IRMA

Initiative for Responsible Mining Assurance

EXCERPT FROM THE

IRMA Standard

for

Responsible Exploration, Extraction, and Processing of Minerals

2nd DRAFT

for public consultation

CHAPTER 4.1 – **Waste and Materials Management**

IRMA Standard v2.0 DRAFT 2

July 2025

English Version

Disclaimer and Context on this Draft

The 2nd DRAFT Version of the IRMA Standard for Responsible Exploration, Extraction, and Processing of Minerals V2.0 (hereafter referred to as the "2nd DRAFT") is being released for public consultation, inviting the world to join once again in a conversation around expectations that drive value for greater environmental and social responsibility in mining and mineral processing.

The 2nd DRAFT does not represent content that has yet been formally endorsed by IRMA's equally-governed multi-stakeholder Board of Directors. IRMA's Board leaders seek the wisdom and guidance of all readers to inform this through an inclusive revision process one more time, to improve the Standard.

This draft document builds on the 1st DRAFT Version published in October 2023, and invites a global conversation to improve and update the 2018 IRMA Standard for Responsible Mining V1.0. This 2nd DRAFT is intended to provide as final of a look-and-feel as possible, although input from this consultation will result in final edits, and consolidation to reduce overall number of requirements (more on this on page 6), for a version that will be presented to IRMA's equally-governed multi-stakeholder Board of Directors for adoption and implementation.

This 2nd DRAFT has been prepared and updated by the IRMA Secretariat based on:

- learnings from the implementation of the current IRMA Standard (V1.0)
- experience from the first mines independently audited (as of July 2025, 24 sites have completed audits or are in the process of being audited)
- evolving expectations for best practices in mining to reduce harm
- comments and recommendations received from stakeholders and Indigenous rights-holders
- the input of subject-specific Expert Working Groups convened by IRMA between 2022 and 2024
- all comments and contributions received during the public-comment period of the 1st DRAFT version (October 2023-March 2024)

Please note that 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 exploration, extraction, and processing of minerals happens.

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.

This current 2nd DRAFT is based on content already in practice in the IRMA Standard for Responsible Mining V1.0 (2018) for mines in production, and its accompanying normative Guidance document and Supplementary Guidance, combined with the content drafted in the IRMA Standard for Responsible Mineral Development and Exploration ('IRMA-Ready' Standard – Draft v1.0 December 2021) and in the IRMA Standard for Responsible Minerals Processing (Draft v1.0 June 2021), and offers an updated version of the 1st DRAFT Version of the IRMA Standard V2.0 that received over 2,500 unique points of comments between 2023 and 2024.

Please note: The IRMA Standard V2.0 is new in its approach in that it now covers more phases of the mining and mineral supply chain, from exploration and development, through mining, closure, and mineral processing. IRMA also, separately, oversees a Chain of Custody Standard for tracking materials through the supply chain from mine-to-market end use products.

Disclaimer on Language and Corrections

For this public consultation, only an English version is available. A Glossary of Terms used in this Standard is provided at the end of the full version of the document (see below). 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.

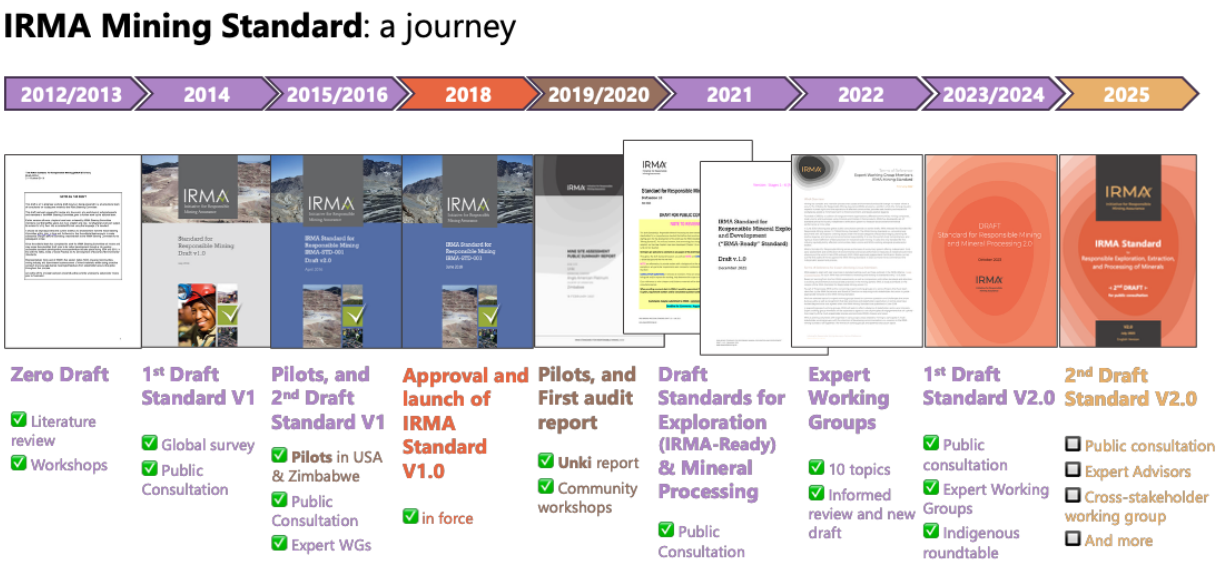
This document provides only one chapter excerpt from the IRMA Standard v2.0 DRAFT 2.

The full version contains 27 Chapters, click here to view it.

Objectives of this 2nd public consultation

Following the release of a 1st DRAFT of the IRMA Standard V2.0 in October 2023 for a 90-day public consultation, the IRMA Secretariat received more than 2,500 points of comments from 82 organizations, then organized additional engagement with stakeholders and Indigenous rights-holders, and solicited complementary guidance from multiple topic-specific Expert Working Groups.

We anticipated release of this 2nd DRAFT for a second round of public consultation as early as Q3 2024, then subsequently announced that more time was needed to support engagement of diverse stakeholders; the revised release date was July 2025. We provided more detailed explanation for the extended process here and here.



The release of this 2nd DRAFT marks a significant milestone on the road to the revision of the IRMA Standard: this public consultation will be the last of this revision cycle on V2.0.

Informed by the outcomes of this public consultation, along with guidance from Expert Advisors and IRMA Working Groups (see more below), and additional engagement with Indigenous rights-holders and stakeholders as requested, the IRMA Secretariat will prepare a final version. This final version will be discussed by the IRMA Board and refined to reach consensus for adoption by all six governing houses of IRMA: Affected Communities including Indigenous Rightsholders; Environmental and Social NGOs; Organized Labor; Finance and Investment Professionals; Mining Companies; Purchasers of Mined Materials.

In IRMA's strategic decision-making, Board members work to achieve consensus. IRMA believes a majority vote is not a model of equal governance. Instead, any motion that results in both of the two representatives from the same governing house voting "no" must go back to the full group for further discussion. In other words, a proposed course of action cannot proceed if both representatives from one of our six governing houses are opposed. Board members will keep talking until a resolution that works for all groups is found. It is a model that has worked for IRMA for nearly two decades and is fundamental to IRMA's credibility, accountability and service to all six houses of governance.

What is IRMA seeking guidance on?

Comments, feedback, and suggestions are welcome on any aspect of this 2nd DRAFT version (including intent and text of the requirements, endnotes, annexes, format and structure, design, readability, etc.).

IRMA is particularly interested in hearing the views of rights-holders and stakeholders on **the provisions in the Standard that are substantially new compared to the IRMA Standard for Responsible Mining V1.0.** These provisions (requirements or at a sub-requirement level) are highlighted in yellow throughout this Draft, to ensure they are easily identifiable.

We ask readers to assist us in weighing these potential new provisions, and also hold awareness that, prior to adoption of the final version, many of these will be consolidated and reduced in overall number.

Although these new requirements have each been drafted in response to lessons learned, the current state of best practices, emerging expectations, and/or in response to requests and suggestions made during the previous public consultation, collectively they represent substantive increased expectations for both implementing entities and audit firms. The IRMA Board of Directors seeks to ensure that the IRMA Standard, while recognized the world's most rigorous and comprehensive mining standard, continue to welcome and support uptake of newcomer companies engaging from the mineral supply chain around the world.

