
**Mine closure and reclamation –
Managing mining legacies —**

**Part 1:
Requirements and recommendations**

*Fermeture et remise en état des mines — Gestion des héritages
miniers —*

Partie 1: Exigences et recommandations

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 82, *Mining*, Subcommittee SC 7, *Mine closure and reclamation management*.

A list of all parts in the ISO 24419 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The purpose of this document is to define a framework for managing mining legacies which, when applied, ensures a comprehensive and multidisciplinary approach at both a whole program and individual project scale. This document targets the management of negative legacies to create positive ones by reducing impacts, and where possible, creating opportunities. Critical to successful implementation of this standard is participation of stakeholders. Mining legacies are typified by a loss of control, be that loss of regulatory and/or site operator's control or the affected communities' influence on the former mining operation. Current site owners can be responsible for mining legacies, through acquisition or other means, whether or not they were responsible for their creation. Sometimes the party or parties responsible cannot be found, are unwilling or unable, financially, to carry out the required reclamation, mitigation and management measures within an acceptable timeframe. This document applies to all mining legacies and responsible parties.

In recent years, efforts to create conditions and frameworks for sustainable mining processes have intensified worldwide. The 17 sustainable development goals (SDGs) adopted by the United Nations in 2015 drive this trend. The 5 core principles (people, planet, prosperity, peace and partnership) clarify the connections between the goals and reveal the link to global mining. [Table 1](#) illustrates how these goals can be applied. This list is not exhaustive and local requirements will guide how these goals might be applied.

This document requires certain activities of organizations to manage the negative impacts of mining legacies. However, it also requires organizations to go beyond simply reducing negative impacts to consider the positive outcomes that can generate social, economic and environmental benefits.

Where specific plans or reports are referred to more than once, they have been included in [Annex A](#) to highlight where reference is made.

ISO/TR 24419-2 provides resources to support implementation of this document through illustrative case studies and a bibliography for further reading and guidance.

[Figure 1](#) provides an overview of the framework for managing mining legacies and the structure of this document.

Table 1 — Incorporating the 17 UN SDGs when managing mining legacies

UN SD goals	Examples of mining legacy impacts	Examples of how UN SDGs can be addressed when managing mining legacies ^a
1 No poverty	Marginalised people living in degraded environments	Upgrade the quality of the environment and local economy through reclamation. Improve the local economy and social programs to help overcome localised poverty.
2 Zero hunger	Unproductive degraded lands and water	Remediate land and water to create sustainable and productive land uses, enable recovery of ecosystems, farmland for food growing and other livelihoods.
3 Good health and well-being	Poor health from contamination	Remediate mining legacies to improve quality of life by improving air quality, treating water to improve utility, creating safe landscapes, ecosystems and creating recreational spaces on former mined areas.
4 Quality education	Asymmetrical knowledge and capacity of local and impacted communities to participate	Provide education and build capacity so communities can fully participate in mine reclamation and closure processes. Countries with know-how to help solve local mining legacy problems share with those that do not while respecting local and cultural knowledge: incorporating that knowledge into planning and work.
5 Gender equality	Exacerbated inequality in environmentally and socially disrupted areas	Ensuring women have equivalent opportunities to men to be employed and remunerated in work on management of mining legacies. Women have an equal role and voice in engagement processes and are empowered to participate. Make former mined lands safe for families and ease the burden on women caused by difficulties accessing clean land and water.
6 Clean water and sanitation	Contaminated surface, ground and mine water	Remediation of mining legacies to prevent on- and offsite impacts from contaminated water, and/or provide alternative clean water sources during remediation.
7 Affordable and clean energy	Reliance upon traditional forms of energy	Transition from traditional carbon-based energy by accompanying ongoing mining legacy management with post-mining uses of mine lands, pits and water for clean energy production such as pumped hydro, solar, geothermal and wind, among other uses.
8 Decent work and economic growth	Loss of employment and traditional income streams through alienation of lands	Reinstate traditional economic relationships by remediating and repurposing mining legacies. Create new employment opportunities by transitioning from the legacy of an extractive economy to a regenerative one, a fair social benefit that provides work in reclamation and restoration, that reinstates cultural values, creates sustainable forests, farms and other inclusive and decent work.
9 Industry innovation and infrastructure	Outdated, undiversified and obsolete industrial bases	Create hubs of innovation through mining legacy reclamation by restoring threatened ecosystems, repurposing for innovative uses that engages communities in novel and interesting ways. Conduct research and trial new methods and innovative technologies to become a showcase for others to visit and learn from.
10 Reduced inequalities	Degraded lands impact people unequally because of where they live and have their livelihoods	Reclaim degraded lands and ecosystems: adding value to reduce inequalities. Apply high and consistent standards of reclamation and closure in both developing and developed nations so that poorer nations are not burdened with more and worse mining legacies. Share knowledge between developed and developing nations to reduce marginalisation, while promoting inclusive engagement of Indigenous Peoples and peaceful societies.

