste containing asbestos that is embedded in the binder matrix (e.g. asbestos cement).

Exposure may take place during collection of the waste (e.g. in waste collection points), handling of the waste before transport, transport to collection point and disposal facility and handling at disposal facility.

The actual handling and exposure situations will be different for the different waste types and depend on to what extent the waste is properly packed before handed over to the waste collection points and disposal facilities.

Waste containing asbestos should according to the AWD be packed in suitable sealed packing with labels indicating that it contains asbestos (does not apply to mining activities). The waste is to be kept separate from other wastes so as to avoid mixing with other materials that would enlarge the amount of asbestos containing waste or that would result in the asbestos content remaining unknown. In this process, local waste disposal regulations are to be adhered to.

[138] Vejledning om asbest i skibe

In principle, when the asbestos waste is packed correctly, the exposure of workers involved in waste management would be minimal, but available data, e.g. from the Italian SIREP database, indicate that some exposure still occurs.

Exposure may, among others, take place when the waste is not packaged properly, when the package is broken e.g. in waste collection containers, whilst cleaning in areas where asbestos waste is stored and where packaging had been broken, and during landfilling of the asbestos-containing waste.

For example, the procedures for disposal of asbestos-containing waste at local waste collection centre in Denmark changed from 1 January 2021 in order to further protect the employees at the centres because the exposure levels had been too high with the practice used until 2021.

5.1.4. Exposure to naturally occurring asbestos

Asbestos intentional commercial uses are banned and handling of past commercially used products is regulated, exposure is possible when handling other minerals (e.g. talc, dolomite and olivine) where asbestos occurs as an impurity. Some of these minerals are in granular or powder form and they relatively easily aerosolise during handling. Therefore, attention is needed in such industries. In experimental studies mixtures of asbestos in dry soils with asbestos content as low as 0.001% were able to produce airborne respirable asbestos concentrations greater than 0.1 fibres/cm3 in dust clouds where the overall respirable dust concentrations were less than 5 mg/m3. However, occurrence of asbestos as an impurity is not limited to the above granular or powder type minerals. In a Finnish geological survey, fibrous minerals, including asbestos (e.g. tremolite and actinolite), were detected in many limestone mines and rock aggregate quarries. More recently, airborne asbestos concentrations of 10-50% of the current national OEL (0.1 fibres/cm3) have been measured in some mines in Finland[139]. Compared to asbestos removal work, the awareness of potential asbestos-related risks is lower in the mining industry and related activities; consequently risk management guidelines were recently published[140]. Depending on the mineralogical characteristics of the bedrock and soil, situations similar to the Finnish example may occur also in other countries."

It is important to stress that 'mining' is not asbestos mining but mining of other materials which might contain asbestos as a naturally occurring 'impurity'.

Exposure to naturally occurring asbestos may take place in the following activities:

- Mining and quarrying;
- Tunnel construction;

[139] Asbesti. Website of the Finnish Institute of Occupational Health
[140] Asbestos risk management guidelines for mines

- Road construction and similar activities where raw materials with asbestos impurities are used; and
- Work with raw materials with asbestos impurities (stones, etc.).

5.1.5. Persons carrying out asbestos sampling and measurements

Exposure to asbestos may occur when samples are taken in order to determine the asbestos concentration in materials and air. When samples are taken of materials e.g. by use of a knife, small amounts of dust may be formed. In the laboratory, staff may be exposed to dust in particular when working with the samples.

Samples of asbestos in air are taken both for monitoring of asbestos exposure and for site clearance check. In order to set up for the stationary sampling the person responsible for the sampling needs to enter the contaminated site and would be exposed for the asbestos is the air at the site.

5.1.6. Exposure situations and main NACE codes

The grouping of activities for the analysis is summarised in the table below. The table furthermore summarises the main NACE activity codes for each group. As asbestos may potentially be found in any type of house or industrial installation build before asbestos was banned, the list of potential NACE codes would be quite extensive. Maintenance workers in all kind of industries, utility companies, institutions, residential houses, etc. may occasionally be exposed to asbestos. The listed NACE codes represent the main NACE codes on the basis of databases of notified activities and the occupational groups expected to be exposed at a level above the assessed OEL options.

Table 6: Overview of worker exposure situations and main NACE codes

#	Exposure group	Worker population	Main NACE codes
1	Building and construction - exposure situations subject to notification	Workers in asbestos removal companies, demolition companies, entrepreneur companies, craftsmen, workers in industries where asbestos occurs	F41.20 Construction of residential and non-residential buildings F43 Specialised construction activities: F43.11 Demolition F43.12 Site preparation F43.21 Electrical installation F43.22 Plumbing, heat and air conditioning installation F43.29 Other construction installation F43.33 Floor and wall covering F43.34 Painting and glazing F43.39 Other building completion and finishing F43.91 Roofing activities F43.99 Other specialised construction activities n.e.c.
2	Building and construction - exposure situations subject to Article 3(3) exemptions.	Largely craftsmen such as plumbers, carpenters, electricians and bricklayers, as well as general caretakers of buildings	F41.20 Construction of residential and non-residential buildings F43 Specialised construction activities: F43.22 Plumbing, heat and air conditioning installation

#	Exposure group	Worker population	Main NACE codes
	'incidental exposure'		F43.29 Other construction installation F43.33 Floor and wall covering F43.34 Painting and glazing F43.39 Other building completion and finishing F43.91 Roofing activities F43.99 Other specialised construction activities n.e.c.
3	Building and construction - passive exposure in buildings	Workers in old office buildings, schools, industry, etc. with ACMs (e.g. wear from ceilings)	In principle, a large number of NACE codes (see further discussion on exposure levels)
4	Exposure to asbestos in articles: Trains, vehicles, vessels, aircraft and other	Workers in asbestos removal companies, renovation and refurbishment of means of transport, sailors, etc. In general, the activities would be subject to notification	C33.14 Repair of electrical equipment C33.15 Repair and maintenance of ships and boats C33.16 Repair and maintenance of aircraft and spacecraft C33.17 Repair and maintenance of other transport equipment G45.2 Maintenance and repair of motor vehicles repair of motor vehicles and motorcycles
5	Waste management and remediation activities	Workers involved in transport and disposal of asbestos-containing waste The activities may be subject to notification or exempted	E36.00 Water collection, treatment and supply E38.11 Collection of non-hazardous waste E38.12 Collection of hazardous waste E38.22 Treatment and disposal of hazardous waste E38.31 Dismantling of wrecks E38.32 Recovery of sorted materials E39.00 Remediation activities and other waste management services (includes asbestos, lead paint, and other toxic material abatement)
6	Mining and quarrying - naturally occurring asbestos	Workers in extraction of asbestos-containing minerals Use of tack powder in manufacture of rubber	B08.11 Quarrying of ornamental and building stone, limestone, gypsum, chalk and slate C22.19 Manufacture of other rubber products
7	Tunnel naturally occurring asbestos	Workers involved in tunnel construction (drilling in asbestos-containing rocks)	F42.11 Construction of roads and motorways F42.12 Construction of railways and underground railways F42.13 Construction of bridges and tunnel
8	Road construction - partly naturally occurring asbestos	Workers involved in use of asbestos-containing construction materials Workers involved in maintenance of roads intentionally added asbestos in the past Mixing of asphalt	F42.11 Construction of roads and motorways F42.12 Construction of railways and underground railways C23.99 Manufacture of other non-metallic mineral products n.e.c. (mixing of asphalt)

#	Exposure group	Worker population	Main NACE codes
9	Sampling and analysis	Workers involved in sampling of ACMs or asbestos in air Not subject to notification if the exposure is below the OEL	M71.20 Technical testing and analysis

Sources: Eurostat. External study RPA 2021

5.2. Exposed workforce

5.2.1. *Published data from databases and the literature*

The available data on the total exposed workers in various Member States are shown in the table below. For comparison, the data are extrapolated to EU27 on a per capita basis.

