Initiative for Responsible Mining Assurance

# Excerpt from the DRAFT Standard for Responsible Mining and Mineral Processing 2.0

## Chapter 4.3 – Air Quality

## Context & Disclaimer on IRMA DRAFT Standard 2.0

IRMA DRAFT Standard for Responsible Mining and Minerals Processing 2.0 is being released for public consultation, inviting the world to join in a conversation around expectations that drive value for greater environmental and social responsibility in mining and mineral processing.

This draft document invites a global conversation to improve and update the 2018 IRMA Standard for Responsible Mining Version 1.0. It is not a finished document, nor seeking final review, but rather is structured to invite a full range of questions, comments and recommendations to improve the IRMA Standard.

This IRMA DRAFT Standard for Responsible Mining and Minerals Processing (v.2.0) has been prepared and updated by the IRMA Secretariat based on learnings from the implementation of the Standard (v.1.0), experience from the first mines independently audited, evolving expectations for best practices in mining to reduce harm, comments and recommendations received from stakeholders and Indigenous rights holders, and the input of subject-specific expert Working Groups convened by IRMA in 2022.

IRMA's Standard has a global reputation for comprehensive in-depth coverage addressing the range of impacts, as well as opportunities for improved benefit sharing, associated with industrial scale mining. This consultation draft proposes a number of new requirements; some may wonder whether IRMA's Standard already includes too many requirements. The proposed additions are suggested for a range of reasons (explained in the text following), including improving auditability by separating multiple expectations that were previously bundled into a single requirement, addressing issues that previously weren't sufficiently covered (e.g. gender, greenhouse gas emissions), and providing more opportunities for mining companies to receive recognition for efforts to improve social and environmental protection.

Please note, expert Working Groups were created to catalyze suggestions for solutions on issues we knew most needed attention in this update process. They were not tasked to come to consensus nor make formal recommendations. Their expertise has made this consultation document wiser and more focused, but work still lies ahead to resolve challenging issues. We encourage all readers to share perspectives to improve how the IRMA system can serve as a tool to promote greater environmental and social responsibility, and create value for improved practices, where mining and minerals processing happens.

The DRAFT Standard 2.0 is thus shared in its current form to begin to catalyze global conversation and stakeholder input. It does not represent content that has been endorsed by IRMA's multistakeholder Board of Directors. IRMA's Board leaders seek the wisdom and guidance of all readers to answer the questions in this document and inform this opportunity to improve the IRMA Standard for Responsible Mining.

IRMA is dedicated to a participatory process including public consultation with a wide range of affected people globally and seeks feedback, comments, questions, and recommendations for improvement of this Standard. IRMA believes that diverse participation and input is a crucial and determining factor in the effectiveness of a Standard that is used to improve environmental and social performance in a sector. To this end, every submission received will be reviewed and considered.

The DRAFT Standard 2.0 is based on content already in practice in the IRMA Standard for Responsible Mining Version 1.0 (2018) for mines in production, combined with the content drafted in the IRMA Standard for Responsible Mineral Development and Exploration (the 'IRMA-Ready' Standard – Draft v1.0 December 2021) and in the IRMA Standard for Responsible Minerals Processing (Draft v1.0 June 2021).

# Chapter Structure

## BACKGROUND

Each chapter has a short introduction to the issue covered in the chapter, which may include an explanation of why the issue is important, a description of key issues of concern, and the identification of key aspects of recognized or emerging best practice that the standard aims to reflect.

**TERMS USED IN THIS CHAPTER**

This is a list of the terms used in the chapter ■ Each term is separated with ■

*Terms listed here are identified in the chapter with a dashed underline. And they are defined in the Glossary of Terms at the end of the chapter.*

## OBJECTIVES/INTENT STATEMENT

A description of the key objectives that the chapter is intended to contribute to or meet.

## SCOPE OF APPLICATION

A description of the conditions under which the chapter may or may not be relevant for particular mines or mineral processing sites. If the entity can provide evidence that a chapter is not relevant, that chapter will not need to be included in the scope of the IRMA assessment. A requirement is 'not relevant' if the issue to which a requirement relates is not applicable at the site. For example, requirements related to the use of cyanide would not be relevant at a site at which cyanide is never used.

## Chapter Requirements

### X.X.X. These are criteria headings

X.X.X.X. And these are the requirements that must be met for an IRMA assessment to be issued and subsequently maintained by a site. Most criteria have more than one requirement. All requirements must be met in order to comply fully with the criterion.

a. Some requirements consist of hierarchical elements:
    i. At more than one level.
    ii. Operations may be required to meet all elements in a list, or one or more of the elements of such a list, as specified.

## NOTES

Any additional notes related to the chapter and its requirements are explained here.

## GLOSSARY OF TERMS USED IN THIS CHAPTER

Terms used in the chapter are defined here.

## ANNEXES AND TABLES

Annexes or Tables are found here.

### IRMA Critical Requirements

The 2018 IRMA Standard for Responsible Mining v. 1.0 includes a set of requirements identified as being critical requirements. Operations being audited in the IRMA system must at least substantially meet these critical requirements in order to be recognized as achieving the achievement level of IRMA 50 and higher, and any critical requirements not fully met would need to have a corrective action plan in place describing how the requirement will be fully met within specified time frames.

The 2023 updates to the 2018 Standard may edit some critical requirements in the process of revising and therefore there will be a further review specific to the language and implications of critical requirements that follows the overall Standard review.

# Associated Documents

**This document is an extract of the full DRAFT IRMA FOR RESPONSIBLE MINING AND MINERAL PROCESSING (Version 2.0) – DRAFT VERSION 1.0, released in October 2023 for a public-comment period. The English-language full version should be taken as the definitive version. IRMA reserves the right to publish corrigenda on its web page, and readers of this document should consult the corresponding web page for corrections or clarifications.**

Readers should note that in addition to the DRAFT Standard, there are additional policies and guidance materials maintained in other IRMA documents, such as IRMA's Principles of Engagement and Membership Principles, IRMA Guidance Documents for the Standard or specific chapters in the Standard, IRMA Claims and Communications Policy and other resources. These can be found on the IRMA website in the Resources section. Learn more at responsiblemining.net

# Comment on the IRMA Standard

> Comments on the IRMA Standard and system are always welcome.
>
> They may be emailed to IRMA at: comments@responsiblemining.net

Additional information about IRMA is available on our website: responsiblemining.net

# Chapter 4.3
# Air Quality

NOTES ON THIS CHAPTER: We are proposing to remove the flag from this chapter. There were three requirements that were being tested in the first audits, and there was no indication from those first audits that the flagged requirements were problematic. As a result, we are proposing that the requirements be incorporated into this chapter (See criterion 4.3.6).