^a <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>

Table 1 (continued)

	UN SD goals	Examples of mining legacy impacts	Examples of how UN SDGs can be addressed when managing mining legacies ^a
11	Sustainable cities and communities	Abandoned mining dependent communities	Integrate planning with local and regional land use plans when managing mining legacies to create value from liability. Grow existing and create new economies and livelihoods that sustain the environment and benefit communities through reclamation and socio-economic regeneration. Repurpose mining legacies for brownfields renewal, encouraging new businesses, recreation, eco-towns, industrial heritage and tourism and other uses.
12	Responsible consumption and production	Linear economy creates negative mining legacies leaving degraded landscapes	Apply the principles of circular economy by encouraging responsible reprocessing of waste, treating water and extracting value, seeking out further raw materials of value from mining legacies, such as for construction materials and critical raw materials. Ensure supply chain transparency by completing the final stage of mining. Ensure governance raises awareness of inadequate practices that may be hidden, especially the costs of mining legacies. Improve transparency for customers so they recognize the full cost of consumption that includes mining legacies.
13	Climate action	Greenhouse gas emissions and burning wastes	Contain the emission of greenhouse gases by extinguishing fires from uncontrolled burning coal seams and trap methane. Restore vegetation to capture carbon in plants and soil through reclamation of degraded environments. Adapt reclamation designs for mining legacy pits, slopes, catchments, encapsulation of contaminated wastes, to accommodate climate change in designs to ensure resilient planning for extreme weather events.
14	Life below water	Pollution adjacent to or within marine environments	Prevent contamination from mining legacies from entering marine environments by improved management of water and dust and remediating contaminated marine sediments. Reverse contamination and sedimentation from undersea tailings deposition and impacts on nearshore reef livelihoods. Apply sustainable reclamation methods to undersea mines and their wastes.
15	Life on land	Degraded lands due to waste rock, tailings and other wastes	Reverse land degradation to restore life by controlling erosion, containing wastes, restoring native ecosystems, forests and agricultural uses. Revegetate to combat desertification, contain dust and encourage restoration and recovery to sustainable ecosystems. Involve communities in reclamation to ensure appropriate and sustainable uses of these lands.
16	Peace, justice and strong institutions	Conflict in former mining areas	Ensure sound governance that is transparent and avoids corruption. mining legacy programs will ensure respectful and fair engagement, involving all stakeholders and empowering disadvantaged or marginalized communities through education, training and involvement in managing mining legacies.
17	Partnerships	Fragmented communities and environments	People who are vulnerable should be empowered by partnering with companies, agencies and/or multi-stakeholder groups to facilitate progress on mining legacy reclamation and closure. Seek out new opportunities for funding such as cross-sector partnerships to treat and manage water. Partner with development funding to build community capacity concurrent with biophysical works. Build trust and understanding through respectful participation with mining legacy affected communities.