Table 7: Published data on total workforce exposed to asbestos

Country	Year(s)	Coverage of national data (source)	Number of exposed workers (rounded) in the Member States	Extrapolated number of exposed workers in the EU27
Italy	2019	Extrapolated from numbers reported to the Italian SIREP database. Includes only sectors where more than 3 companies have been registered in SIREP and where more than 1% of the total workforce of the sector is registered in SIREP (Scarselli, 2020)	46 000	248 000
Germany	2017	Workers covered by the German asbestos registry (BAuA, 2020)	114 000	615 000
		All potentially exposed workers (based on number of workers in the relevant sectors in building and construction - includes the majority of above number) (BaUU, 2020)	647 000	3 500 000
France	2010	Extrapolated from self-declarations of exposure to the French SUMER database (Vinck and Emmi, 2015)	81 000	602 000
	2017	Estimated number of workers carrying out operations on ACMs - potentially exposed (Lesterpt and Leray, 2017)	2 000 000	14 000 000
	2020	Estimated number of workers who do rehabilitation work and can be exposed to asbestos - potentially exposed (EFBWW, stakeholder consultation).	500 000 - 800 000	3 700 000 - 5 900 000
	2007	Total estimated number in France (INRS as quoted by ANSES)	1 000 000 - 2 000 000 (of these	7 000 000 - 14 000 000

Country	Year(s)	Coverage of national data (source)	Number of exposed workers (rounded) in the Member States	Extrapolated number of exposed workers in the EU27
			900 000 in the building sector)	
Finland	2013-2015	Workers registered in the Finnish asbestos registry (FIOH, 2020)	1 200	97 000
Spain	2016	Workers registered in the PIVISTEA database (SANIDAD, 2018)	17 645	167 000
Poland **	2013	Not reported (Quoted by Vencovsky et al. (2017) with reference to Central Register in Poland)	1 400	17 000
Romania **	2006	Not reported (Quoted by Vencovsky et al. (2017) with reference to Ministerului Sănătăţii şi Familiei in Romania	7 300	169 000
Bulgaria	2012	Registered exposed (Vangelova et al., 2015)	1 188	76 000
		Estimated potentially exposed (Vangelova et al., 2015)	27 000	1 700 000

The largest numbers of potentially exposed workers can be extrapolated from estimates of total exposed workforce in France, from which a total of 7 000 000 to 14 000 000 potentially exposed workers in EU27 can be estimated.

The available data suggest that a major part of the exposed and potentially exposed workers is within the 'Specialised construction activities' sector. According to data from Eurostat, there are 2 million companies with 5 million workers in this sector in the EU27. Of these 5 million workers the actual number of workers exposed at a significant level may be much smaller, but no data are available.

5.2.2. Workforce exposed by exposure situation

The estimated exposed workforce by exposure situation, summarised in Table , is based as follows:

Building and construction - exposure situations subject to notification. The per capita number of workers covered by the national asbestos registry varies by Member State with relatively many in Germany as compared to other Member States. Lowest per capita numbers are from Poland and Bulgaria. The total for Member States with data[141] is about 245,000. Not all of these are within building and construction. On basis of the available data it is estimated that in the range of 300,000 - 500,000 workers in building and construction are exposed by exposure situations subject to notification.

[141] Data are available for: [names of countries]

Building and construction - exposure situations subject to Article 3(3) waiver and 'incidental' exposure. Potentially several million workers may be may occasionally be exposed to asbestos in exposure situations not subject to notification. The total number of employed workers in the relevant sectors in the EU27 is 7.8 million. It is worth noting that self-employed workers that come into contact with asbestos at building and construction sites are expected to comply with the OELs under the Council Directive 92/57/EEC on temporary and mobile construction sites[142].

In addition to the 7.8 million employees, about 2.5 million self-employed are working in the sector, this would increase the number of workers to 10.3 million. This would be the upper limit if all workers in these occupations were exposed. Considering the extrapolation of total number of workers potentially to be exposed in Germany and France mentioned above and assuming that only a part of the workers potentially exposed will actually be exposed, the total number of actually exposed in EU27 (and not included in above category) each year is estimated at 3.5 - 5.5 million workers. These workers will only be exposed occasionally. As no or less efficient RPE is often used for workers within this category, the exposure concentrations when RPE is taken into account, for this category may not be much lower than the exposure concentrations by activities subject to notification.

Passive exposure. The number of workers potentially exposed at very low levels by passive exposure in buildings may be up to several millions. No data indicating how many workers are working in buildings with friable ACMs which can release asbestos fibres to the indoor environment have been identified. Examples of asbestos released to the indoor environment in schools are common in the media at least in Denmark and Germany, but asbestos in other buildings has less public attention. The review estimates the total number of buildings with asbestos in the UK at 1.5 million. Based on the available data, it cannot be excluded, that lowering the OEL to 0.001 fibres/cm^3 would mean that some workers in buildings with ACMs would be exposed at levels above the OEL. In order to have a first idea it is assumed that 200,000 - 1,000,000 workers are exposed at those levels estimated in section 4.3.1.

Exposure to asbestos in articles. Limited information is available on number of workers exposed to asbestos in articles. The activities would typically be subject to notification and some of the activities would be undertaken by specialised companies. Examples are 133 aircraft installers and repairers notified in Finland in 2014 and a case from France, 2019 where it was estimated that 400 employees in more than 20 workshops were exposed to asbestos even though it was expected that asbestos had been removed from all SNCF trains since 1997 [143]. The activities may be included in a group such as 'Repair and installation of machinery and equipment' where the French SCOLA database include

[142] Council Directive *92/57/EEC* of 24 June 1992 on the implementation of minimum safety and health requirements at temporary or mobile construction sites (eighth individual Directive within the meaning of Article 16 (1) of Directive 89/391/EEC), *available at:* https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A31992L0057

[143] https://www.francetvinfo.fr/sante/affaires/scandale-de-l-amiante/des-salaries-de-la-sncf-denoncent-la-presence-d-amiante-sur-des-wagons-de-fret_3560829.html

notifications from 123 companies (INRS, 2019). In Madrid Metro, health monitoring includes 1,075 active workers, but asbestos should be removed from rolling stock by the end of 2019 i.e. the workers are after 2019 exposed to asbestos in buildings and infrastructure. Whereas asbestos is reported to have been removed from rolling stocks of several national train companies, asbestos may still be present in private railway companies. Data from the UK and Belgium shows that asbestos is still present in the rolling stock of many railway companies and likely this is also the case in other countries. Large numbers of vehicle mechanics were in the past exposed to asbestos in brakes and other parts, but it is estimated that it will only very seldom happen that vehicle brakes contain asbestos. The presence of several companies specialised in removal of asbestos in ships indicates that a number of workers may also be involved in asbestos removal activities in ships. Some 'incidental' exposure may also take place by maintenance and renovation involving ACMs which has not been identified. No data on other exposure to asbestos in shipyards has been identified. On the basis of limited information, it is roughly estimated that the number of workers actually involved in activities with asbestos in articles including 'incidental' exposure is likely in the range of 5,000 - 25,000 even the number of potentially exposed may be significantly higher.