**Proposed additions and changes:**

- The two most significant proposed changes in this chapter are to require the characterization of air emission sources, which was not required in the 2018 Mining Standard, and also add requirements for the operation of air emissions control equipment, and actions to take in the event of an emergency situation that causes an unintended release of air emissions.
- Moved some air-related requirements from Chapter 4.8 – 'Mercury Management,' as the elements from that chapter are being incorporated into other relevant chapters (see note for requirement 4.3.5.3).
- Reporting requirements have been updated to be more consistent with other IRMA chapters (see criterion 4.3.7).
- A correction to the Air Quality Table (Table 4.3).

**Glossary:**

- We are proposing other new/revised definitions for several glossary terms. The 'Terms Used In This Chapter' box shows which terms are new, and the proposed definitions can be found in the glossary at the end of the chapter requirements (and before the Annexes). Feedback on definitions is welcome.

## BACKGROUND

Mine and mineral processing sites can release significant quantities of air contaminants such as gases, fumes, vapors, and dust. By volume, the great majority of air contaminants from mine sites is in the form of particulate matter, such as dust from blasting, conveyors, and ore crushing. Mineral processing facilities, which often use high temperature processes, may also generate large volumes of gaseous emissions, including fine particulates that can carry metals and metalloids. Particulate matter and other emissions such as organic pollutants and sulfur can adversely affect human health and the environment.

Mines and processing sites may emit contaminants from diffuse sources, such as fugitive dust emitted by blasting or truck traffic, or wind-blown dust from exposed surfaces such as roads, pits, and waste piles, and the 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 dust suppression on mine roads.

**TERMS USED IN THIS CHAPTER**

Affected Community ■ Air Quality Modeling ■ Ambient Air Quality ■ Associated Facility ■ Baseline Air Quality ■ Best Available/Applicable Practices (BAP) ■ Best Available techniques (BAT) ■ Best Environmental Practices (BEP) ■ Competent Professionals ■ Contaminants of Potential Concern (COPC) NEW ■ Contamination NEW ■ Credible Methodology NEW ■ Cultural Heritage NEW ■ Ecosystem ■ Entity NEW ■ Exploration NEW ■ Heap Leach ■ Mercury Emission Control System ■ Mine Waste Facilities ■ Mineral Processing NEW ■ Mining NEW ■ Mining-Related Activities ■ Mitigation ■ Operation NEW ■ Pollution NEW ■ Project NEW ■ Receptor NEW ■ Root Cause Analysis NEW ■ Scoping NEW ■ Stakeholders ■ Tailings ■ Vulnerable Groups ■ Waste Rock ■

*These terms appear in the text with a dashed underline. For definitions see the Glossary of Terms at the end of the chapter.*

Mineral processing, smelting and refining operations can produce more localized air emissions from include units that involve pyrometallurgical, hydrometallurgical and electrometallurgical processes. The range of contaminants contained in off-gases and other emissions depend on the commodity be processed, impurities present in the feed, and mineral processing method employed. Off-gases and other emissions may be generated in an enclosed environment (where capture for subsequent treatment is less challenging) or in an open environment (where capture may be difficult or incomplete). The control mechanisms for emissions are often expensive and technically complex. The common methods for controlling these emissions include technologies such as acid plants (specifically for the capture of sulfur dioxide), bag houses, electrostatic precipitators, and 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 applicable to all exploration, mining and mineral processing projects and operations.

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 is addressed in Chapter 4.5.

> NOTE ON SCOPE OF APPLICATION: This proposed version of the IRMA Standard is meant to apply to exploration, mining, and mineral processing projects and operations (see definitions of project and operation), but not all requirements will be relevant in all cases. We have provided some high-level information below, but the IRMA Secretariat will produce a detailed Scope of Application for each chapter that will indicate relevancy on a requirement-by-requirement basis (and will provide some normative language where the expectations may slightly differ for proposed projects versus operations, or for mining versus mineral processing, etc.).

### CRITICAL REQUIREMENTS IN THIS CHAPTER

When significant potential impacts on air quality are identified, measures to avoid and minimize adverse impacts on air quality are developed, implemented and documented in an air quality management plan (4.3.4.1)

> NOTE ON CRITICAL REQUIREMENTS: The 2018 IRMA Standard includes a set of requirements identified as being critical. Projects/operations being audited in the IRMA system must at least substantially meet all critical requirements in order to be recognized at the achievement level of IRMA 50 and higher, and any critical requirements not fully met need a corrective action plan for meeting them within specified time frames.
>
> INPUT WELCOME: The proposed revisions to the 2018 Standard have led to new content, as well as edits of some critical requirements in the process. Therefore, there will be a further review of the language and implications of critical requirements prior to the release of a final v.2.0 of the IRMA Standard. During this consultation period we welcome input on any existing critical requirement, as well as suggestions for others you think should be deemed critical. A rationale for any suggested changes or additions would be appreciated.

# Air Quality Requirements

## 4.3.1. Scoping and Characterizing Sources of Air Emissions

NOTE FOR 4.3.1: REVISED. The name of this criterion has changed from "Air Quality Screening and Impact Assessment" to its current proposed wording. Assessment is now covered in 4.3.3.

We are proposing to use the word scoping instead of screening throughout the IRMA Standard. These terms mean slightly different things in different jurisdictions. For IRMA's purposes, we are proposing the following definition of scoping, however, if this term is confusing, we are open to reverting to screening, or adopting another term altogether:

**Scoping**

A process of determining potential issues and impacts and producing information necessary to inform decision-making regarding whether additional evaluation and actions are necessary.

Three NEW requirements, 4.3.1.1, 4.3.1.2 and 4.3.1.3, have been added to fill a gap in the 2018 Mining Standard, and to be more consistent with other IRMA chapters.

The identification of all project/operation-related sources of air emissions is key to understanding what contaminants may be released to the environment. Without credible information on sources and potential contaminants, it is not possible to have confidence that all potential emissions and contaminants are being monitored and adequately controlled.

CONSULTATION QUESTION 4.3-1: Do you agree with the two requirements proposed below? Would you add any potential sources or categories of contaminants of potential concern?

4.3.1.1. The entity identifies all potential sources of air emissions (including fugitive emissions) from the project/operation and associated facilities, including, as relevant:[1]

a. Mining, ore handling and transportation, grinding, crushing;
b. Beneficiation and mineral processing, including thermal treatments;
c. Mobile equipment;
d. Stationary equipment;
e. Power plants, and, if relevant, fuel (e.g., coal, diesel, etc.) handling and transportation;
f. Water treatment plants;
g. Waste handling, treatment, and disposal; and
h. Roads.

