



## Chapter 4.3 Air Quality

### BACKGROUND

Mine sites can release significant quantities of air contaminants. By volume, the great majority of air contaminants are particulate matter, such as dust from blasting, large truck and equipment traffic, conveyors, and ore crushing. Other air contaminants may represent only a small proportion of a mine's air emissions, but are important because like particulate matter they can significantly affect human health and the environment.

Mines may emit contaminants from diffused activities, such as fugitive dust emitted by blasting or truck traffic, or wind-blown from exposed surfaces such as roads, pits, and waste piles, or from dried surfaces of tailings impoundments. These releases can generally be controlled with reasonably inexpensive measures. However, a mine's typically large geographic footprint makes control especially important and sometimes difficult. The most common method of dust control is spraying water - such as by truck on roads and near blasting activities. Chemical additives, such as magnesium chloride may be added to increase the effectiveness and durability of sprayed water.

Sources of localized air emissions from mining projects include processing facilities for mineral processing, smelting and refining operations, and usually the control mechanisms for these emissions are expensive and complex. The common methods for controlling these emissions include technologies such as bag houses, electrostatic precipitators, wet and dry scrubbers.

### OBJECTIVES/INTENT OF THIS CHAPTER

To protect human health and the environment from airborne contaminants.

### SCOPE OF APPLICATION

**RELEVANCE:** This chapter is relevant to all mining projects that release to air any of the contaminants in [Table 4.3](#), below, or other contaminants that may present a risk to human or ecosystem health. Air emissions may be from stationary or mobile equipment, [mine waste facilities](#), and other [mining-related activities](#) undertaken on the mine site or along transportation routes.

This chapter does not address air contaminants in the workplace. Those issues are addressed in IRMA Chapter 3.2—Occupational Health and Safety. Also, the management of emissions of greenhouse gases and mercury are addressed in Chapters 4.5 and 4.8, respectively.

#### TERMS USED IN THIS CHAPTER

[Affected Community](#) ■ [Air Quality Modeling](#) ■ [Ambient Air Quality](#) ■ [Baseline Air Quality](#) ■ [Best Available Practices](#) ■ [Biodiversity](#) ■ [Conservation Values](#) ■ [Critical Habitat](#) ■ [Ecosystem Services](#) ■ [Existing Mine](#) ■ [Mine Waste Facilities](#) ■ [Mining Project](#) ■ [Mining-Related Activities](#) ■ [New Mine](#) ■ [Operating Company](#) ■ [Priority Ecosystem Services](#) ■ [Protected Areas](#) ■ [Stakeholders](#) ■ [Threatened Species](#) ■

*These terms appear in the text with a dashed underline. For definitions see the [Glossary of Terms](#) at the end of the document.*

# Air Quality Requirements

## 4.3.1. Air Quality Screening and Impact Assessment

4.3.1.1. The operating company shall carry out air quality screening to determine if there may be significant air quality impacts associated with the mining project and its operations.

4.3.1.2. During screening, or as part of a separate data gathering effort, the operating company shall establish the baseline air quality in the mining project area.

4.3.1.3. If screening or other credible information indicates that air emissions from mining-related activities may adversely impact human health, quality of life or the environment, the operating company shall undertake an assessment to predict and evaluate the significance of the potential impacts.

4.3.1.4. The assessment shall include the use of air quality modeling and monitoring consistent with widely accepted and documented methodologies to estimate the concentrations, transport and dispersion of mining-related air contaminants.<sup>224</sup>

## 4.3.2. Air Quality Management Plan

4.3.2.1. If significant potential impacts on air quality are identified, the operating company shall develop, maintain and implement an air quality management plan that documents measures to avoid, and where that is not possible, minimize adverse impacts on air quality.

4.3.2.2. Air quality management strategies and plans shall be implemented and updated as necessary over the mine life.

## 4.3.3. Air Quality Monitoring

4.3.3.1. The operating company shall monitor and document ambient air quality and dust associated with the mining project by using personnel trained in air quality monitoring.