Waste management. The data for waste management varies considerably between Member States. The Italian SIREP database includes data for 10,337 workers in this sector (22% of all registered); the majority was in the non-hazardous waste sector. Contrary to this, the Finnish and the German data does not specifically indicate number of workers involved in waste management. In the German data, some activities within transport industry may involve transport of waste, and in Finland waste management may be included in the group of other activities. The French SCOLA database includes notifications from 149 companies within this sector accounting for 3% of all notifications (INRS, 2020). A survey from Denmark from 2008 demonstrated exposure of workers on Danish recycling stations (waste collection points for both hazardous and non-hazardous waste) e.g. by sweeping around containers with asbestos-containing waste. The number of recycling stations in Denmark is 364 with several thousand employees. For the stakeholder consultation Hazardous Waste Europe, representing the hazardous treatment installations, has indicated that for the activities represented by the sector, workers would not be exposed to asbestos as they only handle asbestos-containing waste in closed packaging. Exposure may typically take place when the waste is packed e.g. in waste collection points (also for non-hazardous waste), but it seems to be common to require that all asbestos-containing waste should be delivered in suitable containment (e.g. bagging or wrapping) and placed in a secure skip or container on-site. Potential exposure of the workers in waste collection points may happen by cleaning procedures e.g. when waste is disposed in improper containment. The number of workers that occasionally may be exposed to asbestos by waste collection, transport and final disposal may be high. An extrapolation of the data from the SIREP database in Italy would suggest a total of about 78,000 in the EU27. Many situations in the waste sector where workers are occasionally exposed at shorter time would not be registered and e.g. not included in the SIREP database. The total number of employees in the waste sector in the EU is approximately 1,000,000; of these 46,000 in the hazardous waste sector. No data are

available on the potential number of workers involved in land reclamation. Even though the number of potentially exposed may be higher, the number of workers exposed at levels comparable to these concentrations used for the calculation of burden of disease is estimated at 50,000 - 200,000.

Mining and quarrying - naturally occurring asbestos. Limited data are available. According to stakeholder response from the Industrial Minerals Association – Europe (IMA-Europe), natural presence of asbestos in the minerals extracted from the ground is extremely rare and a geological curiosity. Euromines has not provided data for the stakeholder consultation. In Finland, the reported number of exposed workers in the sector is about 50. Half of these are exposed at levels above 0.01 fibres/cm^3. About 30 enterprises in the valley perform quarrying and processing of the serpentinite, with more than 1,810 workers involved[144]. This illustrates that even though the occurrence is rare, the total number may be significant. Mining industry is not among the sectors reported from the Italian SIREP database discussed above. In Germany the number of exposed workers in 'Raw materials and chemical industry' is recorded at 1,991, but it is not indicated how many of these are within the mining and quarrying sector. The BG for the raw materials and chemical industry in Germany estimated that the German acceptance level of 0.01 fibres/cm^3 during mining and treatment is violated in 10 out of 2 000 active quarries in Germany[145] so safety measures have to be applied. The number of miners is not reported and it is not indicated how many quarries have concentrations above 0.001 fibres/cm^3. The French Scolamiante database includes notifications from 29 companies within the mining sector accounting for 0.3% of all notifications, but it is not clear if the exposure is from naturally occurring asbestos or from maintenance of buildings and equipment[146]. From Italy one study point at asbestos exposure in the mining of feldspar, but it has not been reported elsewhere. Feldspar is widely mined in the EU and if exposure to low levels of asbestos take place, the number of workers relevant for the assessment of the lowest OEL at 0.001 fibres/cm^3 could potentially be high. On the basis of the available data the number of workers exposed at levels comparable to the exposure levels reported is estimated at 5,000-30,000.

Tunnel excavation No data are available on the number of workers exposed to asbestos in tunnel excavation. The reported exposure levels are low so the sector is considered not to contribute significantly to the total burden of disease. However, if the OEL is lowered to 0.001 fibres/cm^3, the number of workers exposed at levels relevant for the assessment could potentially be high. Tunnel excavation in asbestos-containing rocks and use of asbestos-containing rocks for various construction works is demonstrated to lead to exposure to asbestos, but no data are available to determine how common it is. For tunnel

[144] Cavallo A, Rimoldi B. Chrysotile asbestos in serpentinite quarries: a case study in Valmalenco, Central Alps, Northern Italy. Environ Sci Process Impacts. 2013 Jul;15(7):1341-50. doi: 10.1039/c3em00193h. PMID: 23770928.

[145] https://www.baua.de/DE/Angebote/Publikationen/Berichte/Gd80-3.pdf?__blob=publicationFile&v=6

[146] INRS (2020). Rapport d'activité pour la période du 1er juillet 2012 au 31 décembre 2019 – Mesures d'exposition à l'amiante META réalisées dans le cadre du décret 2012-639 du 4 mai 2012 relatif aux risques d'exposition à l'amiante Institut national de recherche et de sécurité, Paris. [In French]

excavation, exposure has been reported from Italy, Austria and Germany. The total number of workers is roughly estimated to be in the range of 500 - 5,000.

Road construction - naturally occurring asbestos and asbestos in pavement from past intentional use. For road construction no data are available for an estimate. An investigation from 2015 included 173 personal samples at 53 road maintenance sites in France with intentionally added asbestos. It is not known to what extent raw materials across the EU contain asbestos at low levels. As the exposure concentrations are well below the current OELs in most Member States, these activities would not be subject to notification and data are not available from national databases. The number of workers in the EU27 within the sector 'Construction of roads and motorways' is 630,759. If only a few percent of these may be exposed to asbestos, the number of exposed workers could be in the range of 10,000 - 50,000.

Sampling and analysis. Air monitoring and control is among the processes subject to the Article 3(3) waiver of the AWD, and consequently numbers of workers are not recorded in national databases. The number estimated on the basis of the Italian SIREP database is 3,682 however numbers are not available from other Member States. In France, the number of accredited organisations for dust-level control and analysis is 256[147] but the number of workers involved in sampling of asbestos samples is not reported. On the basis of the data from Italy, the total number involved in sampling and analysis is estimated at 10,000 - 25,000.

Table 8: Estimated total workforce exposed to asbestos by exposure situation

#	Exposure group	Estimated exposed workforce	Remark
1	Building and construction - exposure situations subject to notification	300 000 - 500 000	
2	Building and construction - exposure situations subject to Article 3(3) waiver, 'incidental' exposure	3 500 000 - 5 500 000	Exposure duration is probably lower than for other exposure groups, but no data are available to take this into account.
3	Building and construction - passive exposure in buildings	200 000 - 1 000 000 Potentially millions	The contribution from passive exposure is estimated to be insignificant for the total burden of disease and passive exposure in consequently excluded from the benefit assessment.
4	Exposure to asbestos in articles: Trains, vehicles, vessels, aircraft and other	5 000 - 25 000	Based on very limited data.
5	Waste management	50 000 - 200 000	The number of workers estimated

[147] Lesterpt S, Leray S (2017). Prevention of risks caused by asbestos. A summary of the regulatory reform and perspectives 2009-2012-2020. 10 October 2017 – Asbestos seminar – DGT Asbestos centre. General Directorate for Labour, France.