Thus, in this consultation, we seek guidance from all on **the new provisions that seem most urgent** to be integrated in the final version of the Standard V2.0, so that the revised Standard's expectations are paced at a realistic level to support engagement of mineral operations of a range of sizes, materials and global contexts.

It is important to note that all new requirements and sub-requirements, including those not retained in the final V2.0, will serve as the basis for the ongoing review process once the V2.0 is approved and released by our Board, and will provide fodder for future revisions, when it is decided that a V2.1 or V3.0 is needed.

Chapter 4.1
Waste and Materials Management

SECOND DRAFT (JULY 2025): SUMMARY OF CHANGES

- The following revised ordering of the requirements in Chapter 4.1 is proposed to reflect the consistent structure for Principal 4 chapters. Using a consistent ordering will make the chapters more auditable and easier to follow for companies. See the Chapter 4.1 flowchart.
  - Scoping
  - Characterization
  - Risk and impact assessment
  - Management Plans
  - Monitoring and evaluation
  - Continuous improvement
  - Information-sharing and public reporting.
- The definitions of hazardous materials and hazardous wastes have been revised slightly from the October 2023 draft to make the distinctions more obvious.
  - Hazardous Materials. Usable materials and chemicals that are transported to or from a mine site (e.g., inputs and outputs) with properties or characteristics that make them a physical, health or environmental hazard.
  - Hazardous Wastes. Wastes that are stored at or transported from a mine site with properties or characteristics that make them a physical, health or environmental hazard.
- The lists of potentially hazardous materials have been modified and grouped based on whether the materials are transported to and used at the site (non-feedstock), transported to the site for use as feedstock, or extracted/produced at the site as part of mining or mineral processing. The lists of potentially hazardous wastes are those that are produced at the site and are distinguished based on whether they are produced directly from mining and mineral processing or not directly from mining and mineral processing.
- The new section on spill preparedness and response has been moved and integrated back into Chapter 2.6 on Emergency Preparedness and Response.
- Added two IRMA+ optional requirements related to the management of non-hazardous wastes (i.e., 4.1.3.2 and 4.1.5.6).
- Added an IRMA+ optional requirement to maximize circular uses of non-hazardous materials (4.1.6.4).
- Moved to Chapter 2.6-Emergency Preparedness and Response the requirement (4.1.9.3 in first draft) to share with authorities and emergency services relevant information on the hazardous properties and health and environmental effects of potentially hazardous wastes and materials.
- Replaced the access to information requirement with a public sharing one, consistent with the rest of the Standard.

RESPONSE TO CONSULTATION QUESTIONS OUTLINED IN FIRST DRAFT

Question #	Question	Feedback and Decision
4.1-01	**(Background)** **Question**: Can you suggest other materials or wastes that you believe should be included in the list above, or recommend that any of the materials or wastes in the list be removed? Please provide your rationale for suggested inclusions/exclusions.	**Feedback received** (4): 2 mining think the list is comprehensive; 1 consultant doesn't like removal of the requirement for a waste management policy (formerly 4.1.1); and 1 consultant wonders if the management of mine-impacted waters would be better in Chapter 4.2 (responded that sources are identified and characterized in 4.1). **Proposed decision**: See slightly expanded and modified lists.
4.1-02	**(4.1.1.2)** **Question**: Do you agree with this approach? Is it reasonable to expect that if supplier information is not sufficient that mineral processors do a thorough analysis of all feed materials in order to fully understand the range and concentrations of potential contaminants that may be emitted to air or present in effluent? If not, then how else can the mineral processor demonstrate to auditors that they fully understand the range of containments that may be released (and that have adequate controls in place to address them)?	**Feedback received** (9): 5 say approach is reasonable (to have mineral processor determine COPCs if not supplied by company providing feedstock). But a list of required chemicals is needed and the frequency of analysis. Question also about availability of certified labs in some jurisdictions. **Proposed decision**: Retain expectations as proposed (see 4.1.2.4.b, and endnotes). We propose to require that the determination of COPCs align with the list of parameters in the IRMA Water Quality Criteria, as relevant. We will consider adding guidance on situations where processors could provide an explanation to limit the list of required analytes.
4.1-03	**(4.1.2, waste mitigation hierarchy)** **Question**: Do you think energy recovery from waste is still considered an acceptable practice in terms of human health, safety or environment? Should IRMA include it in the list of waste mitigation hierarchy options?	**Feedback received** (5): (2 mining, 1 auditor, 1 consultant, 1 purchaser). Most agree to keep it in with limitations; 1 purchaser says take it out. **Proposed decision**: We have clarified in an endnote for 4.1.5.1 that energy recovery is only acceptable if the Entity can demonstrate that energy recovery will result in a net positive environmental impact. Note that in 4.1.5.1.c Entities are already required to evaluate the potential human health, safety, biodiversity and environmental impacts of energy recovery and any other mitigation hierarchy option other than prevention of waste generation. We can add further guidance, such as the need for energy recovery to have proper facilities and occupational health and safety measures.
4.1-04	**(4.1.2, waste mitigation hierarchy)** **Question**: Should IRMA go further to integrate concepts of circularity into this chapter? For example, rewarding (i.e., give higher ratings to) entities that demonstrate a higher proportion of waste products that are being recycled/re-used/remined than those who clearly are not prioritizing those circularity-type strategies? We'd be interested in your input on this suggestion, or other suggestions for how IRMA might integrate	**Feedback received** (8): 2 say operations demonstrating circularity should be given higher scores (1 consultant + 1 mining), others less clear on opinion but most say circularity should be promoted. 1 mining: be sure to distinguish between waste management and hazardous waste management; want circularity at a more strategic level. 1 mining says it should be the main focus of this chapter. **Proposed decision**: Most civil society respondents raised the risk of potential greenwashing associated with extractive industries using the term "circularity"; and prefer waste reduction. IRMA notes that this is not only limited to waste

	circularly concepts into this chapter or others in the Standard (see also Chapter 2.1, where we are proposing additional circularity requirements - Note for 2.1.3.3, and CONSULTATION QUESTION 2.1-4).	reduction, as it could include remining, but on the other hand the opportunities for remining are not equal across sites and commodities. The greenwashing risks associated with "circularity" in the extractive sector have been signaled multiple times to IRMA during additional engagement calls with specialized NGOs. We propose to limit the use of the term 'circularity' to materials management (and not wastes). We have also proposed an IRMA+ optional requirement (4.1.6.4) to assess opportunities for and align (if possible) the management of non-hazardous materials with circular uses.
4.1-05	**(4.1.2.3, non-hazardous materials)** **Question**: Currently, while we have some limited requirements for non-hazardous wastes, we have not included requirements related to non-hazardous materials, such as materials used in construction of buildings. Do you agree with this approach, or do you think IRMA should include requirements for non-hazardous materials? If you believe there should be requirements, what would you suggest would be appropriate expectations regarding non-hazardous materials? And are there particular types of non-hazardous materials that warrant a greater focus than others?	**Feedback received** (11): Most agree that what is in the revised Standard is adequate. Most only mentioned non-hazardous wastes rather than non-hazardous materials. 1 mining respondent has begun a process to divert hazardous & non-hazardous wastes/materials for productive use. Some confusion about definition of non-hazardous in the US regarding mine wastes (Bevill Exclusion). **Proposed decision**: We have proposed an IRMA+ optional requirement (4.1.6.4) to assess opportunities for and align (if possible) the management of non-hazardous materials with circular uses. (Note that potentially-hazardous materials could end up being considered non-hazardous if characterization process in 4.1.2 indicated the absence of hazard).
4.1-06	**(4.1.2.3, non-hazardous waste)** **Question**: Regarding non-hazardous wastes, would it be reasonable to limit this requirement to the non-hazardous wastes that are most likely to have associated environmental and health risks (e.g., wastes like garbage dumps/landfills and sewage). Or should all non-hazardous wastes be evaluated? Also, are there additional requirements for non-hazardous wastes that should be added? For example, currently we do not require procedures or management plans for non-hazardous waste facilities, based on the assumption that any significant risks and subsequent mitigation measures (e.g., to control seepage or air emissions) would be incorporated into the plans in those chapters	**Feedback received** (7): Most agree with IRMA's proposed approach to limit to those with likely risks. 2 mining: apply mitigation hierarchy to all wastes. **Proposed decision**: We propose to address the management of non-hazardous wastes in two optional requirements. IRMA+ requirement 4.1.3.2 is an optional risk assessment of these types of wastes, and IRMA+ requirement 4.1.5.5 is a management plan to reduce the generation of non-hazardous wastes, and to prevent, mitigate, and remediate all risks to, and impacts on, human health or safety, biodiversity, or the environment from non-hazardous wastes.
4.1-07	**(4.1.4.1)** **Question**: Do you agree with the current approach in 4.1.3.1 (and 4.1.4.1) of including some specific elements, even though they overlap with other chapters? Or should we try to integrate the relevant requirements from	**Feedback received** (6): all but two (1 consultant + 1 mining, who want requirements integrated) agree that repeating an element is acceptable in some cases, but double counting should obviously be avoided. **Proposed decision**: We have proposed to include reference to risk assessments from other chapters in 4.1.3.1, but for