4.3.3.2. Ambient air quality and dust monitoring locations shall be situated around the mine site, related operations and transportation routes and the surrounding environment such that they provide a representative sampling of air quality sufficient to demonstrate compliance or non-compliance with the air quality and dust criteria in 4.3.4.3, and to detect air quality and dust impacts on affected communities and the environment. Where modeling is required (see 4.3.1.4) air monitoring locations shall be informed by the air quality modeling results.

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<sup>224</sup> See, e.g., US EPA's Air Quality Guidelines. Appendix W To Part 51—Guideline On Air Quality Models. Pt. 51, App. W, 40 CFR Ch. I (7–1–03 Edition). Available at: [www3.epa.gov/scram001/guidance/guide/appw\\_03.pdf](http://www3.epa.gov/scram001/guidance/guide/appw_03.pdf) and European Environment Agency. 2011 The Application of Models under the EU Air Quality Directive. [www.eionet.europa.eu/events/EIONET/Technical\\_report\\_3](http://www.eionet.europa.eu/events/EIONET/Technical_report_3)

#### 4.3.4. Protection of Air Quality

4.3.4.1. New mines and existing mines shall comply with the European Union's Air Quality Standards<sup>225</sup> (EU Standards) as amended to their latest form (see Table 4.3, below) at the boundaries of the mine site and transportation routes, and/or mitigate exceedances as follows:

- a. If a mine is located in an airshed where baseline air quality conditions meet EU Standards, but emissions from mining-related activities cause an exceedance of one or more parameters, the operating company shall demonstrate that it is making incremental reductions in those emissions, and within five years demonstrate compliance with the EU Standards; or
- b. If a mine is located in an airshed where baseline air quality is already degraded below EU Standards, the operating company shall demonstrate that emissions from mining-related activities do not exceed EU Standards, and make incremental improvements to the air quality in the airshed that are at least equivalent to the mining project's emissions.



**[flag] 4.3.4 Issues in brief:** There is not consensus among IRMA sectors on adopting as best practice either a prescriptive approach that includes defined air emissions criteria or a risk-based approach to managing air emissions.

During Launch Phase, this requirement will not be scored. Instead, IRMA will be asking mine sites to share information on what air emissions standards, if any, they are being required to meet or are meeting voluntarily, and/or whether or not they are using utilizing a risk-based approach (e.g., 4.3.4.2) to manage their air emissions (either in addition to having to meet air quality criteria, or lieu of having to meet them). The information gathered about what those approaches entail, and the effectiveness of those approaches will help IRMA to design a requirement or requirements that align with best practices for managing air emissions to protect human health and the environment.

Also, while there is agreement among IRMA sectors that measuring dust emissions from mine sites is important, there is not consensus on an appropriate dust emission standard for protecting human health and the environment. The current metric being proposed by IRMA is found in 4.3.4.3. During Launch Phase, this requirement will not be scored. Instead, IRMA will be asking mine sites to share information on what dust emissions standards, if any, mine sites are following.

4.3.4.2. As an alternative to 4.3.4.1, the operating company may undertake a risk-based approach to protecting air quality as follows:

- a. New and existing mines shall comply with host country air quality standards at a minimum, and where no host country standard exists mines shall demonstrate compliance with a credible international best practice standard;<sup>226</sup>

<sup>225</sup> The most recent version of the EU Air Quality Standards can be found at: <http://ec.europa.eu/environment/air/quality/standards.htm>

Note that mercury is not included in the list of air pollutants in Table 4.3. Mercury air emissions are addressed in IRMA Chapter 4.8. Similarly, there are no emissions limits for the following greenhouse gases: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, or nitrogen trifluoride. Greenhouse gas air emissions are addressed in IRMA Chapter 4.5.