#	Exposure group	Estimated exposed workforce	Remark
			to be exposed at reported exposure levels.
6	Mining and quarrying - naturally occurring asbestos	5 000-20 000	Based on very limited data. The number of workers estimated to be exposed at reported exposure levels.
7	Tunnel excavation	500-5 000	Based on very limited data. The number of workers estimated to be exposed at reported exposure levels.
8	Road construction and maintenance	10 000 - 50 000	Based on very limited data.
9	Sampling and analysis	10 000 - 25 000	
	Total (rounded)	**4 100 000 - 7 300 000**	**Excl. potentially more at levels close to 0.001 fibres/cm^3**

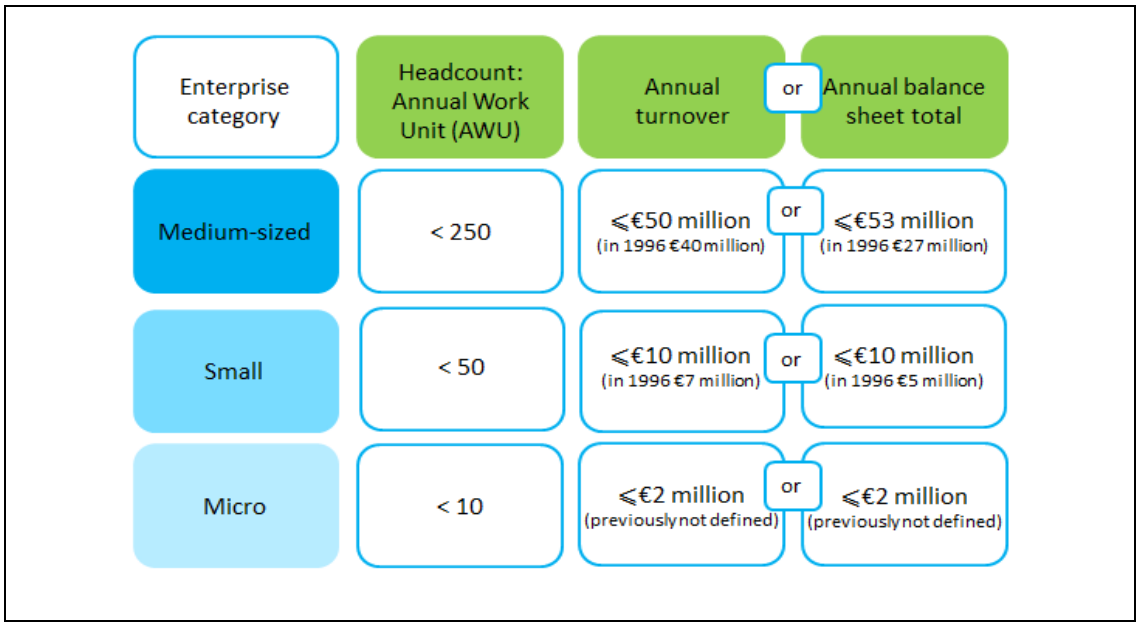
Source: External study. *RPA study own calculation*

Annex 6: Relevant sectors & SME´s test

1. *SME´s test*

An enterprise is considered to be a medium-sized, small or micro enterprise depending on thresholds that have been outlined by the Commission.

Figure 1 Categorisation of SMEs



The identification of the presence of SMEs in the key sectors relied, to the maximum degree possible, on the use of NACE codes, to facilitate extraction of data on the proportion of SMEs from the Eurostat Structural Business Statistics (SBS) database.

The numbers of small, medium, and large enterprises likely to have workers exposed to asbestos in the EU is estimated in the tables below. The vast majority (99.32%) of companies with exposed workers and which are likely be affected by the OEL options are SMEs.

Table 1: Companies involved in work with asbestos by size of company and by sector

Exposure group	Main sectors	Total	Small	%	Medium	%	Large	%
Building and construction - exposure situations subject to notification	F41 - Construction of buildings	2,399	2,381	99.25%	17	0.71%	1	0.04%
	F43 - Specialised construction activities	33,600	33,395	99.39%	186	0.55%	19	0.06%
	Potentially many sectors (e.g. D35 and E39; SCOLA database lists up to 24 sectors)	12,001	11,901	99.17%	68	0.57%	32	0.27%

Exposure group	Main sectors	Total	Small	%	Medium	%	Large	%
Building and construction - exposure situations subject to Article 3(3) waiver, 'incidental' exposure	F41 - Construction of buildings	200,000	198,428	99.21%	1,454	0.73%	118	0.06%
	F43 - Specialised construction activities (selected subsectors)	1,000,001	993,907	99.39%	5,531	0.55%	563	0.06%
	Potentially many sectors (e.g. D35 and E39; SCOLA database lists up to 24 sectors)	300,000	297,517	99.17%	1,690	0.56%	793	0.26%
Building and construction - passive exposure in buildings	Many sectors	No data	No data	No data	No data	No data	No data	No data
Exposure to asbestos in articles: Trains, vehicles, vessels, aircraft and other	C33 - Repair and installation of machinery and equipment (selected subsectors)	300	296	98.67%	3	1.00%	1	0.33%
	G45 - Wholesale and retail trade and repair of motor vehicles and motorcycles	50	50	100.00%	0	0.00%	0	0.00%
Waste management	E36 - Water collection, treatment and supply	300	279	93.00%	15	5.00%	6	2.00%
	E38 - Waste collection, treatment and disposal activities; materials recovery	2,200	2,027	92.14%	138	6.27%	35	1.59%
Mining and quarrying - naturally occurring asbestos	B08.11 - Quarrying of ornamental and building stone, limestone, gypsum, chalk and slate	251	242	96.41%	8	3.19%	1	0.40%
Tunnel excavation	F42.12 - Construction of railways and underground railways	9	9	100.00%	0	0.00%	0	0.00%
	F42.13 - Construction of bridges and tunnel	40	38	95.00%	2	5.00%	0	0.00%
Road construction and maintenance	F42.11 - Construction of roads and motorways	1,100	1,042	94.73%	47	4.27%	11	1.00%
Sampling and analysis	M71.20 Technical testing and analysis	440	434	98.64%	5	1.14%	1	0.23%
Summary (rounded)		**1,550,500**	**1,540,000**	**99.32%**	**9,000**	**0.58%**	**1,500**	**0.10%**

Source: Eurostat and RPA (2021) study own calculation

2. Number of companies and employees by NACE

An overview of number of companies and employees by NACE code for activities with main risk of exposure as demonstrated by data from national exposure databases, prepared on the RPA study is presented.

Table 2: Number of companies and employees by NACE code for activities with main risk of exposure

2-digit NACE category	4-digit NACE category	No of enterprises, EU27	Number of workers, EU27		SME in % of total workers
			Total	SME	
Asbestos in building and construction					
F41 - Construction of buildings	F41.20 - Construction of residential and non-residential buildings	677,446	2325033	2031,511	87%
F43 - Specialised construction activities	F43.11 - Demolition	24 004	74 036	70 979	96%
	F43.12 - Site preparation	157 756	271 822	260 598	96%
	F43.21 - Electrical installation	344 137	1 209 416	1 049 444	87%
	F43.22 - Plumbing, heat and air conditioning installation	348 954	1 063 606	922 919	87%
	F43.29 - Other construction installation	99 570	382 713	380 693	99%
	F43.33 - Floor and wall covering	170 130	276 082	274 625	99%
	F43.34 - Painting and glazing	240 214	410 306	408 141	99%
	F43.39 - Other building completion and finishing	244 028	225 896	224 704	99%
	F43.91 - Roofing activities	116 843	338 190	318 172	94%
	F43.99 - Other specialised construction activities n.e.c.	256 390	775 515	729 611	94%
D35 - Electricity, gas, steam and air conditioning supply	D35.11 - Production of electricity	144 783	501 965	139 380	28%
E39 - Remediation activities and other waste management services	E39.00 - Remediation activities and other waste management services (includes asbestos, lead paint, and other toxic material abatement)	4 080	31 000	25 315	82%
Asbestos in articles					
C33 - Repair and installation of machinery and equipment	C33.- 14 Repair of electrical equipment	15 299	50 754	37 667	74%
	C33.15 - Repair and maintenance of ships and boats	16 408	79 094	58 701	74%
	C33.16 - Repair and maintenance of aircraft and	2 196	66 940	49 680	74%