	this chapter into the chapters on OHS, water, or other relevant chapters?	other elements point to relevant requirements in other chapters in footnotes or in guidance to avoid double counting.
4.1-08	**(4.1.5.1)** **Question**: Currently, in engineering controls in 4.1.5.1.b, we are only including leachate/runoff collection system. Can you recommend other controls that should be implemented for on-site hazardous waste facilities?	**Feedback received** (4): 1 mining: no additions; 1 mining + 1 consultant: don't include specifics/put examples in guidance; 1 consultant: treatment for underground equipment repair area. **Proposed decision**: We will not list specific engineering controls in the requirement (now 4.1.5.2), but instead will put examples in guidance.
4.1-09	**(4.1.6.3, riverine, lake, marine disposal)** **Question**: Should IRMA consider expanding this requirement to include all hazardous wastes? Or all wastes (even if they are non-hazardous), since dumping of wastes into water bodies is not best practice for any type of waste?	**Feedback received** (9): 5 agree to expand exclusion to all wastes (hazardous or non-hazardous); 1 NGO says shouldn't dispose wastes unless can demonstrate lower risk than on-land disposal; two mining say OK to dispose in natural waters if permitted or if based on positive comprehensive assessment. **Proposed decision**: To maintain IRMA's commitment to best practices, we have proposed a new, optional IRMA+ requirement (4.1.4.3) that no wastes be disposed in rivers, lakes or marine environments (to complement the critical requirement to not dispose any waste from mining and mineral processing into such environments, now 4.1.4.1).
4.1-10	**(4.1.6.3, riverine, lake, marine disposal)** **Question**: Should IRMA consider adding a remediation step to enable sites that are no longer using these practices but did so in the past to at least partially, or possibly even substantially, meet this requirement? Remediation for damage that has been done might include, for example, waste removal and ecosystem restoration, and/or some sort of offset to create an equivalent ecosystem or ecosystem services elsewhere, or providing other forms of compensation. This is the approach taken in Chapter 4.6 for historic soil pollution.	**Feedback received** (9): 8 say yes, add a remediation step so ENTITY can gain partial/substantial credit; 1 mining says determine on a case-by-case basis. **Proposed decision**: Based on the responses to this consultation question and the level of effort involved, we are proposing to include a pathway for sites with past waste disposal into water bodies to meet this requirement (see 4.1.4.2 on remediation action plan). Note that any remediation action plan would also require monitoring and evaluation (as per Section 4.1.9), and continuous improvement (as per 4.1.10).
4.1-11	**(4.1.8.1, inspections)** **Question**: We are proposing annual inspections, but do you think that these types of inspections should occur at a much higher frequency (e.g., weekly, monthly)?	**Feedback received** (8): Several say inspection frequency depends on climate or the particular element requiring inspection; 1 mining says make them more frequent. 1 mining says can't be prescriptive - relate to risk. **Proposed decision**: Because these requirements pertain to inspection of facilities, storage and conveyance structures, and equipment used in relation to hazardous materials and hazardous wastes, we propose to adjust the frequency of inspections in requirements 4.1.9.1 and 4.1.9.2 from annual to monthly, and add more context to guidance.

4.1-12	**(4.1.8.1, inspections)** **Question**: There will be cases when entities send hazardous wastes to third-party disposal facilities. If those facilities are poorly managed, then it is possible that the ENTITY would be contributing to impacts on human health or safety, or impacts on the environment or communities. Should there be either an up-front due diligence requirement to ensure that any third-party disposal facilities are well managed, adhere to certain standards, etc., and/or should there be any ongoing monitoring of those facilities by the ENTITY?	**Feedback received** (8): Most agree with an up-front due diligence requirement but not ongoing monitoring of the third-party disposal facilities. 1 mining say best practice is to audit off-site facilities at least every 3 yrs - but just request the audit report. Ongoing inspections could be quite costly due to multiple facilities, lack of auditors, lack of qualifications of ENTITY, etc. 1 mining recommends adding a requirement for upfront due diligence for any third-party hazardous waste disposal. 1 mining say should be due diligence and ongoing monitoring b/c is a key corporate risk. **Proposed decision**: We have proposed to add a requirement (4.1.5.4) for up-front due diligence including evidence that facilities are licensed and in good standing, and requesting an audit (or equivalent) of the third-party disposal facility every 3 years.

BACKGROUND

Mineral exploration projects, mines and mineral processing operations use various materials and create wastes and products and by-products that, if poorly managed, create risks to human health, safety and the environment. The range of materials and wastes with hazardous characteristics varies significantly from one site to the next, based on the commodity, throughput, processing method, and other factors.

Materials brought to a site that may have hazardous properties include chemicals and reagents used during construction, extraction, mineral processing, or wastewater treatment; drilling muds; explosives used in both surface and underground mining; fuels including coal and petroleum products; solvents and lubricants associated with the use and maintenance of machinery; construction fill; and cement.

Also, some materials extracted/produced as a result of exploration, mining and mineral processing operations, such as ores, brines and concentrates, may contain constituents that create ecological or human health hazards if released to the natural environment.

Wastes produced at a site that may have hazardous properties include residues from mineral processing (e.g., tailings, slag) and by-product waste streams from those processes (e.g., mercury from gold recovery/refining); waste rock; spent ores from leaching operations; laboratory wastes; used equipment and batteries; and others. Mining-related operations may also create waste as a result of mitigation or remediation activities such as water treatment residuals or spill cleanup. Additionally, both solid and liquid wastes (e.g., garbage, sewage) are produced at all mining and mineral processing sites.

There are proven technologies and practices to prevent and greatly reduce the potential for materials and wastes to impact human health, safety and the environment. This includes identification of the potential hazards, elimination of the hazards where possible, the use of appropriate design criteria and engineering controls to otherwise minimize risks, regular inspection and maintenance of facilities and equipment, and spill response plans, and appropriate training of workers who transport, handle and work with hazardous materials and wastes.

KEY REFERENCES

This chapter strongly builds on, or aligns with, the following international or multilateral frameworks, conventions, and guidance:

- The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
- ICMM, UNEP, UN PRI, Global Industry Standard on Tailings Management (GISTM), 2023
- Minamata Convention on Mercury, 2013
- International Cyanide Management Code For the Manufacture, Transport, and Use of Cyanide In the Production of Gold" (The Cyanide Code), 2002

OBJECTIVES OF THIS CHAPTER

To transport, handle, store, treat and dispose of materials and wastes in a manner that protects worker and community health and safety, and the environment.

SCOPE OF APPLICATION

This chapter is applicable to all exploration, mining and mineral processing projects and operations. For each requirement, the following colors are displayed in the margin to indicate the phases for which it is required:

E1	Exploration – Stage 1
E2	Exploration – Stage 2
E3	Exploration – Stage 3
D	Project Development and Permitting
M	Operating Mine
P	Operating Mineral Processor

TERMINOLOGY

IRMA recognizes that in some jurisdictions the terms "hazardous materials" and "hazardous wastes" may have a regulatory definition. This Standard has not adopted any one jurisdiction's definition, but rather, uses the term hazardous more generally, as in "creating a danger or a risk."

Hazardous Materials

Valuable and usable materials and chemicals transported to, extracted from, or produced at a site with properties or characteristics that make them a physical, health or environmental hazard.