<sup>226</sup> For example, EU's Air Quality Standards (See Table 4.3, below) or International Finance Corporation. 2007. Environmental, Health and Safety Guidelines, 1.1 Air Emissions and Ambient Air Quality. <https://www.ifc.org/wps/wcm/connect/532ff4804886583ab4d6f66a6515bb18/1-1%2BAir%2BEmissions%2BAnd%2BAmbient%2BAir%2BQuality.pdf?MOD=AJPERES>

- b. Where compliance is met for host country standards but the mine experiences a residual risk related to its air emissions,<sup>227</sup> then more stringent international best practice standards shall apply;
- c. Where compliance is met for international best practice standards and a mine still experiences a residual risk from its air emissions, then the mine shall set more stringent self-designed limits, and implement additional mitigation measures to meet those limits; and
- d. For all air-emissions-related risks, the mine shall demonstrate that it is making incremental reductions in emissions, through a multi-year phased plan with defined timelines.

4.3.4.3. Dust deposition from mining-related activities shall not exceed 350 mg/m<sup>2</sup>/day, measured as an annual average.<sup>228</sup> An exception to 4.3.4.3 may be made if demonstrating compliance is not reasonably possible through ordinary monitoring methods. In such cases the operating company shall utilize best available practices to minimize dust contamination.

### 4.3.5. Reporting

4.3.5.1. The operating company shall ensure that its air quality management plan and compliance information is up-to-date and publicly available, or made available to stakeholders upon request.<sup>229</sup>

#### NOTES

Air quality standards and requirements were reviewed for various countries, focusing on the most expansive, developed standards. The greatest focus was on the standards of the European Union, Canada, Australia, and United States. With the goal in mind of adopting a standard that would evolve over time the decision was made to adopt the European Union's (EU) numeric air quality standards. There are many developed standards but the EU's stands out for its breadth of contaminants, including some known to be released during mining, and its inclusion of specific metalloids contaminants.<sup>230</sup> Further, like many developed national standards, the EU's air quality standards were developed to be comprehensive, transparent (development, review and modification, application, and interpretation in the courts), and enduring. Finally, the EU's air quality standards are evolving and therefore predicating IRMA's air quality standard on them will ensure that IRMA's air quality standards also evolve.

<sup>227</sup> Residual risk may include, for example, a saturated airshed with elevated background levels of pollution, stakeholder grievances, community unrest, impending regulatory changes, media attention and reputational damage, or potential health impacts or harm to sensitive receptors associated with emissions impacts.

<sup>228</sup> IRMA has added a specific dust criteria because dust is not listed on EU list of contaminants as it is not strictly harmful to health rather it is a "nuisance", and can be problematic communities and ecosystems located near mine sites. This requirement is based on the German TA Luft (Technical Instructions on Air Quality Control) Regulation, available at: [www.bmub.bund.de/fileadmin/bmu-import/files/pdfs/allgemein/application/pdf/taluft\\_engl.pdf](http://www.bmub.bund.de/fileadmin/bmu-import/files/pdfs/allgemein/application/pdf/taluft_engl.pdf). The German dust guidelines have been incorporated here as the minimum requirement, but may require further citation and consideration, notably the potential inclusion of both an annual and a monthly mean. More information will be provided in IRMA Guidance.

<sup>229</sup> Compliance information may include air quality monitoring data, air quality reports (to agencies), records related to non-compliance (as per Chapter 1.1) etc.

<sup>230</sup> The US EPA's Air Quality Standards are similar in many ways, however the EU includes contaminants not found in the US standards that may be released by mining and mining-related activities, such as arsenic, cadmium, and nickel.