2-digit NACE category	4-digit NACE category	No of enterprises, EU27	Number of workers, EU27		SME in % of total workers
			Total	SME	
	spacecraft				
	C33.17 - Repair and maintenance of other transport equipment	3 400	53 940	40 032	74%
G45 - Wholesale and retail trade and repair of motor vehicles and motorcycles	G45.2 - Maintenance and repair of motor vehicles	452 830	994 874	958 621	96%
Naturally occurring asbestos and asbestos from past intentional use in asphalt					
B08 - Other mining and quarrying	B08.11 - Quarrying of ornamental and building stone limestone, gypsum, chalk and slate	5 000	47 116	39 771	84%
F42 - Civil engineering	F42.11 - Construction of roads and motorways	33 569	630 759	298 124	52.70%
	F42.12 - Construction of railways and underground railways	2 136	79 751	37 693	47%
	F42.13 - Construction of bridges and tunnel	1 900	36 994	17 485	47%
Waste treatment					
E36 - Water collection, treatment and supply	E36.00 - Water collection, treatment and supply	15 000	348 937	134 553	39%
E38 - Waste collection, treatment and disposal activities; materials recovery	E38.11 - Collection of non-hazardous waste	17 989	533 581	213 554	40%
	E38.12 - Collection of hazardous waste	1 323	17 803	7 126	40%
	E38.22 - Treatment and disposal of hazardous waste	1 000	28 660	12 732	44%
	E38.31 - Dismantling of wrecks	3 097	15 798	10 920	69%
	E38.32 - Recovery of sorted materials	16 126	177 712	122 844	69%
Testing					
M71 - Architectural and engineering activities; technical testing and analysis	M71.20 - Technical testing and analysis	68 984	410 396	249 431	61%

Source: Eurostat's Structural Business Statistics database. External study RPA 2021

The companies certified for asbestos management may consist of:

- Companies specialised in asbestos management, where managing asbestos and ACMs account for a major part of the turnover of the company;
- Companies working with demolition, renovation and remediation of buildings and infrastructure where managing asbestos is a significant part of the turnover in addition to managing other hazardous substances such as PCB, lead, PAH, mercury, etc.
- Companies in the building and construction sector where managing asbestos account for a minor part of the activities;
- Companies in other sectors where the building/facility owner's own staff may be exposed to asbestos by various maintenance activities. Managing asbestos account for a minor part of the activities.

3. Total estimated number of companies involved in work with ACMs by size and sector

The total number of enterprises involved in work with ACMs is based on the information of the stakeholder consultation and public sources on number of enterprises with workers exposed to asbestos, whereas information on size distribution is based on the Structural Business Statistics from Eurostat. The total number of companies in the EU is derived from the same statistics.

Table 3: Number of enterprises involved in work with ACMs by size of enterprise by sector

	Exposure group	Main sectors	Micro and small	Medium	Large	Total No. of enterprises involved in work with ACMs	Total No. of enterprises in the EU27	% of total enterprises in EU27 involved in work with ACMs
1	**Building and construction - exposure situations subject to notification**	F41 - Construction of buildings	2 381	17	1	**2 400**	**677 446**	0.4%
		F43 - Specialised construction activities	33 395	186	19	**33 600**	**2 002 026**	1.7%
		Potentially many sectors (e.g. D35 and E39; SCOLA database lists up to 24 sectors)	11 901	68	32	**12 000**	**n/a**	n/a
2	**Building and construction - exposure situations subject to Article 3(3) waiver, 'incidental'**	F41 - Construction of buildings	198 428	1 454	118	**200 000**	**677 446**	50%
		F43 - Specialised construction activities (selected subsectors)	993 907	5 531	563	**1 000 000**	**2 002 026**	30%

	Exposure group	Main sectors	Micro and small	Medium	Large	Total No. of enterprises involved in work with ACMs	Total No. of enterprises in the EU27	% of total enterprises in EU27 involved in work with ACMs
	exposure	Potentially many sectors (e.g. D35 and E39; SCOLA database lists up to 24 sectors)	297 517	1 690	793	**300 000**	**n/a**	n/a
3	**Building and construction - passive exposure in buildings**	Many sectors	No data	No data	No data	**No data**	**No data**	No data
4	**Exposure to asbestos in articles: Trains, vehicles, vessels, aircraft and other**	C33 - Repair and installation of machinery and equipment (selected subsectors)	296	3	1	**300**	**37 303**	0.8%
		G45 - Wholesale and retail trade and repair of motor vehicles and motorcycles	50	0	0	**50**	**452 830**	0.01%
5	**Waste management**	E36 - Water collection, treatment and supply	279	15	6	**300**	**15 000**	2.0%
		E38 - Waste collection, treatment and disposal activities; materials recovery	2 027	138	35	**2 200**	**39 535**	5.6%
6	**Mining and quarrying - naturally occurring asbestos**	B08.11 - Quarrying of ornamental and building stone, limestone, gypsum, chalk and slate	242	8	1	**250**	**5 000**	5.0%
7	**Tunnel excavation**	F42.12 - Construction of railways and underground railways	9	0	0	**10**	**2 136**	0.5%
		F42.13 - Construction of bridges and	38	2	0	**40**	**1 900**	2.1%

	Exposure group	Main sectors	Micro and small	Medium	Large	Total No. of enterprises involved in work with ACMs	Total No. of enterprises in the EU27	% of total enterprises in EU27 involved in work with ACMs
		tunnel						
8	**Road construction and maintenance**	F42.11 - Construction of roads and motorways	1 042	47	11	**1 100**	**33 569**	3.3%
9	**Sampling and analysis**	M71.20 Technical testing and analysis	434	5	1	**440**	**68 984**	0.6%
	Summary (rounded)		**1 540 000***	**9 000***	**1 500 ***	**1 550 500 ***		

* These estimates do not include companies with passively exposed workers and companies with workers exposed to concentrations below 0.002 fibres/cm^3
Source: Eurostat; RPA estimates

4. Cost/turnover ratio per sector and size of companies

The table below sets out the average levels for turnover in the sectors where it has been determined workers are exposed to asbestos.