Hazardous Wastes

Wastes produced at a site that are derived or not derived from mining and mineral processing operations that require minimization and management and that have properties or characteristics that make them a physical, health or environmental hazard.

Examples of different categories of potentially hazardous materials and wastes are included in the following lists, which are not exhaustive.

Potentially Hazardous MATERIALS		
Transported to and used by the site (non-feedstock)	Transported to the site as mineral processing feedstock	Produced at the site directly from mining and mineral processing
1. Fuel including petroleum products, coal, etc. 2. Solvents, lubricants and anti-freeze used in equipment, machine shops and vehicles 3. Explosives supplied, or produced on site, and used in mining including, but not limited to: solid, gel, emulsion, ammonium nitrate/fuel oil mixtures, detonators, boosters and caps 4. Mineral processing reagents including chemicals used in flotation, leaching (e.g., cyanide, acids, bases) or other process (e.g., solvent extraction and electrowinning SX/EW, smelting fluxes) 5. Treatment plant chemicals 6. Construction fill 7. Cement 8. Drilling chemicals/mud 9. Instrumentation such as weighing gauges (which may contain radioactive elements/radionuclides)	1. Ore 2. Concentrate 3. Mine waste for processing 4. Soil, scrap, recycled materials.	1. Ore 2. Brine 3. Evaporate 4. Concentrate 5. Doré 6. Pregnant solutions 7. Active material, including anodes and cathodes 8. Mineral processing by-products sold as raw materials to third parties

Potentially Hazardous WASTES	
Produced at the site directly from mining and mineral processing	Produced at the site not directly from mining and mineral processing
<u>Solid</u> 1. Tailings 2. Waste rock (which may be a material considered as a construction material at some sites) 3. Overburden 4. Spent ore (from heap and dump leach operations) 5. Mineral processing wastes (e.g., slag from iron, copper, lead, zinc or other processing; red and brown muds from bauxite refining; dross from aluminum production; wastes from solvent extraction and electrowinning (SX/EW); refractory lining/bricks; spent pot linings; wet scrubber sludges, baghouse dusts and other residues from thermal processes; wastewaters from various processes, etc.). This includes mineral processing wastes sold as raw materials to third parties. <u>Liquid</u> 1. Mine-influenced water (e.g., from dewatering of underground or open pit operations, tailings supernatant, industrial stormwater, barren solutions, seepage from mine facilities, acid mine drainage, treatment plant surge pond water)	1. Laboratory waste including chemical and solid waste (e.g., assay crucibles and cupels) 2. Equipment and machine shop waste including solvents, waste oil and grease and anti-freeze 3. Used batteries, used tires, electronics, etc. 4. Used unrepairable weighing gauges if they contain radioactive elements/radionuclides 5. Construction and decommissioning wastes 6. Wastes generated during spill cleanup 7. Water treatment sludge, residue and materials (e.g., membranes) 8. Used unrepairable equipment 9. Equipment and material packaging 10. Human-generated waste including garbage and sewage produced at sites, accommodations and camps.

Each category will have different requirements for scoping, characterization, risk assessment, mitigation/management/planning, monitoring/inspection, and reporting/disclosure, as indicated in **bold** throughout the Chapter.

CRITICAL REQUIREMENTS IN THIS CHAPTER

Throughout the Standard, critical requirements are identified using a red frame.
There are five (5) **critical requirements** in this Chapter (including 1 that is only applicable to sites that use cyanide, and 2 that are only applicable if mercury is present in ore, concentrates or waste materials).

OPTIONAL IRMA+ REQUIREMENTS IN THIS CHAPTER

Throughout the Standard, optional IRMA+ requirements are identified using a dotted blue frame. There are three (3) **optional IRMA+ requirements** in this Chapter.

In this second draft, IRMA introduces a new category of requirements: IRMA+. These requirements are aspirational and forward-looking. They reflect emerging expectations and recommendations from stakeholders, but currently go above and beyond existing and established best practice. IRMA+ requirements are entirely optional, and they will not affect the scores and achievement levels obtained by the entities choosing to be assessed against them.

IRMA Requirements

4.1.1 Scoping

E2 E3 D M P

4.1.1.1 Critical Requirement

A scoping process (or equivalent) is undertaken by competent professionals to identify all potentially hazardous materials and hazardous wastes associated with the site and its associated facilities, as follows:

a. The process identifies all potentially hazardous **materials transported to, and used** at, the site or its associated facilities[1];

b. It identifies all potentially hazardous **materials and wastes extracted from, or produced at**, the site or its associated facilities as a result of mining or processing activities[2];

c. It identifies all potentially hazardous **wastes** produced at the site or its associated facilities **that are not derived from mining or mineral processing** activities;

d. It includes identification and mapping of the existing or planned locations where potentially hazardous materials, hazardous wastes and, if relevant, non-hazardous wastes[3] are transported to, stored, used, treated and/or disposed on-site, at associated facilities, or off-site[4];

e. It includes collaboration with relevant affected rights-holders and stakeholders to identify concerns, challenges, and opportunities related to the planned locations; and

f. It includes collaboration with relevant affected rights-holders and stakeholders to identify possible risks and impacts, and actual impacts, associated with potentially hazardous materials and wastes transported to, stored on, and used at the site.

4.1.2 Characterization

E3 D M P

4.1.2.1 For each potentially **hazardous solid or semi-solid material and waste** produced as a result of mining or mineral processing activities (identified in 4.1.1.1.b[5]), a chemical characterization is carried out and documented by competent professionals, as follows:

a. It uses a credible methodology, and the methodology is documented;

b. It determines the potential for acid rock drainage (ARD), the potential for radioactivity, and the potential for contaminant or metals leaching (ML);

c. If relevant, it includes analysis of petrology, mineralogy, and mineralization, and identification of geochemical test units[6] or representative ranges of chemical composition;

d. It includes estimation of an appropriate number of samples for each geochemical test unit or range of material compositions, and performing comprehensive geochemical testing on all samples from each geochemical test unit, or, for solid wastes for which geochemical test units are not relevant (such as mineral sands), on samples representative of the range of compositions[7]; and

e. It identifies the COPCs for each relevant material and waste[8].

E3 D M P

4.1.2.2 For each potentially **hazardous liquid material and waste** produced as a result of mining or mineral processing activities (identified in 4.1.1.1.b[9]), a chemical characterization is carried out and documented by competent professionals, as follows:

a. It uses a credible methodology, and the methodology is documented;

b. It includes estimation of an appropriate number of samples[10] for each compositional range;

c. It includes full chemical characterization of the materials and wastes for constituents identified in the IRMA Water Quality Criteria (see Annex 4.3-A in Chapter 4.3); and

d. It identifies the COPCs for each relevant material and waste[11].

E3 D M P

4.1.2.3 For each potentially **hazardous waste not derived from mining or mineral processing activities** (as identified in 4.1.1.1.c), a chemical characterization is carried out and documented by competent professionals, as follows:

a. It uses a credible methodology, and the methodology is documented;

b. It determines if it has characteristics or properties that make it dangerous or capable of having a harmful effect on human health or safety, biodiversity, or the environment; and

c. It documents the hazardous properties or characteristics, and the related potential health, safety, or environmental impacts.

E3 D M P

4.1.2.4 For each potentially **hazardous material transported to, or used at, the site or its associated facilities**[12] (identified in 4.1.1.1.a), a chemical characterization is carried out and documented by competent professionals, as follows:

a. It uses a credible methodology, and the methodology is documented;

b. It determines if it has characteristics or properties that make it dangerous or capable of having a harmful effect on human health or safety, biodiversity, or the environment[13];

c. If applicable, it identifies contaminants of potential concern (COPCs) in feed materials purchased for mineral processing operations[14]; and

d. It documents the hazardous properties or characteristics, and the related potential health, safety, or environmental impacts.

4.1.3 Risk and Impact Assessment

E3 D M P

4.1.3.1 Building on 4.1.1 and 4.1.2, where COPCs or potential risks or impacts from **hazardous wastes** or **hazardous materials** are identified, a risk and impact assessment[15] (or equivalent) is carried out and documented by competent professionals, as follows:

a. It uses a credible methodology, and the methodology is documented;

b. It determines Contaminants of Concern (COCs) and specific risks that will need to be mitigated and managed in accordance with Sections 4.1.5 and 4.1.6;

c. It assesses the risks and impacts to human health or safety, biodiversity, or the environment from hazardous **wastes**; and

d. It assesses the risks and impacts to human health or safety, biodiversity, or the environment from hazardous **materials**.