4.3.1.2. For each air emission source, the entity identifies the contaminants of potential concern (COPCs), including: [2]

a. Particulate matter ($PM_{10}$, $PM_{2.5}$)
b. Sulfur dioxide (e.g., from sulfur in fuels and feed materials or from thermal treatment of sulfide ores);
c. Nitrogen oxides (NO and $NO_2$);
d. Carbon monoxide;
e. Ozone;
f. Polycyclic Aromatic Hydrocarbons (PAH);
g. Volatile organic compounds (including benzene);
h. Acids;
i. Persistent organic pollutants;[3] and
j. Metals and metalloids.[4]

[1] This should have been done during ESIA for proposed projects. If not, then it needs to be done for operations.

[2] For mineral processing operations, COPCs for mineral processing feeds should have been done during the characterization of for potential hazardous constituents in Chapter 4.1, requirements 4.1.1.2 and 4.1.1.3. For example, those characterizations should have revealed the presence of constituents such as sulfur, metals, and metalloids, etc. that could be emitted to air.

[3] Persistent organic pollutants include, for example, polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxin, and dibenzofuran (PCDD/F), polychlorinated naphthalenes, and others. These may be by-products from industrial processes or combustion, including smelting (e.g., see: Yang et al. 2020. "Concentrations and profiles of persistent organic pollutants unintentionally produced by secondary nonferrous metal smelters," Chemosphere. 255:126958. https://www.sciencedirect.com/science/article/abs/pii/S0045653520311516)

[4] Mining operations are notable with respect to the quantity of particulates generated, the global extent of the area impacted, and the toxicity of contaminants associated with metal and metalloid emissions. See, e.g., the following study (with case studies that focus on smelters and emissions of Pb, Zn, As, Hg, Cu, Cd, Se, and other metals and metalloids and their health and environmental impacts): Csavina et al., 2012. A

**NOTE FOR 4.3.1.2:** NEW. The list of categories to be identified include the parameters in Table 4.3, which is IRMA's air quality standards table (i.e., particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, ozone, benzene, and PAHs, as well as the metals/metalloids lead, nickel, cadmium, and arsenic).

Table 4.3 is based on EU standards developed to protect human health. However, we have added a general category of metals and metalloids, as well as volatile organic compounds and persistent organic pollutants, with the assumption that air emissions of metals other than lead, nickel, cadmium and arsenic, and the organic contaminants are also important to identify, as these may have toxic effects on other living organisms (plants, animals, fungi). For example, elements such as boron, copper, iron, molybdenum and zinc, while essential for plant growth become toxic when certain thresholds are exceeded.

Air emissions can affect plant, animals and fungi both by existing in high concentrations in ambient air, but also through deposition of contaminants into or on to water, soil or vegetation, where they can affect the growth of plants or aquatic organisms and also accumulate in plants and animals, and thus be introduced into the food chain of humans and other animal species, resulting in adverse impacts on health.[5] Contaminants may also be deposited in areas used by people for recreation, or growing or harvesting food, and pollutants may be carried into living and working spaces.[6]

The characterization of COPCs should have happened during the identification of chemicals and materials with potentially hazardous properties in Chapter 4.1. It is unclear, however, whether mineral processing operations typically carry out a comprehensive evaluation of all of the metals/metalloids or other potential air contaminants in the feed materials. Please see CONSULTATION QUESTION 4.1-3 in Chapter 4.1 if you have expertise on that subject.

4.3.1.3. The entity identifies potential receptors and potential values that may be affected by air contaminants, including but not limited to:

a. Individuals, communities, soils, water bodies, or cultural heritage that may be affected by emissions, deposition or dispersion of the identified COPCs;
b. Vulnerable groups within nearby affected communities or vulnerable individuals in nearby residences who may be particularly sensitive receptors of the identified COPCs;[7]
c. Plants, animals, or fungi with known sensitivity to the identified COPCs;
d. Areas with scenic values that may be affected by haze; and
e. Receptors that may be affected by dust or odors.

**NOTE FOR 4.3.1.3:** NEW. The list of categories to be identified include the parameters in IRMA's air quality standards table (i.e., particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, ozone, benzene, and PAHs, as well as the metals/metalloids lead, nickel, cadmium and arsenic).

review on the importance of metals and metalloids in atmospheric dust and aerosol from mining operations. Science of the Total Environment 433, 58-73. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3418464/

[5] Edelstein, M. and Ben-Hur, M. 2018. "Heavy metals and metalloids: Sources, risks and strategies to reduce their accumulation in horticultural crops," Scientia Horticulturae. Vol 234, pp. 431-444. https://www.sciencedirect.com/science/article/abs/pii/S0304423817307628

[6] For example, see "Health and Environment" information on the Colorado Smelter, Pueblo, Colorado Superfund Site. https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.Healthenv&id=0802700

[7] What may constitute a 'vulnerable group' requiring additional focus depends on the context and the matter at hand. Entities should draw on stakeholder mapping, stakeholder interviews, project documentation, as well as site observations to determine whether all relevant stakeholders have been identified and included. For this requirement, those who may be vulnerable to air pollution include children, elderly, people with respiratory conditions like asthma, and others who may be a heightened risk due to exposure to air pollution.

4.3.1.4. Competent professionals carry out a scoping or similar process to identify significant sources of air emissions, including:

a. Documenting the particular contaminants and using credible methods to estimate emissions from each source (e.g., facilities, activities, processes), based on proposed or actual operational characteristics; and

b. Documenting the rationale for why certain facilities, activities or processes are considered to be minor or insignificant sources of emissions of air contaminants.

NOTE FOR 4.3.1.4: MINOR CHANGE. This was 4.3.1.1 in the 2018 Mining Standard. It provides greater clarity on the scoping process (in the 2018 standard this was called 'screening,' but as in the note for 4.3.1, above, we are proposing to use more consistent language throughout the IRMA Standard), including the need to estimate emissions and to provide a rationale for why certain sources are deemed 'insignificant.' IRMA guidance includes more information on methods that can be used to estimate emissions.[8]

### 4.3.2. Baseline Air Quality

NOTE FOR 4.3.2: NEW. This is a new criterion heading. It has been added to be more consistent with other IRMA chapters. The requirement in this criterion is not new.

4.3.2.1. Competent professionals establish the baseline air quality in project/operation area using credible methods to determine the ambient concentrations of all contaminants of potential concern (COPCs).[9]

NOTE FOR 4.3.2.1: MINOR CHANGE. This was 4.3.1.2 in the 2018 Mining Standard. We added that competent professionals be responsible for establishing the baseline, using credible methods. This is consistent with other IRMA chapters.