Table 4: Average turnover for companies operating in sectors working with asbestos by size class, in € million

Sector	Average turnover per company (€ million)		
	Small	Medium	Large
F41.20 Construction of residential and non-residential buildings	0.34	18.22	269.97
F43.11 Demolition	0.30	19.01	347.44
F43.12 Site preparation	0.20	13.01	237.70
F43.21 Electrical installation	0.29	11.95	163.68
F43.22 Plumbing, heat and air conditioning installation	0.28	11.41	156.26
F43.29 Other construction installation	0.34	50.58	285.74
F43.33 Floor and wall covering	0.13	19.96	112.77
F43.34 Painting and glazing	0.13	18.72	105.76
F43.39 Other building completion and finishing	0.09	13.19	74.51
F43.91 Roofing activities	0.28	12.52	103.34
F43.99 Other specialised construction activities n.e.c.	0.33	14.88	122.84
F42.12 Construction of railways and underground railways	1.72	37.45	523.50
F42.13 Construction of bridges and tunnels	0.82	17.86	249.60
B08.11 Quarrying of ornamental and building stone, limestone, gypsum, chalk and slate	0.85	16.21	182.80
C33.14 Repair of electrical equipment	0.19	8.77	87.76
C33.15 Repair and maintenance of ships and boats	0.27	12.18	121.93
C33.16 Repair and maintenance of aircraft and	3.82	172.56	1727.48

Sector	Average turnover per company (€ million)		
	Small	Medium	Large
spacecraft			
C33.17 Repair and maintenance of other transport equipment	0.91	41.30	413.47
D35.11 Production of electricity	0.38	74.60	1089.22
E36.00 Water collection, treatment and supply	0.74	13.10	99.86
E38.11 Collection of non-hazardous waste	0.71	10.10	132.34
E38.12 Collection of hazardous waste	0.48	6.84	89.65
E38.22 Treatment and disposal of hazardous waste	1.53	20.38	204.77
E38.31 Dismantling of wrecks	0.39	10.97	88.53
E38.32 Recovery of sorted materials	1.48	41.96	338.60
E39.00 Remediation activities and other waste management services	0.77	13.99	68.23
G45.2 Maintenance and repair of motor vehicles	0.22	14.97	24.99
M71.20 Technical testing and analysis	0.24	9.84	104.86
F42.11 Construction of roads and motorways	0.74	15.99	223.46

Source: Eurostat (2018 data) and study team's calculations

Note: Turnover data by size class is mostly available for sectors at the NACE 3-digit level as opposed to the 4-digit level. Where this is the case, the share of turnover between the different size classes at the 4-digit level has been assumed to be the same as at the 3-digit level and then applied to the overall turnover level at the 4-digit level to generate estimates at sub-sector levels.

With available data, has been only possible to estimate costs on the basis of exposure groups. For the purposes of generating estimates of the significance of the likely costs to be incurred with respect to turnover in the different sub-sectors, it has been assumed that the costs associated with each exposure group will be the same for all the sectors/sub-sectors within that exposure group.

On the basis of the cost model estimates for average cost for a company in each exposure group and utilising the average turnover for different sized companies in Table above, the following table sets out estimates of the average annual costs predicted to be incurred as a percentage of average annual turnover.

The results show that at an OEL of 0.01 fibres/cm3, almost all companies of all sizes in the exposure groups "Building and construction - exposure situations subject to notification" and "Building and construction - exposure situations subject to Article 3(3) waiver, 'incidental' exposure" would have a cost/turnover ratio of less than 1%, with only small companies in the first group in sectors "F43.33 Floor and wall covering", "F43.34 Painting and glazing" and "F43.39 Other building completion and finishing" having results above 1% but below 2%.

"M71.20 Technical testing and analysis" in the exposure group "Sampling and analysis" shows a similar result to these groups. The only exposure group where costs in relation to turnover appear to be higher than 2% at an OEL of 0.01 fibres/cm3 is "Exposure to

asbestos in articles: Trains, vehicles, vessels, aircraft and other". Small enterprises in sectors "C33.14 Repair of electrical equipment" and "C33.15 Repair and maintenance of ships and boats" show costs/turnover in the 2% to 5% category. Similarly, Sector G45.2 Maintenance and repair of motor vehicles" also shows a cost/turnover in the same 2-5% category.

With respect to Sector G45.2, the compliance costs per company are expected to be lower than the costs per company calculated for that whole exposure group, which also includes the C33.1 sectors (repair of ships, trains etc). Workers in C33.1 sectors are much more likely to come into contact with asbestos then the ones in G45.2 since in G45.2 workers would be most likely to come into contact with asbestos when they are repairing old 'veteran' cars, and number of these are limited.

At OELs of 0.002 and 0.001 fibres/cm3, more sectors exhibit higher levels of costs/turnover as might be expected, and this extends to medium and large companies in addition to small ones. Small companies exhibiting higher cost/turnover ratios even at the highest OEL under consideration in sectors such as C33.14 and C33.15 would face significantly greater challenges under OELs of 0.002 and 0.001 fibres/cm3, with cost/turnover ratio results calculated between 18% and almost 30%.

When expressed as % of profits or investment, these costs are even greater. Although these costs are likely to be, to a large extent, passed on to the customers, they may result in some companies abandoning the market and the transfer of the relevant activities to other companies. However, significant price increases may result in consumers putting off asbestos work and as a result spread the demand over greater period of time, thus reducing the market available each year. This may result in a reduction of firms in the market. These issues appear to be more significant for small companies.

It is noted that for the exposure group "Building and construction - exposure situations subject to Article 3(3) waiver, 'incidental' exposure", the cost/turnover ratio remains below 1%, even at the strictest OEL across all company sizes in all sectors. These companies will deal with asbestos occasionally but not as a major part of their operations, and the increase in costs associated with potential moves to lower OELs are expected to be significantly less than for companies in the exposure group "Building and construction - exposure situations subject to notification", where work with asbestos will likely form a much greater significance in their overall portfolio. The corresponding significantly lower cost/turnover ratios in sectors in the exposure group involving incidental exposure is therefore to be expected. However, whilst the cost/turnover ratios for the exposure group "Building and construction - exposure situations subject to Article 3(3) waiver, 'incidental' exposure" are lower across the different OELs than in the other exposure groups, this does not necessarily mean that companies operating in these sectors will be unaffected by the increases in costs associated with having to comply with progressively lower OELs.