E3 D M P

4.1.3.2 **IRMA+**
The identified risks on, and impacts to, human health or safety, biodiversity, or the environment, from **non-hazardous wastes**[16] that are extracted, used or produced by the site, are also integrated in relevant risk and impact assessment processes, as per 4.1.3.1.

4.1.4 Riverine, Lake, and Marine Disposal or Storage

E2 E3 D M P

4.1.4.1 **Critical Requirement**
The ENTITY can demonstrate that it does **not** propose to, nor actually, dispose of or store wastes **produced as a result of** mining or mineral processing activities in rivers, lakes or marine environments[17].

E3 D M P

4.1.4.2 If riverine, lake, or marine disposal or storage of wastes produced as a result of mining or mineral processing was **previously** used at the site (but no longer occurs), by the ENTITY and/or any previous owner/s, a remediation action plan (or equivalent) is developed by competent professionals to address the damage that has been done, through:

a. Determination of the nature and extent of the damage, to the greatest extent possible;

b. Development and documentation of specific measures to remediate the damage and/or minimize any ongoing/continuous damage[18]; and

c. Development of estimated timeline and budget needed to implement the remediation action plan (or equivalent);

d. Inclusion of a financing plan to ensure that funding is available for effective implementation of the remediation measures; and

e. Implementation of the remediation measures.

E3 D M P

4.1.4.3 **IRMA+**
The ENTITY can demonstrate that it does **not** propose to, nor actually, dispose of, or store, **any wastes** (including those **not derived from** mining or mineral processing activities) in rivers, lakes or marine environments[19].

4.1.5 Waste Reduction and Management

E3 D M P

4.1.5.1 Building on 4.1.3, and in addition to the concurrent reclamation plan required in Chapter 2.7 and the management of tailings and mine waste storage facilities required in Chapter 4.2[20], a hazardous waste management plan (or equivalent) is developed and documented by competent professionals, to reduce the generation of **hazardous wastes**, and to prevent, mitigate, and remediate all the risks and impacts on human health or safety, biodiversity, or the environment, from the **hazardous wastes** identified as per 4.1.3.1, as follows:

a. The plan includes mitigation measures that strictly align with the waste mitigation hierarchy to prioritize measures that prevent generation of hazardous wastes[21];

b. It includes mitigation measures that align, to the extent possible, with the preferences of affected rights-holders and stakeholders regarding post-closure end-uses of affected areas[22];

c. It is informed by specific risk assessment/s to determine the level of risk to human health and safety, biodiversity, and the environment associated with all selected mitigation measures identified[23];

d. It assigns implementation of measures to responsible staff with adequate skills and expertise;

e. It assigns responsibility to its top management level to oversee plan implementation, monitoring, and recordkeeping[24];

f. It has an implementation schedule in place;

g. It specifies annual, or more frequent, reviews of the effectiveness of the measures implemented;

h. It maintains estimates of human resources and budget required; and

i. It includes a financing plan, to ensure that funding is available for the effective implementation of the plan.

E3 D M P

4.1.5.2 For each identified hazardous waste, the plan required in 4.1.5.1 includes the following procedures for safe handling, transport, storage, re-use, recycling, treatment and disposal[25], as appropriate[26]:

a. Disposal container or containment materials are appropriate for the specific hazardous contents, and engineering controls are implemented to prevent the release of the hazardous wastes or their components into the workplace or the environment[27];

b. Appropriate protective equipment and clothing are provided to relevant workers to prevent illness or injury from exposure to hazards[28], and appropriate hygiene practices are implemented in relevant work areas[29];

c. Specific occupational safety and health training to relevant workers, in accordance with applicable requirements in Chapter 3.2, that includes instruction on: 1) Where to find safety data information[30] and other relevant information related to the chemicals of concern; and 2) Appropriate methods for transporting, handling, storing,[31] using and disposing of hazardous wastes[32]; and

d. These procedures (a. to c.) are developed and documented by competent professionals.

E3 D M P

4.1.5.3 The plan required in 4.1.5.1 also includes procedures to document and keep records of the following information about all hazardous wastes identified:

a. The annual quantity of hazardous wastes generated, both solid and liquids contents;

b. The storage, treatment and disposal locations, on-site and off-site;

c. Waste transport, treatment, and disposal dates/periods, and shipping/transport dates; and

d. If applicable, regulatory authorizations for any third-party vendors contracted/engaged by the ENTITY for transport and off-site treatment or disposal of hazardous wastes.

E3 D M P

4.1.5.4 If the Entity has contracted/engaged any third-party vendors for transport and off-site treatment or disposal of hazardous wastes, procedures are developed and implemented to:

a. Confirm that the third-party treatment or disposal facility is licensed to carry out the treatment or disposal activities, prior to any contractual arrangement;

b. Confirm that the third-party treatment or disposal facility is operational and in compliance with applicable environmental and health and safety regulations, prior to any contractual arrangement; and

c. Require, through contractual agreement, that at least every three years either the Entity will carry out an inspection of the facility or the facility will provide a third-party inspection report to the Entity.

E3 D M P

4.1.5.5 **IRMA+**

A non-hazardous waste management plan (or equivalent) is developed and documented by competent professionals, in accordance with 4.1.5.1, 4.1.5.2, and 4.1.5.3, to reduce the generation of **non-hazardous wastes**, and to prevent, mitigate, and remediate all risks to, and impacts on, human health or safety, biodiversity, or the environment, from **non-hazardous wastes**, identified as per 4.1.3.2.

4.1.6 Materials Management

E3 D M P

4.1.6.1 Building on 4.1.3, and in addition to the concurrent reclamation plan required in Chapter 2.7[33], a management plan for **hazardous materials** (or equivalent) is developed and documented by competent professionals, to prevent all risks and impacts on human health or safety, biodiversity, or the environment, from the **hazardous materials** identified as per 4.1.3.1, and to mitigate and remediate those risks and impacts that cannot be prevented, as follows:

a. The plan includes mitigation measures that strictly align with the mitigation hierarchy to prioritize measures that eliminate the need for hazardous materials[34];

b. It assigns implementation of measures to responsible staff with adequate skills and expertise;

c. It assigns responsibility to its top management level to oversee plan implementation, monitoring, and recordkeeping[35];

d. It has an implementation schedule in place;

e. It specifies annual, or more frequent, reviews of the effectiveness of the measures implemented;

f. It maintains estimates of human resources and budget required; and

g. It includes a financing plan, to ensure that funding is available for the effective implementation of the plan.

E3 D M P

4.1.6.2 For each identified hazardous material, the plan includes procedures for safe transportation (to the site and associated facilities), handling, storage, re-use, recycling, treatment and disposal, as appropriate[36]:

a. Storage container and conveyance materials are appropriate for the specific hazardous contents, and engineering controls are implemented to prevent the release of the hazardous materials into the workplace or the environment[37];

b. Appropriate protective equipment and clothing are provided to relevant workers to prevent illness or injury from exposure to hazards[38], and appropriate hygiene practices are implemented in relevant work areas[39];

c. Specific occupational health and safety training to relevant workers, in accordance with applicable requirements in Chapter 3.2, that includes instruction on: 1) Where to find safety data information[40] and other relevant information related to the chemicals/materials of concern; and 2) Appropriate methods for transporting, handling, storing,[41] using and disposing of hazardous materials;

d. These procedures (a. to c.) are developed and documented by competent professionals.

E3 D M P

4.1.6.3 The plan includes procedures to document and keep record of the following information about all hazardous materials identified:

a. The annual quantity of hazardous materials transported to the site and associated facilities[42];

b. The annual quantity produced at the site and associated facilities[43];

c. The annual quantity used at the site and associated facilities;

d. The annual quantity transferred off-site;

e. The storage, usage, and disposal locations, on-site and off-site;

f. Shipping/transport dates and supplier information for materials coming to the site and associated facilities; and

g. Shipping/transport dates and receiver information for any hazardous materials transported off-site[44].