CROSS REFERENCES TO OTHER CHAPTERS	
CHAPTER	ISSUES
1.1—Legal Compliance	As per Chapter 1.1, if there are <u>host country laws</u> governing air quality related to mine sites, the company is required to abide by those laws. If IRMA requirements are more stringent than <u>host country law</u> , the company is required to also meet the IRMA requirements, as long as complying with them would not require the operating company to violate the <u>host country law</u> .
2.1—Environmental and Social Impact Assessment and Management	Potential air quality impacts may be identified in the Environmental and Social Impact Assessment (ESIA). The ESIA may also contain information and data that can inform the location of air monitoring sites.  Air quality issues may be addressed as part of the Environmental Management System, such as a site monitoring plan.
1.4—Complaints and Grievance Mechanism and Access to Remedy	Air quality impacts not anticipated in the ESIA or not adequately <u>mitigated</u> may result in complaints by <u>stakeholders</u> . As per Chapter 1.4, the <u>operating company</u> is required to have an operational-level <u>grievance mechanism</u> available to <u>stakeholders</u> , including procedures for filing complaints, and having complaints recorded, investigated and resolved in a timely manner.
3.2—Occupational Health and Safety	Chapter 3.2 addresses air contaminants in the workplace.
4.5—Greenhouse Gas Emissions	Greenhouse gas air emissions are addressed in Chapter 4.5. As per 4.5.2, companies are required to quantify greenhouse gas emissions, and 4.5.4 requires public reporting on those emissions.
4.6—Biodiversity, Ecosystem Services and Protected Areas	If screening in 4.3.1 indicates that air emissions may result in significant impacts to <u>important biodiversity, priority ecosystem services, critical habitat (including threatened species)</u> or the <u>conservation values of protected areas</u> , then the significance of impacts should be further assessed and <u>mitigation</u> measures developed as per Chapter 4.6.
4.8—Mercury Management	Mercury air emissions are addressed in Chapter 4.8. As per 4.8.1, companies are required to estimate the amount of mercury released to air from <u>mercury emission control systems</u> . Although there are no mercury air criteria in either Chapter 4.3 or 4.8, Chapter 4.8 does provide emissions limits for mercury that, if met, means that no further mitigative actions need to be taken (see 4.8.2.1).c.  Criteria 4.8.3 includes requirements related to mercury air emission monitoring, including the development of a mercury air monitoring plan. Mercury air emissions could be incorporated into an air quality monitoring plan that covers all a broader suite of air emissions as per 4.3.3.1. Criteria 4.8.4 requires public reporting on mercury emissions.

**TABLE 4.3. – European Union (EU) Numeric Air Quality Standards.<sup>1</sup>**

Pollutant	Concentration	Averaging period	Permitted exceedances / year
Sulphur dioxide (SO <sub>2</sub> )	350 µg/m <sup>3</sup>	1 hour	24
	125 µg/m <sup>3</sup>	24 hours	3
Nitrogen dioxide (NO <sub>2</sub> )	200 µg/m <sup>3</sup>	1 hour	18
	40 µg/m <sup>3</sup>	1 year	not applicable
Fine particles (PM-2.5)	25 µg/m <sup>3</sup>	1 year	not applicable
PM-10	50 µg/m <sup>3</sup>	24 hours	35
	40 µg/m <sup>3</sup>	1 year	not applicable
Lead (Pb)	0.5 µg/m <sup>3</sup>	1 year	not applicable
Carbon monoxide (CO)	10 mg/m <sup>3</sup>	Maximum daily 8-hour mean	not applicable
Benzene	5 µg/m <sup>3</sup>	1 year	not applicable
Ozone	120 µg/m <sup>3</sup>	Maximum daily 8-hour mean	25 days averaged over 3 years
Arsenic (As)	6 ng/m <sup>3</sup>	1 year	not applicable
Cadmium (Cd)	5 ng/m <sup>3</sup>	1 year	not applicable
Nickel (Ni)	20 ng/ m <sup>3</sup>	1 year	not applicable
Polycyclic Aromatic Hydrocarbons	1 ng/m <sup>3</sup> (as concentration of Benzo(a)pyrene)	1 year	not applicable
<b>Notes:</b> EU. Air Quality Standards (as of July 3, 2013). <a href="http://ec.europa.eu/environment/air/quality/standards.htm">http://ec.europa.eu/environment/air/quality/standards.htm</a>			