Table 5: Costs as percentage of turnover

Exposure group	4-digit NACE category	Cost as a % of turnover								
		0.001 fibres/cm^3			0.002 fibres/cm^3			0.01 fibres/cm^3		
		Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
Building and construction - exposure situations subject to notification	F41.20 Construction of residential and non-residential buildings	3.42%	0.32%	0.09%	3.06%	0.29%	0.08%	0.44%	0.04%	0.01%
	F43.11 Demolition	3.95%	0.31%	0.07%	3.54%	0.28%	0.06%	0.51%	0.04%	0.01%
	F43.12 Site preparation	5.78%	0.45%	0.10%	5.18%	0.41%	0.09%	0.74%	0.06%	0.01%
	F43.21 Electrical installation	4.02%	0.49%	0.14%	3.60%	0.44%	0.13%	0.52%	0.06%	0.02%
	F43.22 Plumbing, heat and air conditioning installation	4.21%	0.52%	0.15%	3.78%	0.46%	0.14%	0.54%	0.07%	0.02%
	F43.29 Other construction installation	3.49%	0.12%	0.08%	3.12%	0.10%	0.07%	0.45%	0.01%	0.01%
	F43.33 Floor and wall covering	8.83%	0.30%	0.21%	7.91%	0.26%	0.19%	1.14%	0.04%	0.03%
	F43.34 Painting and glazing	9.42%	0.31%	0.22%	8.44%	0.28%	0.20%	1.21%	0.04%	0.03%
	F43.39 Other building completion and finishing	13.37%	0.45%	0.32%	11.98%	0.40%	0.28%	1.72%	0.06%	0.04%
	F43.91 Roofing activities	4.21%	0.47%	0.23%	3.78%	0.42%	0.20%	0.54%	0.06%	0.03%
	F43.99 Other specialised construction activities n.e.c.	3.54%	0.40%	0.19%	3.18%	0.35%	0.17%	0.46%	0.05%	0.02%
	D35.11 Production of electricity	3.09%	0.08%	0.02%	2.77%	0.07%	0.02%	0.40%	0.01%	0.003%
	E39.00 Remediation activities and other waste management services	1.54%	0.42%	0.35%	1.38%	0.38%	0.31%	0.20%	0.05%	0.04%
Building and construction - exposure situations subject to Article 3(3) waiver, 'incidental' exposure	F41.20 Construction of residential and non-residential buildings	0.27%	0.03%	0.01%	0.21%	0.02%	0.01%	0.09%	0.01%	0.002%
	F43.11 Demolition	0.31%	0.02%	0.01%	0.24%	0.02%	0.004%	0.10%	0.01%	0.002%
	F43.12 Site preparation	0.45%	0.04%	0.01%	0.35%	0.03%	0.01%	0.14%	0.01%	0.002%
	F43.21 Electrical installation	0.31%	0.04%	0.01%	0.24%	0.03%	0.01%	0.10%	0.01%	0.004%
	F43.22 Plumbing, heat and air conditioning installation	0.33%	0.04%	0.01%	0.25%	0.03%	0.01%	0.11%	0.01%	0.004%
	F43.29 Other construction installation	0.27%	0.01%	0.01%	0.21%	0.01%	0.005%	0.09%	0.003%	0.002%
	F43.33 Floor and wall covering	0.69%	0.02%	0.02%	0.53%	0.02%	0.01%	0.22%	0.01%	0.01%
	F43.34 Painting and glazing	0.73%	0.02%	0.02%	0.56%	0.02%	0.01%	0.24%	0.01%	0.01%
	F43.39 Other building completion and finishing	1.04%	0.03%	0.02%	0.80%	0.03%	0.02%	0.33%	0.01%	0.01%
	F43.91 Roofing activities	0.33%	0.04%	0.02%	0.25%	0.03%	0.01%	0.11%	0.01%	0.01%
	F43.99 Other specialised construction activities n.e.c.	0.28%	0.03%	0.01%	0.21%	0.02%	0.01%	0.09%	0.01%	0.005%
	D35.11 Production of electricity	0.24%	0.01%	0.002%	0.19%	0.005%	0.001%	0.08%	0.002%	0.001%

Exposure group	4-digit NACE category	Cost as a % of turnover								
		0.001 fibres/cm^3			0.002 fibres/cm^3			0.01 fibres/cm^3		
		Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
	E39.00 Remediation activities and other waste management services	0.12%	0.03%	0.03%	0.09%	0.03%	0.02%	0.04%	0.01%	0.01%
Building and construction - passive exposure in buildings	Many sectors	No data	No data	No data	No data	No data	No data	No data	No data	No data
Exposure to asbestos in articles: Trains, vehicles, vessels, aircraft and other	C33.14 Repair of electrical equipment	28.50%	8.51%	2.36%	25.60%	7.64%	2.12%	3.93%	1.17%	0.33%
	C33.15 Repair and maintenance of ships and boats	20.52%	6.13%	1.70%	18.42%	5.50%	1.53%	2.83%	0.84%	0.23%
	C33.16 Repair and maintenance of aircraft and spacecraft	1.45%	0.43%	0.12%	1.30%	0.39%	0.11%	0.20%	0.06%	0.02%
	C33.17 Repair and maintenance of other transport equipment	6.05%	1.81%	0.50%	5.43%	1.62%	0.45%	0.83%	0.25%	0.07%
	G45.2 Maintenance and repair of motor vehicles	24.60%	4.98%	8.29%	22.09%	4.47%	7.45%	3.39%	0.69%	1.14%
Waste management	E36.00 Water collection, treatment and supply	2.82%	2.15%	0.78%	2.50%	1.91%	0.69%	0.36%	0.28%	0.10%
	E38.11 Collection of non-hazardous waste	2.95%	2.79%	0.59%	2.61%	2.47%	0.52%	0.38%	0.36%	0.08%
	E38.12 Collection of hazardous waste	4.35%	4.12%	0.87%	3.85%	3.65%	0.77%	0.56%	0.53%	0.11%
	E38.22 Treatment and disposal of hazardous waste	1.37%	1.38%	0.38%	1.21%	1.23%	0.34%	0.18%	0.18%	0.05%
	E38.31 Dismantling of wrecks	5.39%	2.57%	0.88%	4.77%	2.28%	0.78%	0.69%	0.33%	0.11%
	E38.32 Recovery of sorted materials	1.41%	0.67%	0.23%	1.25%	0.59%	0.20%	0.18%	0.09%	0.03%
Mining and quarrying - naturally occurring asbestos	B08.11 - Quarrying of ornamental and building stone, limestone, gypsum, chalk and slate	2.88%	2.03%	0.50%	2.55%	1.80%	0.44%	0.43%	0.31%	0.08%
Tunnel excavation	F42.12 - Construction of railways and underground railways	0.91%	0.56%	0.11%	0.80%	0.50%	0.10%	0.17%	0.10%	0.02%
	F42.13 - Construction of bridges and tunnels	1.90%	1.18%	0.23%	1.68%	1.04%	0.21%	0.35%	0.22%	0.04%
Road construction and maintenance	F42.11 - Construction of roads and motorways	0.78%	0.48%	0.10%	0.69%	0.43%	0.08%	0.16%	0.10%	0.02%
Sampling and analysis	M71.20 Technical testing and analysis	11.57%	3.74%	0.98%	10.19%	3.29%	0.86%	1.66%	0.54%	0.14%

Key:

< 1% **No colour** | **1-2%** | **2-5%** | **5-10%** | **>10%**

Source: External study. RPA 2021

Annex 7: Existing Guidelines and voluntary industry initiatives

A number of guidelines have been published by the EU Commission, national authorities or research institutions and industry stakeholders. Examples of guidelines are listed in the table below on the basis of responses to the stakeholder consultation and literature search. The list is not exhaustive, most Member States would have guidelines at different levels.

The guidelines can be grouped into two groups. Exemplified with France, the Ministry of labour has issued instructions specifying which RMMs would be required in order to meet the legislation while the French National Research and Safety Institute (INRS) has published guidelines describing in detail all steps in managing ACMs with more specific information on the different RMMs.

As part of the stakeholder consultation contact has been established to Dutch experts in order to understand to what extent guidelines are available and has been updated to reflect the lowering of the Dutch OEL to 0.002 fibres/cm^3. There are no common guidelines, but guidelines were developed on how to assess that a specific working method is safe. Parties can decide to develop a safe working method to be applied at nationwide level, which would result in having to apply a less strict safety regime. These safe working methods often include the application of some type of control measures (like a wetting agent). For such safe working methods to be generally available these have to be evaluated and approved by a specific committee that has been installed by the Ministry of Social Affairs and Employability. Currently a limited number of such safe working methods are now generally available in the Netherlands (Spaan, personal communication 2021).

Existing voluntary industry initiatives, from collected information via the stakeholder consultation and literature search, concern mainly the development of guidelines for good practice for working with asbestos.