E3 D M P

4.1.6.4 **IRMA+**

A circularity plan for **non-hazardous materials**[45] (or equivalent) is developed and documented by competent professionals, to **maximize circular uses of materials**. The plan:

a. Assesses the opportunities for circular uses of all non-hazardous materials;

b. Includes time-bound measures and targets to maximize the identified opportunities; and

c. Is developed in collaboration with institutions and businesses to maximize synergies with their respective circular uses of materials.

4.1.7 Cyanide Management

E3 D M P

4.1.7.1 **Critical Requirement**

If cyanide will be, or is, transported to and stored on-site in bags or bulk containers, or used as a chemical in any aspect of mining or mineral processing, and **if the site is eligible** to be certified by the International Cyanide Management Institute (ICMI):

a. The site is currently certified as being in full compliance with the International Cyanide Management Code (The Cyanide Code) in accordance with the verification requirements of the ICMI;

b. The ENTITY has a system in place to proactively share summary audit reports with relevant stakeholders; and

c. All cyanide producers and transporters supplying the operation are certified as meeting the "Cyanide Production and Transport Practices" of the Cyanide Code.

OR

E3 D M P

4.1.7.1* **Critical Requirement**

If cyanide will be, or is, transported to and stored on-site in bags or bulk containers, or used as a chemical in any aspect of mining or mineral processing, but **if the site is not eligible** to be certified by the ICMI, the site's cyanide management practices are:

a. Assessed at least every three years against the Cyanide Code's "Gold Mining Operation Verification Protocol" by auditors meeting ICMI requirements;

b. Verified as fully meeting the Cyanide Code requirements; and

c. All cyanide producers and transporters supplying the operation are certified as meeting the "Cyanide Production and Transport Practices" of the Cyanide Code.

4.1.8 Mercury Management

E3 D M P

4.1.8.1 Critical Requirement

If **mercury** is present in ore, concentrates or waste materials[46], the ENTITY has a system in place to ensure that:

a. At least annually, a mercury mass balance is conducted and documented by competent professionals[47];

b. Mercury recovered from mercury emission control systems or produced as a by-product[48] is only sold for an end-use listed in Annex A (Products) or Annex B (Processes) of the Minamata Convention on Mercury, subject to the appropriate phase-out dates[49];

c. Mercury recovered is not sold or given away, either directly or indirectly, to individual/s or ENTITY/ies engaged in artisanal or small-scale mining;

d. Mercury wastes from mercury emission control systems are sent to a regulated repository that accepts mercury wastes;

e. If mercury wastes from mercury emission control systems are stored on-site or disposed with tailings or with other materials, prior to being permanently disposed of, mercury wastes undergo conversion and, where intended to be disposed of in above-ground facilities, conversion and solidification;

f. If mercury wastes from mercury emission control systems are stored on-site or disposed with tailings or with other materials, this only occurs if a risk-based evaluation of the storage or disposal of mercury waste demonstrates that the risk of long-term air or water pollution is low, and disposal occurs in fully lined facilities using synthetic liners that have a permeability of 10-9 cm/sec or less and a leachate collection system;

g. If mercury wastes from mercury emission control systems are stored on-site or disposed with tailings or with other materials, sampling for mercury in groundwater and surface water is integrated into the monitoring program for water in Chapter 4.3[50], and corresponding environmental impact monitoring[51] is carried out in locations that are most likely to promote methylation[52], at a frequency that is appropriate and commensurate to the risks and potential impacts.; and

h. If mercury wastes from mercury emission control systems are stored on-site or disposed with tailings or with other materials, mercury monitoring is included in the air monitoring program plan in Chapter 4.5.

4.1.9 Monitoring and Evaluation

E3 D M P

4.1.9.1 To monitor and evaluate the effectiveness and appropriateness of its measures to prevent, mitigate, and remediate all risks and impacts from **hazardous wastes** the ENTITY, at least monthly[53]:

a. Inspects and documents the condition and safety of: 1) areas where hazardous wastes are handled, mixed, stored or disposed of, on-site and at associated facilities; 2) storage and conveyance structures for hazardous wastes[54]; and 3) secondary hazardous wastes containment systems;

b. Tests and documents the functioning of alarms and sumps for hazardous wastes; and

c. Tracks and documents the effectiveness of any mitigation measures or controls (engineered or others) meant to prevent the release of hazardous wastes into the workplace or the environment.

E3 D M P

4.1.9.2 To monitor and evaluate the effectiveness and appropriateness of its measures to prevent, mitigate, and remediate all risks and impacts from **hazardous materials** the ENTITY, at least monthly[55]:

a. Inspects and documents the condition and safety of: 1) areas where hazardous materials are handled, mixed, stored or disposed of, on-site and at associated facilities; 2) storage and conveyance structures for hazardous materials[56]; and 3) secondary hazardous materials containment systems;

b. Tests and documents the functioning of alarms and sumps for hazardous materials; and

c. Tracks and documents the effectiveness of any mitigation measures or controls (engineered or others) meant to prevent the release of hazardous materials into the workplace or the environment.

E3 D M P

4.1.9.3 These monitoring and evaluation processes, both for hazardous wastes and hazardous materials:

a. Encourage and facilitate joint monitoring with workers and their representatives, in a manner that is inclusive of different seniority levels, genders, and any potentially underserved and/or marginalized workers;

b. Encourage and facilitate joint monitoring with affected communities, in a manner that is inclusive of different genders, ages, ethnicities, and any potentially underserved and/or marginalized people, as per Chapter 1.2[57]; and

c. If members of affected communities agree to participate in joint monitoring, the ENTITY offers to cover, in full or in part, costs related to participation in monitoring and review of the monitoring program, including for independent experts, and a mutually-acceptable agreement for covering costs is developed

4.1.10 Continuous Improvement

E3 D M P

4.1.10.1 At least annually, but without undue delay after a significant change, the ENTITY collaborates with workers and their representatives to:

a. Review monitoring and evaluation results, as per Section 4.1.9;

b. Review any materials-related or waste-related grievances filed through its grievance mechanism/s required in Chapter 1.6 (Section 1.6.1), and any notification submitted through its whistleblowing mechanism required in Chapter 1.6 (Section 1.6.2);

c. Review the effectiveness of the mitigation measures implemented as per 4.1.5 and 4.1.6 (and 4.1.7 and 4.1.8 if applicable) to prevent risks related to materials and waste, including their release into the workplace or the environment;

d. Develop and implement time-bound corrective measures to update, if necessary[58], the scoping in accordance with Section 4.1.1; and characterization in accordance with Section 4.1.2;

e. Develop and implement time-bound corrective measures to update, if necessary[59], the risk and impact assessment in accordance with Section 4.1.3;

f. Develop and implement time-bound corrective measures to update, if necessary[60], its management plans, in accordance with Sections 4.1.5 and 4.1.6 (and 4.1.7 and 4.1.8 if applicable); and

g. Develop and implement time-bound corrective measures to update, if necessary[61], its monitoring and evaluation processes, in accordance with Section 4.1.9.

E3 D M P

4.1.10.2 **Critical Requirement**

The ENTITY has a system in place to ensure that, whenever the review process indicates that waste or materials management procedures or engineering controls are not being effective, and/or whenever an incident related to materials or waste happens, the following actions occur:

a. If there is an imminent risk or actual impact to human health or safety, or biodiversity, or the environment, immediate measures are implemented to remedy the situation and, if necessary, response measures outlined in emergency response plans in Chapter 2.6 and 3.2 are implemented[62];

b. If risks to human health or safety, or biodiversity, or the environment are not imminent, remedial measures are implemented as soon as possible[63]; and

c. The issues and/or incidents are documented and used to inform reviews and updates to hazardous waste management procedures (see 4.1.5), hazardous materials management procedures (see 4.1.6), and the management plans related to occupational health and safety (Chapter 3.2), emergency response (Chapter 2.6), water (Chapter 4.3), or air (Chapter 4.5), as relevant.