This requirement also applies to existing operations. As in IRMA Guidance, if baseline data were not collected early in the development process the entity will be expected to carry out a study to estimate baseline.[10]

### 4.3.3. Assessment of Risks to Air Quality

NOTE FOR 4.3.3: NEW. This is a new criterion heading. Previously, this impact assessment requirements were included in criterion 4.3.1 in the 2018 Mining Standard (4.3.1 'Screening and Impact Assessment'). See note for 4.3.1, also.

4.3.3.1. If scoping or other credible information indicates that air emissions from mining-related activities may adversely impact human health, quality of life or the environment, a credible methodology is used to assess and document air quality risks associated with the project/operation. The assessment includes:

a. The use of air quality modeling and monitoring consistent with widely accepted and documented methodologies to estimate the concentrations, transport, and dispersion of air contaminants, including:[11]

   i. Estimation of potential emissions on a contaminant-by-contaminant basis, and under various operational scenarios including maximum emissions during maximum production levels; and

[8] IRMA Standard for Responsible Mining 1.0, Guidance Document (v.1.2). p. 550. Available at: https://responsiblemining.net/resources/#full-documentation-and-guidance

[9] This is to establish the pre-project air quality conditions, and/or any existing air contaminants that are unrelated to the project/operation.

[10] IRMA Standard for Responsible Mining 1.0, Guidance Document (v.1.2). p. 551. Available at: https://responsiblemining.net/resources/#full-documentation-and-guidance

See also: DiGiovanni, F. and Coutinho, M. 2017. Guiding Principles for Air Quality Assessment Components of Environmental Impact Assessments. pp. 8 and 9. https://www.iaia.org/downloads/Guiding%20Principles%20for%20Air%20Quality_2_1.pdf

[11] 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: https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-51/appendix-Appendix%20W%20to%20Part%2051

and European Environment Agency. 2011 The Application of Models under the EU Air Quality Directive. https://www.eea.europa.eu/publications/fairmode

ii. Estimation of potential emissions at potentially sensitive receptors (e.g., residences, water bodies, ecosystems) under the worst-case dispersion conditions.

b. Conducting an assessment to predict and evaluate the significance of the potential impacts.

NOTE FOR 4.3.3.1: REVISED. This combines 4.3.1.3 (assessment) and 4.3.1.4 (modeling) in the 2018 Mining Standard, as modeling will inevitably be used to inform the risk/impact assessment.

Sub-requirements 4.3.1.3.a.i and 4.3.1.3.a.ii are NEW. They come from guidance developed by the International Association of Impact Assessment.[12]

4.3.3.2. The assessment is updated if there are proposed changes to mining-related activities that will result in new sources or changes in the volume of emissions, or if there are changes in in the operational or social context that may change the probability or severity of impacts of (e.g., a new school is constructed downwind of the site).

NOTE FOR 4.3.3.2: NEW. This is similar to expectations in other chapters where risk assessments need to be updated.

4.3.3.3. Any models used to inform risk assessments are:

a. Consistent with credible methodologies; and

b. Evaluated annually and updated, as necessary, through an iterative process using operational monitoring data, as they become available.[13]

NOTE FOR 4.33.3: This aligns with 4.2.4.4 in the Water Management chapter.

### 4.3.4. Air Quality Management

NOTE FOR 4.3.4. This has been changed from 'Air Quality Management Plan' to Air Quality Management, as some of the elements contained below are management actions that are not directly related to the plan itself.

4.3.4.1. (Critical Requirement)
If significant potential impacts on air quality are identified, an air quality management plan is in place and implemented that:

a. Is developed by competent professionals;

b. Outlines the mitigation measures to avoid and, where that is not possible, minimize adverse impacts on human health and the environment (including impacts to land, soil, water, and vegetation). The measures in the plan are specific, measurable, linked to clearly defined outcomes, relevant, and time-bound;

c. Identifies key indicators, linked to adequate baseline data, to enable measurement of the effectiveness of mitigation activities over time;

d. Assigns implementation of actions, or oversight of implementation, to responsible staff;[14]

e. Includes an implementation schedule; and

f. Includes estimates of human resources and budget required and a financing plan to ensure that funding is available for the effective implementation of the plan.

[12] DiGiovanni, F. and Coutinho, M. 2017. Guiding Principles for Air Quality Assessment Components of Environmental Impact Assessments. pp. 8 and 9. https://www.iaia.org/downloads/Guiding%20Principles%20for%20Air%20Quality_2_1.pdf

[13] This process includes comparing the predicted model results with actual monitoring data and set parameters for what constitutes acceptable versus unacceptable deviations between modeled and actual results. When predicted and actual results do not agree, models should be revised and predictions updated to ensure that water management practices are based on the best possible data.

[14] If work is carried out by third party contractors, then there needs to be a staff employee responsible for overseeing the quality of work, timelines, etc.

**NOTE FOR 4.3.4.1:** REVISED. This was 4.3.2.1 in the 2018 Mining Standard. It has been revised to include the elements of a management plan that are outlined in other IRMA chapters, so that there is consistency in these plans across all chapters.

4.3.4.2. In the event of an unwanted event that causes a loss of normal operation in air pollution control equipment:

a. All reasonable and safe corrective actions are taken to minimize air emissions, and the actions are documented;

b. Ambient air quality and dust sampling is carried out if there are uncontrolled emissions, and any exceedance of a pollution limit in Table 4.3 or host country air quality regulations is recorded;

c. A documented root cause analysis is carried out to determine the cause (e.g., improperly designed equipment, lack of preventative maintenance, careless or improper operation, operator error, etc.) of the unwanted event; and

d. The air quality management plan is updated with actions to prevent a similar occurrence.

**NOTE FOR 4.3.4.2:** NEW. This proposed requirement will be applicable to all operations that utilize a process that has air emissions control equipment. Some of proposed material in this requirement was drawn from the U.S. National Emission Standards for Hazardous Air Pollutants for Source Categories.[15]

4.3.4.3. If mercury is detected in ore, concentrate, or mining facilities (e.g., tailings, heap leaches, waste rock), as determined in 4.3.1.2.i, then mercury emissions are managed as follows:

a. Best available techniques (BAT) and best environmental practices (BEP) are implemented at mineral processing or smelting facilities that use thermal processes,[16] unless the entity demonstrates that air emissions (gaseous and dust) from the facility are unlikely to pose a significant risk to human health or the environment;[17] and

b. Fugitive gaseous and dust emissions associated with crushing, grinding, handling, and transporting of ore, concentrate and/or disposal of waste materials containing mercury are controlled using BAT and BEP unless the entity demonstrates that fugitive emissions (gaseous and dust) from certain sources are unlikely to pose a significant risk to human health or the environment.