Examples of guidelines for management of asbestos in the workplace

Title	Published by (year)
EU level	
A practical guide on best practice to prevent or minimise asbestos risks in work that involves (or may involve) asbestos: for the employer, the workers and the labour inspector.	Issued by the Senior Labour Inspectors Committee (SLIC) for use in the 2006 asbestos campaign undertaken throughout Europe and published by the European Commission (undated)
Practical guidelines for the information and training of workers involved with asbestos removal or maintenance work.	European Commission (2012)

Title	Published by (year)
National authorities or Occupational Health and Safety institutes	
Asbestos-containing materials (ACMs) in workplaces. Practical guidelines on ACM management and abatement	Health and Safety Authority, Ireland (HSA, 2013)
Asbestos risk management guidelines for mines	Finnish Institute of Occupational Health (Kähkönen et al., 2019)
Tätigkeiten mit potenziell asbesthaltigen mineralischen Rohstoffen und daraus hergestellten Gemischen und Erzeugnisse. TRGS 517. [mandatory]	Federal Institute for Occupational Safety and Health, Germany (BAuA, 2015)
Technische Regeln für Gefahrstoffe Asbest: Abbruch-, Sanierungs- oder Instandhaltungsarbeiten. TRGS 519. [mandatory]	Federal Institute for Occupational Safety and Health, Germany (BAuA, 2019)
Instruction DGT/CT2 no 2015/238 du 16 octobre 2015 concernant l'application du décret du 29 juin 2015 relatif aux risques d'exposition à l'amiante [mandatory]	Ministère du Travail, de L'emploi, de la Formation Professionnelle et du Dialogue Social, France MTEFR (2015).
Exposition à l'amiante dans les travaux d'entretien et de maintenance. Guide de prévention.	Institut National de Recherche et de Securité, France (INRS, 2019a)
Situations de travail exposant à l'amiante	Institut National de Recherche et de Securité, France (INRS, 2007)
Para la evaluación y prevención de los riesgos relacionados con la exposición al amianto	Instituto Nacional de Seguridad e Higiene en el Trabajo (INSHT, 2006)
Asbestos. Health and Safety at Workplaces.	Occupational Health and Safety Authority, Malta (OSHA, 2016)
Varno delo zazbestom. [Safe work with asbestos] [mandatory]	Ministrstvo za delo, druûino in socialne zadeve, Urad RS za varnost in zdravje pri delu, Slovenia (Vrečko, 2002)
Arbetsmiljöverkets föreskrifter om asbest och allmänna råd om tillämpningen av föreskrifterna [The Swedish Work Environment Authority's regulations on asbestos and general advice on the application of the regulations] [mandatory]	Arbetsmilöverket, Sweden (Arbetsmiljöverket, 2019)
Asbest. Regler for ethvert arbejde med asbest og herunder reparation, vedligeholdelse og fjernelse af asbestholdige materialer. [Mandatory]	Arbejdstilsynet, Denmark
Ασφάλεια και Υγεία στην Εργασία. Διεθνείς Συμβάσεις [Occupational Safety and Health. Asbestos]	Website of Department of Labour Inspection, Cyprus[148]
Inventaire d'amiante et programme de gestion	Service Public Federal Emploi, Travail et Concertation Sociale, Belgium (SPF Emploi, 2020)
Препоръки за опазване здравето на работещите при експозиция на азбест [Recommendations for protecting the health of	Website of Ministry of Health, National Center of Public Health and Analyses, Bulgaria [149]

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http://www.mlsi.gov.cy/mlsi/dli/dliup.nsf/All/2E24CA4412E799C9C2257DD6003AC247?OpenDocument&highlight=asbestos

Title	Published by (year)
workers by exposure to asbestos]	
Industry stakeholders	
Information modules Asbestos (a list of information modules) Available in Bulgarian, Croatian, Czech, English, French, German, Hungarian, Italian, Latvian Lithuanian, Polish, Romanian, Slovenian, Spanish, and Turkish	European Construction Industry Federation (FIEC) **and** European Federation of Building and Woodworkers (EFBWW **or FETBB), available at the websites of EFBWW and FIEC** [150]
EFBWW Trade Union Guide on using Asbestos Registries	European Federation of Building and Woodworkers (EFBWW, 2018)
Guía sobre amianto. Visión general y proceso de descontaminación (desamiantado)	AEDED - Asociación española de demolición, descontaminación, corte y perforación. Prepared in cooperation with the European Demolition Association (EDA) and a number of national associations (AEDED, 2020)
Asbest. Den grønne asbestvejledning og beskrivelse for udførelse af asbestsanering [Asbestos. The green asbestos guide and description for performing asbestos remediation]	Danish Construction Association (Dansk Byggeri, 2019)
Vejledning om asbest i skibe [Guidelines on asbestos in ships]	The Industry's Work Environment Council, Denmark (I-bar 2010)
Asbesthuset [The asbestos house. interactive guideline] https://asbest-huset.dk/	Social partners within the building and construction sector, Denmark

Source: External study. RPA 2021

[149] https://ncpha.government.bg/uploads/pages/3001/Azbestos-Prot_Workers.pdf
[150] **https://www.fiec.eu/our-projects/completed-projetcs/information-modules-asbestos**

Annex 8: Measurement Method

At present, PCM is not considered a state of the art measurement method for asbestos in the work environment anymore. In addition to its inability to speciate fibre types it cannot detect fibres thinner than about 0.2 µm. Nowadays measurement techniques based on electron microscopy (EM) have been introduced. These methods can detect thinner and shorter fibres than PCM and are also equipped with analysers able to characterise the elemental composition or crystal structure of the fibres.

PCM with a practical limit of quantification (LOQ)[151] at approx. 0.005 - 0.01 fibres/cm^3[152], seems not feasible for monitoring compliance with the OEL options lower than 0.01 fibres/cm^3. Although still possible, it will neither be the ideal method for monitoring compliance for OEL option equal to 0.01 fibres/cm^3[153].

The electronic microscopy methods are, according to the scientific report done by ECHA, intended to be used as a complement of the PCM methods. TEM is a much more sensitive method than PCM as its high resolution allows objects with a diameter smaller than 0.01µm to be observed and fibres with a length exceeding 0.5µm to be counted. The quantitative working range is 0.04 to 0.5 fibres/cm^3 for a 1000 L air sample while the limit of detection (LOD), depending on sample volume and quantity of interfering dust is <0.01 fibres/cm^3 for atmospheres free of interferences. A LOD of 0.001 fibres/cm^3 can be achieved when levels of airborne dust are around 10 µg/m^3 (e.g. clean rural environment), but extremely challenging to achieve in an urban or construction environment[154]. For SEM LOD is estimated at 0.004 fibres/cm^3 for a 2-hour sample at the maximum flow rate.

The French Agency for Environmental and Occupational Health Safety (AFSSET) [155]indicates a LOQ for PCM method equal to 0.01 f/cm^3 and a LOQ equal to 0.0025 f/cm^3 for the TEM methods. It refers yet that The LOQ for SEM is bigger than the one for TEM.

The findings from the external study highlight that likely more than half of the asbestos analysis for compliance control today is undertaken by EM methods. It is also mentioned that some uncertainties regarding the applicability of the methods as applied by commercial laboratories today for compliance control at the options of 0.002 and 0.001 fibres/cm^3 have been raised but that based on the Dutch experience, measuring down to 0.002 fibres/cm^3 is possible by use of scanning electron microscopy with energy dispersive X-ray spectroscopy (SEM/EDXA).

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[151] The limit of quantification is in practice determined by the "background noise" of (non-asbestos) fibrous components that are always present in the air

[152] External study. See footnote 7

[153] For the screening tests, ideally an analytical method with a limit of quantification (LOQ) at 0.1 - 0.2 times the OEL is required; otherwise, it will be necessary to undertake more tests, and the costs of monitoring increase.

[154] Example NFX 43-050: 1996 method (AFNOR, 1996). ECHA/RAC/ A77-O-0000006981-66-01/F 10 June 2021

[155] Asbestos fibres: assessment of the health effects and methods used to measure exposure levels in the workplace. Available at: https://www.anses.fr/en/system/files/VLEP2005et9900RaEN_0.pdf