4.1.11 Information-Sharing and Public Reporting

E3 D M P

4.1.11.1 At least annually, the ENTITY makes publicly accessible updated versions of, and maintains[64] publicly accessible all previous versions of:

a. Key findings of the risk and impact assessment required in 4.1.3, and all relevant Material Safety Data Sheets (MSDSs);

b. A summary of the mitigation measures implemented to reduce and manage wastes required in 4.1.5;

c. A summary of the mitigation measures to manage materials required in 4.1.6;

d. If applicable, a summary of the mitigation measures to manage cyanide and mercury required in 4.1.7 and 4.1.8;

e. Key findings of the monitoring and evaluation process required in 4.1.9 and of the review process required in 4.1.10.1;

f. A list of the time-bound corrective measures identified as per 4.1.10.1;

g. The total amounts of wastes generated over the reporting period, disaggregated by the amount that was: 1) Re-used and, where applicable, re-mined; 2) Recycled, and recovered for energy; and 3) Disposed of.

CROSS REFERENCES TO OTHER CHAPTERS

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

CHAPTER ENDNOTES

[1] Both non-feedstock **and** used as feed materials for mineral processing operations[1] if relevant.

[2] Note that this could include ore, concentrates, tailings or other residues, waste rock, overburden, slag or mineral processing wastes, and mine waste materials that get re-used or re-purposed, for example as road-bed or construction fill. All wastes need to be tested to demonstrate that they are non-hazardous (unless classified as non-hazardous by legislation). There is often an assumption that waste rock is not hazardous, but this is not necessarily the case.

[3] This is only relevant if the Entity wishes to demonstrate that it has met the corresponding IRMA+ requirements related to non-hazardous wastes (i.e., 4.1.3.2 and 4.1.5.6)

[4] The locations of off-site facilities do not necessarily need to be mapped, but the locations/addresses of off-site facilities that have received or will receive hazardous wastes generated by the project/operation must be documented.

[5] E.g., tailings, waste rock, overburden, spent ore produced at the site.

[6] Geochemical test units are rock types of distinctive lithology, mineralogy, and/or alteration. The units should be as homogeneous as possible, based on information on lithology, mineralogy, alteration, and the availability of minerals to weathering. (Maest and Kuipers, 2005; GARD Guide, Sections 5.4.2 and 5.4.4 and Figure 5-5; http://www.gardguide.com/index.php?title=Chapter_5b#5.4.4_Introduction_to_Geochemical_Characterization

[7] Comprehensive testing would include determining ARD potential, metal/contaminant leaching potential, and an estimate of radioactivity for relevant solids materials using a gamma or scintillation counter or similar instrumentation.

[8] COPCs are identified using the results of laboratory short-term and long-term (kinetic) leach tests or results of chemical analysis of extracted brines and liquid wastes. If laboratory leachate, brine or liquid waste concentrations exceed numeric IRMA Water Quality Criteria by End-Use Tables (Annex 4.3-A), those constituents are identified as COPCs. A risk assessment will be conducted to determine final COCs (see 4.1.3.1).

[9] Applies to, e.g., brines, pregnant solutions, mine-influenced waters, spent brine.

[10] If composition of the liquid material or waste changes over time, will need additional samples

[11] COPCs are identified using the results of laboratory short-term and long-term (kinetic) leach tests or results of chemical analysis of extracted brines and liquid wastes. If laboratory leachate, brine or liquid waste concentrations exceed numeric IRMA Water Quality Criteria (Annex 4.3-A), those constituents are identified as COPCs. A risk assessment (4.1.3.1) will be conducted to determine final Contaminants of Concern (CoC), and these CoCs would then need to be addressed in the relevant management plans in 4.3.5.

[12] Both non-feedstock **and** used as feed materials for mineral processing operations if relevant.

[13] For chemicals and other materials, Material Safety Data Sheets (MSDSs), as available, will provide information; for materials such as construction fill, ores, and certain wastes (e.g., tailings), characterization could include 4.1.2.2 if stored on site and not provided by the supplier.

[14] For materials coming from third parties to be used as feedstock for mineral processing operations, if the supplier does not disclose to the ENTITY detailed information on the principal components and contaminants that are considered likely to be routinely or periodically present in feed materials, the ENTITY will need to carry out a thorough characterization to determine this for themselves. COPCs are identified using the results of laboratory short-term and long-term (kinetic) leach tests or results of chemical analysis of extracted brines and liquid wastes. If laboratory leachate, brine or liquid waste concentrations exceed numeric IRMA Water Quality Criteria (Annex 4.3-A), those constituents are identified as COPCs. A risk assessment (4.1.3.1) will be conducted to determine final Contaminants of Concern (CoC), and these CoCs would then need to be addressed in the relevant management plans in 4.3.5.

[15] This may be a standalone assessment or integrated in relevant risk and impact assessment processes. For example, COPCs and other potential risks related to hazardous wastes and hazardous materials may have been identified in the ESIA process in Chapter 2.1. (requirement 2.1.4.1 in ESIA Scoping requires the identification and documentation of potential significant environmental and social impacts and risks that require further assessment). If adequate documentation of potential risks related to hazardous wastes and hazardous materials, and subsequent risk assessment, were not done as part of the ESIA in Chapter 2.1, then it needs to be done as a standalone risk assessment.

If there is no standalone assessment, to fully meet this requirement the ENTITY must have a system in place to ensure that information on, and characteristics of, these wastes and materials (e.g., known hazards, volumes, storage, usage, treatment and disposal locations, transport routes, etc) is integrated into the risk assessments in the following chapters, as appropriate:

2.1–Environmental and Social Impact Assessment and Management;

2.6–Emergency Preparedness and Response;

2.7–Concurrent Reclamation, Closure, and Post-Closure;

3.2–Occupational Health, Safety, and Wellbeing;

3.3–Community Health and Safety;

4.2–Tailings Storage Facilities and Physical Stability Management;

4.3–Water Management;

4.4–Biodiversity, Ecosystem Services, and Protected and Conserved Areas; and

4.5–Air Quality and Dust Management.

By integrating them into those risk and impact assessments, they will be considered in the management plans, monitoring and evaluation, and continuous improvement processes (of those relevant chapters), if risk and impacts are identified.

[16] There can still be risks from non-hazardous wastes. Even if the waste materials themselves do not contain hazardous elements, per se, the disposal method may create risks. For example, depending on the contents, garbage can lead to impacts on air quality and human health if incinerated.

[17] This includes tailings, waste rock, overburden, spent ore from heap and dump leach operations, mineral processing wastes, and mine-influenced water. For more details, see the table on Potential Hazardous Wastes (in particular, wastes "Produced at the site directly from mining and mineral processing") in the Scope of Application section of the chapter.

Some exceptions can be allowed to 4.1.8.1 for overburden sand material at mineral sand mining, sand mining, and gemstone mining operations that extract or dredge ore/sand/gemstones from beaches, dunes or riverbeds, as follows:

1. *The overburden sand material can be returned to its original location including 'wet' location (i.e. beach or riverbed), only if all the following conditions are met:*
    a. *separation does not involve chemical processes;*
    b. *the returned material does not create new or additional acid rock drainage (ARD), radioactivity, contaminant or metals leaching (ML) risks compared to the baseline conditions; and*
    c. *the site can demonstrate that it ensures safe and long-term landscape stability (see Chapter 2.6–Planning and Financing Reclamation and Closure).*
2. *For those types of mining, any ore-specific or mine waste-specific risks such as acid rock drainage (ARD), radioactivity, contaminant or metals leaching (ML) must be identified and managed as per Chapters 2.1, 4.1, 4.3, 4.4 (including disruption or damage of the environment/habitats and ecosystems that depend on them).*
3. *Cultural values of beaches, dunes or rivers must also be considered when applying Chapter 3.6–Cultural Heritage.*
4. *If extracting from, or disturbing, beaches, dunes, or riverbeds has any potential impact on Indigenous Peoples, those types of operations can only proceed with the Free, Prior, and Informed Consent of affected Indigenous Peoples (as per Chapter 2.2–Free, Prior and Informed Consent).*
5. *Any impact on climate change resulting from disruption or damage of the environment/habitats must be considered when applying Chapter 4.6–Climate Action.*

[18] This might include, for example, partial or full waste removal and ecosystem restoration.