**NOTE FOR 4.3.4.3:** MOVED from Chapter 4.8. This was requirement 4.8.2.1 in Chapter 4.8 – 'Mercury Management' in the 2018 Mining Standard. We are proposing to delete chapter 4.8 and integrate the requirements into other relevant chapters so that auditors with specialty in water, air, soils, etc., are able to evaluate the requirements alongside other water, air and soil requirements (since the documentation being reviewed in those chapters should also contain mercury-related information, if they are relevant to the project/operation), rather than having a single auditor cross the different areas of expertise.

4.3.4.3.b is NEW. These potential sources of mercury-related air emissions are increasingly being addressed in impact assessments and should be managed if they represent significant air emissions.[18]

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[15] US Code of Federal Regulations. Title 40. Chapter I, Subchapter C, Part 63, "Primary Copper Smelting Area Sources." https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-63/subpart-EEEEEE

[16] For example, an autoclave, roaster, carbon kiln, refining furnace, or other thermal processes.

[17] While many air emissions of many metals can be controlled using technologies that control emissions of particulate matter, some metals, like mercury, remain a vapor at ambient temperatures, and can pass through some control equipment. So alternative control techniques and technologies must be used. (Source: IFC. 2007. Environmental, Health, and Safety Guidance. Base Metal Smelting and Refining. pp. 3, 4. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/605891489653831342/environmental-health-and-safety-guidelines-base-metal-smelting-and-refining)

[18] For example, see: Ramboll US Consulting, Inc. 2021. Draft Report: Donlin Gold Mine Supplemental Mercury Modeling and Mass Balance Analysis. Available at: https://dec.alaska.gov/water/wastewater/donlin-gold-mine-certification-remand-decsion/

Barr. 2012. Mercury Emission Control Technology Review for NorthMet Project Processing Plant. https://www.leg.mn.gov/docs/2015/other/150681/PFEISref_1/Barr%202012k.pdf

4.3.4.4. Annually or more frequently, if necessary (e.g., due to proposed or actual changes in operational or environmental factors):

a. The entity reviews air quality monitoring data and evaluates the effectiveness of measures to minimize air quality impacts; and

b. If actions are not being effective, develops new mitigation measures and revises the air quality management plan.

NOTE FOR 4.3.4.4: REVISED. This was 4.3.2.1 and 4.3.2.2 in the 2018 Mining Standard. It has been revised to require annual review of monitoring data and updating of plans if necessary. This is consistent with other IRMA chapters.

### 4.3.5. Air Quality Monitoring and Inspections

4.3.5.1. Competent professionals monitor and document ambient air quality and dust from the project/operation.

NOTE FOR 4.3.5.1: REVISED. This was 4.3.3.1 in the 2018 Mining Standard. We are proposing to change the language from "personnel trained in air quality monitoring" to "competent professionals," which is a defined term, and is more consistent with other IRMA chapters.

4.3.5.2. Ambient air quality and dust monitoring locations are:

a. Situated around the site, associated facilities (if there are any emissions sources), transportation routes and the surrounding environment such that they provide a representative sampling of air quality sufficient to detect air quality and dust impacts on affected communities and the environment; and

b. Informed by the air quality modeling results (see 4.3.3.1).

NOTE FOR 4.3.5.2: This was 4.3.3.2 in the 2018 Mining Standard. We separated the information into two sub-requirements to make it clear that both elements should be evaluated during audits.

4.3.5.3. If mercury will be or is released to air (as gaseous emissions or dust), the entity:

a. Includes mercury in the ambient air monitoring (as per 4.3.5.3);

b. Monitors and documents:[19]

   i. Direct releases of mercury to the atmosphere from ore treatment and/or mineral processing or smelting facilities that use thermal processes;[20]

   ii. Fugitive emissions (to the extent technologically and economically feasible with air monitoring equipment), or provides best estimates for these emissions; and

   iii. The amount of mercury recovered or captured as by-product in mercury emission control systems;

c. Monitors and documents the concentration of mercury in soils, water, sediment, and biota downwind of the emissions sources (as part of the soil quality monitoring program in proposed Chapter 4.XX, and water monitoring program in Chapter 4.2);[21] and

d. Consults with affected communities to develop and implement a plan to monitor mercury levels in community members (e.g., in blood or hair) and in any significant food sources that may be affected by the emissions.

[19] The information from monitoring feeds into the mercury mass balance in Chapter 4.1 (see requirement 4.1.6.2.a).

[20] This could be carried out through continuous monitoring or measured at least annually if using sorbent trap systems, or. See, e.g., Envirotech. 2022. Mercury sorbent trap sampling for compliance in the U.S. https://www.envirotech-online.com/article/air-monitoring/6/ohio-lumex/mercury-sorbent-trap-sampling-for-compliance-in-the-us/3153

[21] The entity would need to sample for mercury (total and dissolved) and methyl mercury and sulfate in wetlands and water bodies located on or downwind of the mine site and carry out environmental sampling (e.g., fish tissue and sediment mercury levels) in locations that are most likely to promote mercury methylation, such as still waters, wetlands, and anaerobic sediment. This would be incorporated into the water sampling and analysis plan (see 4.2.5.1.a.iv, and the accompanying footnote).

NOTE FOR 4.3.5.3: MOVED from Chapter 4.8. This requirement incorporates material from 4.8.3.2 and 4.8.3.3 in Chapter 4.8 – 'Mercury Management' in the 2018 Mining Standard. As mentioned in the Note for 4.3.4.3, we are proposing to delete chapter 4.8 on Mercury Management and integrate the requirements into other relevant chapters.

4.3.5.5.b.ii includes monitoring of fugitive emissions. When mercury is known to be present in ores and waste rock, mercury-related fugitive air emissions are increasingly being addressed in impact assessments. If these sources represent potentially significant emissions of mercury, they need to be monitored (or estimated).[22]

4.3.5.4. Air pollution control equipment is inspected on a regular basis by competent professionals to verify that the equipment was installed and is being maintained in accordance with vendor instructions and is operating as expected. Inspection dates and observations are recorded and maintained by the entity.

NOTE FOR 4.3.5.4: NEW. This proposed new requirement will be applicable to all operations that utilize a process that has air emissions control equipment. It is being proposed to fill a gap regarding equipment inspection.

### 4.3.6. Comparison of Monitoring Results to Air Quality Standards

NOTE FOR 4.3.6: NEW. This is a new criterion heading, but the requirements are not new. Previously, this criterion was called Protection of Air Quality. It has been revised to be more consistent with a similar criterion heading in the Water Management chapter (see 4.2.6).

In the 2018 Mining Standard, the requirements in this criterion were flagged. They were audited, to gain information, but not scored. There was no indication from the audits that the flagged requirements were problematic. As a result, we are proposing that the two requirements be incorporated into this chapter. See additional notes below.

4.3.6.1. Ambient air quality monitoring results demonstrate that the site is in compliance with the European Union's Air Quality Standards[23] (EU Standards) as amended to their latest form (see Table 4.3, below) at the boundaries of the project/operation site and on transportation routes. If emissions from mining-related activities cause an exceedance beyond what is allowed in Table 4.3:

a. And an operation is located in an airshed where baseline air quality conditions meet EU Standards, the entity:
    i. Develops mitigation measures to reduce its emissions;
    ii. Demonstrates that it is making incremental reductions in the non-compliant emissions, and within five years demonstrates compliance with the EU Standards; and
    iii. Incorporates mitigation measures into the air quality management plan;
b. And an operation is located in an airshed where baseline air quality was already degraded beyond EU Standards, the entity:
    i. Demonstrates that emissions from mining-related activities, alone, do not exceed EU Standards,
    ii. Develops and implements mitigation measures to make incremental improvements to the air quality in the airshed that are at least equivalent to the operation's emissions; and
    iii. Incorporates mitigation measures into the air quality management plan.

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[22] For example, see: Ramboll US Consulting, Inc. 2021. Draft Report: Donlin Gold Mine Supplemental Mercury Modeling and Mass Balance Analysis. Available at: https://dec.alaska.gov/water/wastewater/donlin-gold-mine-certification-remand-decsion/

Barr. 2012. Mercury Emission Control Technology Review for NorthMet Project Processing Plant. https://www.leg.mn.gov/docs/2015/other/150681/PFEISref_1/Barr%202012k.pdf

[23] 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 contaminants in Table 4.3. 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 Chapter 4.5 (Greenhouse Gas Emissions and Energy Consumption).

a. As an alternative to 4.3.6.1.a or b, the entity undertakes a risk-based approach to protecting air quality as follows:

   i. Operations demonstrate compliance with host country air quality standards, if they exist, or more stringent international best practice standards;[24]

   ii. A risk assessment is undertaken to determine residual risks from the operation's air emissions;

   iii. Where residual risks remain, the operation sets more stringent self-designed limits, develops, and implements a multi-year phased set of mitigation measures with defined timelines to make incremental reductions in emissions, and incorporates this information into the air quality management plan.

NOTE FOR 4.3.6.1: REVISED. This combines 4.3.4.1 and 4.3.4.2 in the 2018 Mining Standard. It also now requires that mitigation measures be incorporated into the air quality management plan.

CONSULTATION QUESTION 4.3-2: We are proposing that all entities measure their air quality emissions against the standards in Table 4.3, so that there is comparability between sites, but then offer a menu of how they might mitigate any exceedances of the air quality limits. The options align with the options that were proposed in the 2018 Mining Standard. Do you agree with this approach?

4.3.6.2. Dust deposition from mining-related activities is below exceed 350 mg/m$^2$/day, measured as an annual average.[25] An exception to 4.3.4.3 may be made if demonstrating compliance is not reasonably possible through ordinary monitoring methods.[26] In such cases, the entity documents its rationale, implements best available/applicable practices (BAP) to minimize dust contamination, and incorporates the BAP measures into its air quality management plan.

NOTE FOR 4.3.6.2: REVISED. This was 4.3.4.3 in the 2018 Mining Standard. Note that the German Technical Instructions on Air Quality Control (TA Luft) regulation, which was used as the basis for the 350 mg/m$^2$/day deposition value, was updated in 2021. The TA Luft dust deposition value to protect against significant nuisance or significant disadvantages due to dustfall (Section 4.3.1, Table 2 of the 2002 regulation) remained unchanged,[27] and so we are maintaining this prescriptive expectation.

We added that the entity must document its rationale for why the dust emission levels cannot be met, and that the dust mitigation measures be added into the management plan.

[24] 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.

Best practice international standards include, for example, the International Finance Corporation. 2007. Environmental, Health and Safety Guidelines, 1.1 Air Emissions and Ambient Air Quality. https://www.ifc.org/en/insights-reports/2000/general-environmental-health-and-safety-guidelines

[25] IRMA has added a dust criterion 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 Technical Instructions on Air Quality Control (TA Luft) Regulation, available at: https://www.bmuv.de/fileadmin/Daten_BMU/Download_PDF/Luft/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.

[26] An example of where exceptions might be appropriate are where roads are shared by external third parties, or operational and non-operational roads are so close to each other so as to make it impossible to distinguish their contributions.

[27] The TA Luft regulation 2002 (in English) is available here: https://www.bmuv.de/fileadmin/Daten_BMU/Download_PDF/Luft/taluft_engl.pdf The 2021 updated version (in German) is available here: https://www.verwaltungsvorschriften-im-internet.de/bsvwvbund_18082021_IGI25025005.htm

### 4.3.7. Disclosure of Information

4.3.7.1. Information on air quality management, including the air quality management plan and compliance and monitoring information is: [28]

a. Publicly available; or

b. A publicly available access to information (or equivalent) policy that commits the entity to providing stakeholders with this information upon request is in place and shared with stakeholders.[29]

NOTE FOR 4.1.7.1: REVISED. This was 4.3.4.3 in the 2018 Mining Standard. In the 2018 Mining Standard there was a blanket requirement in Chapter 1.2 - 'Community and Stakeholder Engagement,' requirement 1.2.4.1, that "Any information that relates to the mine's performance against the IRMA Standard shall be made available to relevant stakeholders upon request." We are adding this element into each chapter where there was not previously a reporting requirement, to make it clear that information related to the specific topic is included in the blanket requirement. Note that the requirement for an access to information policy (of equivalent) is being proposed in Chapter 1.2 (see Note for requirement 1.2.4.3).

CONSULTATION QUESTION 4.3-3: In addition to disclosure requirements, some IRMA chapters require annual reporting to stakeholders on the entity's management of the issues. In some cases, the reporting is to stakeholders generally (e.g., reporting on human rights due diligence), and in other cases, it involves more active discussion with relevant stakeholders, which tend to be the affected communities, on the issues (e.g., annual discussions on water management). Should IRMA require that entities report to stakeholders, or that they meet with and discuss air quality issues with affected communities? Or should IRMA not require this (and assume that if it is an important issue to stakeholders, that they will request such meetings with the entity)?

## NOTES

Air quality standards and requirements were reviewed for various countries, focusing on the most expansive, standards those 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. The EU's stands out for its breadth of contaminants including some known to be released during mining and mineral processing (in particular, metal and metalloid contaminants such as nickel, lead, cadmium, arsenic).[30] Further, like many developed national standards, EU's air quality standards were developed to be comprehensive, transparent, 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.

## CROSS REFERENCES TO OTHER CHAPTERS

This table will be added when the new content for all chapters is finalized and approved.

[28] Compliance information may include monitoring data or air quality reports to regulatory agencies, and records related to non-compliance (as per Chapter 1.1) etc.