[19] This includes: Laboratory waste including chemical and solid waste (e.g., assay crucibles and cupels); Equipment and machine shop waste including solvents, waste oil and grease and anti-freeze; Used batteries, used tires, electronics, etc.; Used unrepairable weighing gauges if they contain radioactive elements/radionuclides; Construction and decommissioning wastes; Wastes generated

during spill cleanup; Water treatment sludge, residue and materials (e.g., membranes); Used unrepairable equipment; Equipment and material packaging; Human-generated waste including garbage and sewage produced at sites, accommodations and camps.. See tables at the beginning of this Chapter for more details.

[20] See Chapter 2.7, requirement 2.7.1.5, and Chapter 4.2, requirements 4.2.12.1 and 4.2.12.2.

[21] See definition in the Glossary. Options must be evaluated in the following order of priority, taking into consideration the potential human health, safety and environmental impacts of each option:

1. Prevent generation of wastes;
2. Reduce the generation of wastes;
3. Re-use wastes (or re-mine);
4. Recycle wastes (or compost food/organic wastes);
5. Recover energy from wastes, if energy recovery can occur without generating significant air quality impacts on health and safety, ecosystems or the environment; and
6. Dispose of any remaining wastes;

[22] As identified in Chapter 2.7, requirement 2.7.1.1.d.

[23] When waste prevention (the first priority of the waste mitigation hierarchy) is not achievable or not fully achievable, the ENTITY is expected to carry out a risk assessment on the preferred next best option in the waste mitigation hierarchy, and if the assessment shows it can be implemented without creating unacceptable risks then it becomes the chosen mitigation strategy (for the residual waste that cannot be prevented). If there are unacceptable risks then the ENTITY must develop an alternative option and carry out a risk assessment on that one. This repeats until an acceptable mitigation option can be found.

[24] 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.

[25] These procedures should cover what takes place at the site and associated facilities, and, if relevant, procedures for safe transport (e.g., to off-site treatment, disposal, recycling or re-use facilities).

[26] Not all of the procedures will be relevant for all hazardous wastes. Entities will need to justify to auditors why certain sub-requirements are not "appropriate" or relevant to their situations.

[27] Other mitigation measures/controls to prevent environmental releases may be developed as part of the water management chapter (Chapter 4.3), and the tailings and physical stability management chapter (Chapter 4.2). Controls may vary depending on risks and context, but will usually include: 1) A leachate/run-off collection system; 2) Impermeable secondary containment for pipelines containing mine-influenced waters that have hazardous properties; and 3) Facility designs that incorporate safe freeboard levels.

[28] Guidance: Depending on the hazards and potential exposure routes, appropriate equipment may include eye, face, skin or respiratory protection, and there may be special requirements (e.g., a specific type of glove material, such as PVC or nitrile rubber gloves, depending on the breakthrough time of the glove material).

[29] E.g., locations and situations where eating, drinking, and/or smoking are prohibited.

[30] E.g., safety data sheets.

[31] Guidance: e.g., ventilation, temperature, moisture, identification of incompatible materials, and other conditions for safe storage.

[32] For example, there may be special precautions to take for particular circumstances, or there may be practices like disposal of wastes into sewage systems or incineration that are prohibited. This information needs to be conveyed to workers.

[33] See Chapter 2.7, requirement 2.7.1.5.

[34] Eliminating the need for hazardous materials is the highest priority. Where elimination is not possible, Entities will be expected to investigate and include measures to substitute hazardous materials with materials that pose lower physical, health and/or environmental risks; and if when all options for elimination and substitution are exhausted, the ENTITY would develop measures as per 4.1.6.2 to minimize any remaining risks posed by these materials to human health or safety, biodiversity or the environment.

[35] 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.

[36] Not all of the procedures will be relevant for all hazardous wastes. Entities would be expected to justify to auditors why certain sub-requirements are not "appropriate" or relevant to their situations.

[37] Other mitigation measures/controls to prevent environmental releases may be developed as part of the water management chapter (see 4.3.6.1), and the tailings and physical stability management chapter (Chapter 4.2). Controls may vary depending on risks and context, but will usually include: 1) Constructing impermeable secondary containment in areas where hazardous material is unloaded, mixed, processed or stored, and for pipelines containing or solutions that have hazardous properties, including, if relevant, pipelines carrying process water/solutions that have a concentration of 0.5 mg/l weak acid dissociable (WAD) cyanide or greater; 2) Secondary containment that holds at least 110% of the largest tank within the containment area plus additional capacity for the design storm event; and 3) Audible alarms, interlock systems, and/or sumps.

[38] Guidance: Depending on the hazards and potential exposure routes, appropriate equipment may include eye, face, skin or respiratory protection, and there may be special requirements (e.g., a specific type of glove material, such as PVC or nitrile rubber gloves, depending on the breakthrough time of the glove material).

[39] E.g., locations and situations where eating, drinking, and/or smoking are prohibited.

[40] E.g., safety data sheets.

[41] Guidance: e.g., ventilation, temperature, moisture, identification of incompatible materials, and other conditions for safe storage.

[42] Hazardous materials transported to the site may include chemicals, fuels or other materials that have hazardous properties. They could also include ores or concentrates purchased from other sites.

[43] Produced materials that may have hazardous properties/characteristics include ores, brines and concentrates.

[44] E.g., ores, concentrates, brines.

[45] This could include any of the following, when characterization and risk and impact assessment demonstrate the absence of hazard: Laboratory materials; light and heavy vehicles and mining/processing equipment including engines and spare parts; batteries, tires, electronics; scaling equipment, weighing gauges; construction materials and decommissioning materials/wastes; packaging and shipment elements including bulk bags, cubitainers, containers; others.

[46] This would be identified in the process outlined in 4.1.2.1.

[47] This mercury mass balance must be based on the calculated amount of mercury in the ore and waste materials, and the amount of mercury that is: 1) Released to air; 2) Recovered (e.g., from mercury emissions control systems) or produced as a by-product (e.g., from gold and/or silver heap leach processes) – Some of the information for 1) and 2) would be derived from the mercury air quality monitoring program in Chapter 4.5 – and; 3) Resident in tailings impoundments, waste rock dumps, or processing waste facilities (on-site and/or off-site).

[48] E.g., from heap leach processes.

[49] Annex A and B also list phase out dates after which the manufacture, import or export of the product shall not be allowed. Companies are expected to comply with those phase-out dates. The Minamata Convention text and Annexes are at: https://mercuryconvention.org/en/about

[50] This would be incorporated into the water sampling plan (see Chapter 4.3, Section 4.3.5)

[51] E.g., fish tissue and stream sediment mercury levels.

[52] Such as still waters, wetlands, and anaerobic sediment.

[53] Overall monitoring and inspection is required every month, but specific inspections for each type of hazardous waste may take place less regularly if it can be demonstrated that its risk/hazard level does not require monthly inspection.

[54] Such as tanks, pipes/pipelines, valve flanges.

[55] Overall monitoring and inspection is required every month, but specific inspections for each type of hazardous material may take place less regularly if it can be demonstrated that its risk/hazard level does not require monthly inspection.

[56] Such as tanks, pipes/pipelines, valve flanges.

[57] This is especially relevant for contexts where your business and (potentially) affected rights-holders are in dispute about a particular (potential) adverse impact, and rights-holders are unlikely to accept the business' own tracking of the effectiveness of its response to it.

[58] This will be informed by the monitoring and evaluation process required in the previous Section, and on the review process required in a. to c.

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[62] Depending on the nature of the incident, it is possible that response measures for affected communities or workers have already been developed, and in such cases, they would need to be implemented. For example, in Chapter 2.6, emergency response plans are required to include measures that will be implemented if there are spills, leaks or releases of hazardous materials or hazardous wastes (2.6.3.2). Similarly, Chapter 3.2 includes specific measures that are required to be taken if there is a verified imminent and serious threat to human health (See Section 3.2.12), including the authority to stop work in the area until the situation is remedied.

[63] These types of issues may be identified, for example, through regular inspections or reported by workers. When they are identified, remedial measures would need to developed within seven days of the issue/incident, however, implementation may require a longer time frame (e.g., in situations where ordering parts or scheduling shutdowns may be necessary).

[64] All material must remain publicly accessible at least until the completion of all post-closure activities (including any previous versions, iterations and revisions). Note that the intention is not that the reports should be removed from the public domain after that. Rather, where possible, it should be retained indefinitely as the information may be important for legal or other purposes.

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