[29] As per Chapter 1.2, requirement 1.2.4.3, an access to information policy is proposed in the revised IRMA Standard. It is expected that this policy could include the relevant provisions related to stakeholder access to entity-generated information and data on air quality.

[30] 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.

GLOSSARY OF TERMS USED IN THIS CHAPTER

## PROPOSED NEW DEFINITIONS

### Contaminant of Potential Concern (COPC)

Contaminants that may pose a risk to human health or non-human biological receptors (e.g., plants, animals).

### Contamination

The presence of a substance where it should not be or at concentrations above background, but not necessarily high enough to have an adverse impact on ecosystem and/or human health. See also 'Pollution'.

Source: Chapman, P. 2006. "Determining when contamination is pollution," Environ. Int. https://doi.org/10.1016/j.envint.2006.09.001

### Credible Method/Methodology

A method/methodology that is widely recognized, accepted, and used by experts and practitioners in a particular field of study.

### Cultural Heritage

Refers to (i) tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values; (ii) unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls; and (iii) certain instances of intangible forms of culture that are proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles.

Source: Adapted from IFC Performance Standard 8.

### Entity

A company, corporation, partnership, individual, or other type of organization that is effectively in control of managing an exploration, mining or mineral processing project or operation.

### Exploration

A process or range of activities undertaken to find commercially viable concentrations of minerals to mine and to define the available mineral reserve and resource. May occur concurrent with and on the same site as existing mining operations.

### Mineral Processing

Activities undertaken to separate valuable and non-valuable minerals and convert the former into an intermediate or final form required by downstream users. In IRMA this includes all forms of physical, chemical, biological and other processes used in the separation and purification of the minerals.

### Mining

Activities undertaken to extract minerals, metals and other geologic materials from the earth. Includes extraction of minerals in solid (e.g., rock or ore) and liquid (e.g., brine or solution) forms.

### Operation

The set of activities being undertaken for the purpose of extracting and/or processing mineral resources, including the running and management of facilities and infrastructure required to support the activities, and the ongoing legal, environmental, social and governance activities necessary to maintain the business endeavor.

### Pollution

Contamination that results in or can result in adverse biological effects to human or ecosystem health. All pollutants are contaminants, but not all contaminants are pollutants. See also 'Contamination'.

Source: Chapman, P. 2006. "Determining when contamination is pollution," Environ. Int. https://doi.org/10.1016/j.envint.2006.09.001

### Project

The development phases before a mining or mineral processing operation can begin (e.g., exploration, pre-feasibility, feasibility, conceptual design, planning, permitting). Includes all desk-top and field-based activities, including exploration activities, needed to inform and develop a project proposal, support the environmental and social impact assessment of a proposal, generate information necessary to fulfill regulatory and permitting requirements, engage with stakeholders and rights holders, and maintain the entity's business endeavor.

### Receptor

Any human, plant, animal, or structure which is, or has the potential to be, affected by the release or migration of contaminants.

### Root Cause Analysis

Root cause analysis seeks to identify the primary cause of a problem that allowed a NC to occur. By identifying the root cause, a NC can be effectively addressed and recurrence can be avoided.

Source: Adapted from Aluminum Stewardship Initiative Glossary. https://aluminium-stewardship.org/wp-content/uploads/2022/05/ASI-Glossary-V1-May2022.pdf

### Scoping

The process of determining potential issues and impacts and producing information necessary to inform decision-making regarding whether additional evaluation and actions are necessary.

### Site

An area that is owned, leased, or otherwise controlled by the entity and where mining-related activities are proposed or are taking place.

## EXISTING DEFINITIONS

### Affected Community

A community that is subject to risks or impacts from a project/operation.

REVISED. Changed wording from project to project/operation.

### Air Quality Modeling

Mathematical and numerical techniques used to simulate the physical and chemical processes that affect air pollutants as they disperse and react in the atmosphere. These include, for example: air dispersion models, which are used to predict concentrations of pollutants at selected downwind receptor locations; and receptor models, which use observational techniques and chemical and physical characteristics of gases and particles measured at source and receptor and to identify the presence of and to quantify source contributions to receptor concentrations.

### Ambient Air Quality

The concentrations of pollutants (e.g., chemicals, particulate matter) in air (for IRMA's purposes, outdoor air).

### Associated Facility

Any facility owned or managed by the entity that would not have been constructed, expanded or acquired but for the project/operation and without which the project/operation would not be viable. Examples include but are not limited to stationary physical property such as power plants, port sites, roads, railroads, pipelines, borrow areas, fuel production or preparation facilities, parking areas, shops, offices, housing facilities, construction camps, storage facilities, etc. Associated facilities may be geographically separated from the area hosting the project/operation (i.e., the site). See also 'Facility'.

REVISED. Revised to indicate that a mineral processing facility could be an associated facility for a mining operation if not co-located with the mine.

### Baseline

A description of existing conditions to provide a starting point (e.g., pre-project condition) against which comparisons can be made (e.g., post-impact condition), allowing the change to be quantified.

### Baseline Air Quality

Ambient air quality at the site and in the area surrounding a proposed project, before mining-related activities have occurred.

### Best Available/Applicable Practice (BAP)

Encompasses management systems, operational procedures, techniques and methodologies that, through experience and demonstrated application, have proven to reliably manage risk and achieve performance objectives in a technically sound and economically efficient manner. BAP is an operating philosophy that embraces continual improvement and operational excellence, and which is applied consistently throughout the life of a facility, including the post-closure period.

### Best Available Techniques (BAT)

Techniques that can most effectively achieve a high level of environmental protection and allow implementation in relevant sectors under economically and technically viable conditions. “Techniques” includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned; “Available” techniques means those techniques that are accessible to the operator and that are developed on a scale that allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages; and “Best” means most effective in achieving a high general level of protection of the environment as a whole.

### Best Environmental Practices (BEP)

The application of the most appropriate combination of environmental control measures and strategies.

### Competent Professionals

In-house staff or external consultants with relevant education, knowledge, proven experience, and necessary skills and training to carry out the required work. Competent professionals would be expected to follow scientifically robust methodologies that would withstand scrutiny by other professionals. Other equivalent terms used may include: competent person, qualified person, qualified professional.

REVISED. Deleted reference to Chapter 4.1.

### Ecosystem

A dynamic complex of plant, animal, and micro-organism communities and their non-living environment interacting as a functional unit.

### Heap Leach/Heap Leaching

An industrial mining process to extract precious metals, copper, and other compounds from ore. Typically, mined ore is crushed and heaped on an impermeable leach pad, and chemicals (reagents) are applied that percolate through the ore and absorb specific minerals and metals. The solution is collected and target metals are recovered from the solution.

### Mercury Emission Control System

Any system that will limit mercury emissions (either designed specifically for mercury, or mercury capture is a co-benefit), including sorbent technologies that can remove mercury from the gas stream during processing, or oxidation technologies that will increase the percentage of particulate-bound mercury removed by particulate scrubbers.

### Mining-Related Activities

Any activities carried out during any phase of the mineral development life cycle for the purpose of locating, extracting and/or producing mineral or metal products. Includes physical activities (e.g., land disturbance and clearing, road building, sampling, drilling, airborne surveys, field studies, construction, ore removal, brine extraction, beneficiation, mineral or brine processing, transport of materials and wastes, waste management, monitoring, reclamation, etc.) and non-physical activities (e.g., project or operational planning, permitting, stakeholder engagement, etc.).

REVISED. Added reference to mineral development life cycle, project/operation, brine.

### Mitigation (including in relation to human rights impacts)

Ac Actions taken to reduce the likelihood of the occurrence of a certain adverse impact.The mitigation of adverse human rights impacts refers to actions taken to reduce their extent, with any residual impact then requiring remediation.

### Stakeholders

Individuals or groups who are directly or indirectly affected by a project/operation, such as rights holders, as well as those who may have interests in a project/operation and/or the ability to influence its outcome, either positively or negatively.

REVISED. Changed wording from persons to individuals, and from project to project/operation.

### Tailings

The waste stream resulting from milling and mineral concentration processes that are applied to ground ore (i.e., washing, concentration, and/or treatment). Tailings are typically sand to clay-sized materials that are considered too low in mineral values to be treated further. They are usually discharged in slurry form to a final storage area commonly referred to as a tailings storage facility (TSF) or tailings management facility (TMF).

### Waste Rock

Barren or mineralized rock that has been mined but is of insufficient value to warrant treatment and, therefore, is removed ahead of the metallurgical processes and disposed of on site. The term is usually used for wastes that are larger than sand-sized material and can be up to large boulders in size; also referred to as waste rock dump or rock pile.

### Vulnerable Group

A group whose resource endowment is inadequate to provide sufficient income from any available source, or that has some specific characteristics that make it more susceptible to health impacts or lack of economic opportunities due to social biases or cultural norms (e.g., may include households headed by women or children, people with disabilities, the extremely poor, the elderly, at-risk children and youth, ex-combatants, internally displaced people and returning refugees, HIV/AIDS-affected individuals and households, religious and ethnic minorities, migrant workers, and groups that suffer social and economic discrimination, including Indigenous Peoples, minorities, lesbian, gay, bisexual, transgender, queer or questioning (LGBTQ+) and gender-diverse individuals, and in some societies, women).

REVISED. Proposing to add reference to LGBTQ+ and gender-diverse individuals in the list of examples.

CONSULTATION QUESTION 1.X-2 (From proposed Chapter 1.X on Gender Equality and Protection): References to women and gender-diverse individuals as potentially "vulnerable" or as "vulnerable groups" may sound disempowering and/or otherwise not aligned with the objectives of this chapter to advance gender equality. Are there other widely recognized terms or phrases we could use that recognize the potential susceptibility of women and gender-diverse individuals to adverse impacts such as health impacts or lack of economic opportunities due to social biases or cultural norms?

## TABLE 4.3. – European Union (EU) Numeric Air Quality Standards.

| Pollutant | Concentration | Averaging period | Permitted exceedances / year |
|---|---|---|---|
| Sulphur dioxide (SO2) | 350 µg/m$^3$ | 1 hour | 24 |
| | 125 µg/m$^3$ | 24 hours | 3 |
| Nitrogen dioxide (NO2) | 200 µg/m$^3$ | 1 hour | 18 |
| | 40 µg/m$^3$ | 1 year | not applicable |
| Fine particles (PM-2.5) | 20 µg/m$^3$ | 1 year | not applicable |
| PM-10 | 50 µg/m$^3$ | 24 hours | 35 |
| | 40 µg/m$^3$ | 1 year | not applicable |
| Lead (Pb) | 0.5 µg/m$^3$ | 1 year | not applicable |
| Carbon monoxide (CO) | 10 mg/m$^3$ | Maximum daily 8-hour mean | not applicable |
| Benzene | 5 µg/m$^3$ | 1 year | not applicable |
| Ozone | 120 µg/m$^3$ | Maximum daily 8-hour mean | 25 days averaged over 3 years |
| Arsenic (As) | 6 ng/m$^3$ | 1 year | not applicable |
| Cadmium (Cd) | 5 ng/m$^3$ | 1 year | not applicable |
| Nickel (Ni) | 20 ng/ m$^3$ | 1 year | not applicable |
| Polycyclic Aromatic Hydrocarbons | 1 ng/m$^3$ (as concentration of Benzo(a)pyrene) | 1 year | not applicable |

Notes: EU. Air Quality Standards (as of July 3, 2013). https://environment.ec.europa.eu/topics/air/air-quality/eu-air-quality-standards_en

NOTE ON TABLE 4.3: In 2021, the World Health Organization (WHO) updated its 2005 Global Air Quality Guidelines (AQG). According to WHO, "More than 15 years have passed since the publication of Global update 2005. In that time there has been a marked increase in evidence on the adverse health effects of air . . . air pollution is now recognized as the single biggest environmental threat to human health . . ."[31]

The new WHO air quality guidelines recommend aiming for annual mean concentrations of $PM_{2.5}$ not exceeding 5 µg/m$^3$ and $NO_2$ not exceeding 10 µg/m$^3$, and the peak season mean 8-hr ozone concentration not exceeding 60 µg/m$^3$ [1]. For reference, the corresponding 2005 WHO guideline values for $PM_{2.5}$ and $NO_2$ were, respectively, 10 µg/m$^3$ and 40 µg/m$^3$ with no recommendation issued for long-term ozone concentrations.

The EU has proposed changes to its Air Quality Standard that would revise its standards for annual mean concentrations of $PM_{2.5}$ to 10 µg/m$^3$ and $NO_2$ to 20 µg/m$^3$, and PM10 to 20, however, these have not yet been approved.[32] IRMA will be tracking these changes, and if they are made in the EU Numerical Air Quality Standards then we will update Table 4.3 accordingly.

[31] World Health Organization. 2021. WHO global air quality guidelines: particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. p. xiv and xv. https://apps.who.int/iris/handle/10665/345329.

[32] The proposed revisions to the EU's Ambient Air Quality Directives (and air quality standards) can be found here: https://environment.ec.europa.eu/topics/air/air-quality/revision-ambient-air-quality-directives_en; Updates on the status of the legislation are available here: https://oeil.secure.europarl.europa.eu/oeil/popups/ficheprocedure.do?reference=2022/0347(COD)&l=en