^a <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>

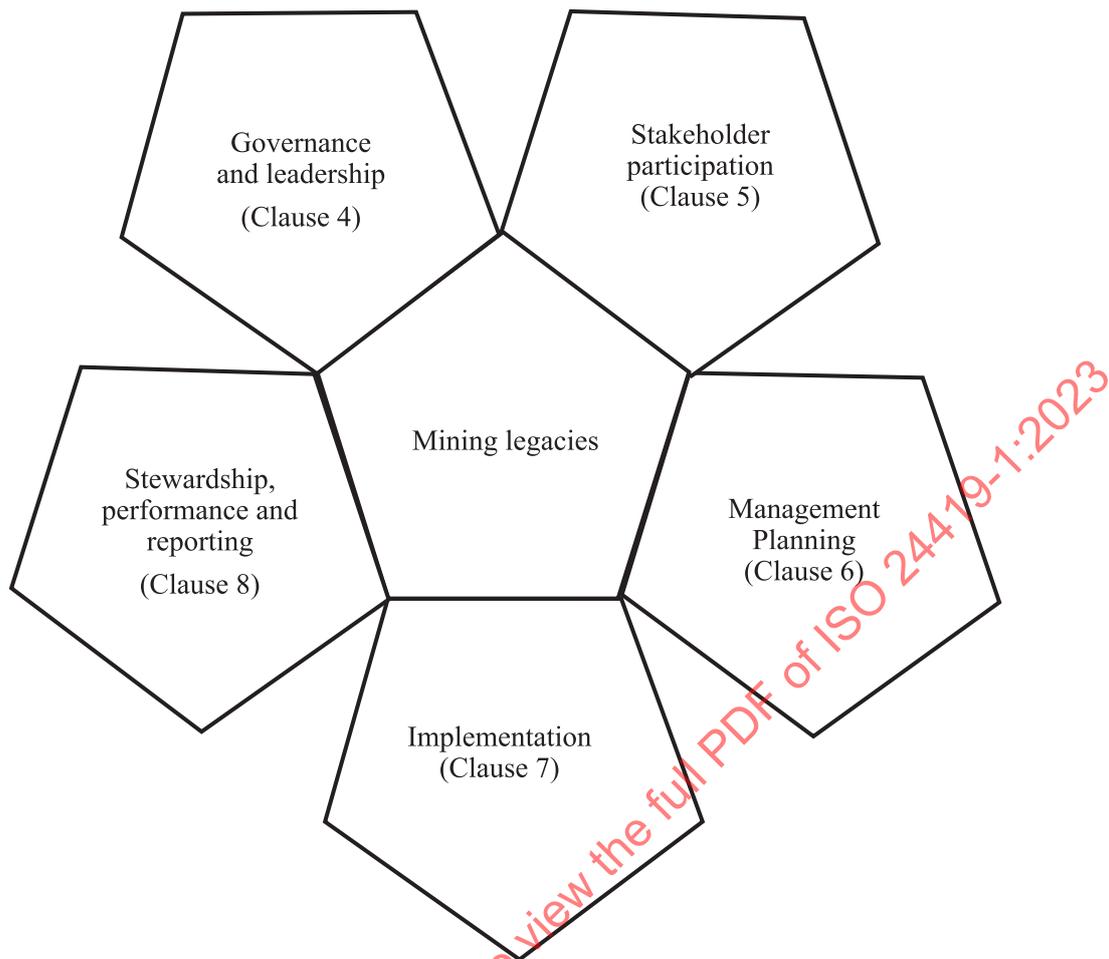


Figure 1 — Structure of this document

Mine closure and reclamation – Managing mining legacies —

Part 1: Requirements and recommendations

1 Scope

This document establishes requirements and recommendations for managing mining legacies. It can be used by any public, private or community enterprise, or group, but is deemed particularly relevant to government and the mining industry who have a legal right or obligation to manage mining legacies.

This document encompasses a range of activities that are relevant to planning, implementing and stewardship, performance and reporting when managing mining legacies while engaging stakeholders throughout the process. It is applicable to all mining legacies from large complex sites to medium and small mines. It is also applicable to mining legacies in a range of climates, land uses and social contexts. Managing mining legacies can pose complex challenges that require high level support and clear responsibilities to ensure delivery of acceptable outcomes. The process of managing mine closure and reclamation for active mines is addressed in ISO 21795 series.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 20305, *Mine closure and reclamation — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20305 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 mining legacy

residual mine impacts (positive and negative) that have accrued from mining

3.2 four dimensional monitoring

monitoring of three spatial dimensions and one temporal dimension

Note 1 to entry: This describes an ongoing process of spatio-temporal monitoring at a specific location(s) and over a specific time period where time-series analysis of data helps interpret dynamic and spatially variable impacts on the environment and people during the life cycle of a mine

**3.3
stewardship**

care, maintenance, management of mined land after closure and reclamation that ensures ongoing management of risks and opportunities

Note 1 to entry: This usually includes surveillance, aftercare, monitoring and maintenance for both mining legacies (this document) and sites subject to a regulated closure process ISO 21795

**3.4
institutional control**

legal or administrative action or requirement imposed on non-operational mined land to protect and maintain reclamation works and minimize human exposure to harm while protecting values and particular ongoing uses

Note 1 to entry: These controls may include deeds, land use zoning, access, security and monitoring.

**3.5
organization**

company, firm, enterprise, government, authority or institution, whether incorporated or not, public or private, that has its own functions and administration

Note 1 to entry: Organization does not include an individual 'person or sole trader'

**3.6
mining legacy program**

organized program to manage mining legacies

Note 1 to entry: Programs can be international, national or sub-jurisdictional, catchment scale and may include a mining company's portfolio of closed sites or other means of defining the *mining legacy* (3.1) responsibilities of an entity. A program may be comprised of individual projects.

**3.7
management plan**

documented actions required to manage risks and opportunities that have been identified through a risk-assessment process

**3.8
social license**

ongoing acceptance by employees, stakeholders, and the general public of how plans are developed and implemented

**3.9
social benefit**

improved aesthetics, ecosystem services, new employment and capacity building, revitalised regional areas and healthier communities

**3.10
contingency plan**

emergency response and disaster recovery strategy for an unplanned event

**3.11
kinship leadership**

shared governance that ensures all people involved are valued and respected for the unique knowledge and skills that they individually and collectively bring

**3.12
good samaritan legislation**

tool to provide legal certainty to non-liable parties who volunteer to clean up mine sites

4 Governance and leadership

4.1 Applying the SDGs

Organizations should apply the 5 core principles (people, planet, prosperity, peace and partnership) of the UN SDGs in line with [Agenda 2030](#) (see [Table 1](#)). Mining legacies are a product of the linear economy that takes value and leaves negative legacy, and thus should adopt the principles of a circular economy to add value through reclamation. Organizations should apply the principles of the waste hierarchy by finding value in waste materials where this is compatible with program objectives.

The process whereby mining legacies were created may not have been transparent. The organization shall ensure their management of mining legacies facilitates a free flow of information to stakeholders.

Mining legacies have failed to close in the manner expected of an operating mine (refer to ISO 21795-1 and ISO 21795-2) and are unlikely to be accepted by society impacting the reputation of industry and thus social license to open new mines. Mining legacies shall be managed in a way that achieves social acceptance by applying the 17 SDGs adopted by the United Nations (UN) in 2015. Through the process of addressing SDGs within mining legacy programs and projects, society is likely to be more supportive of new mining projects.

4.2 Shared governance framework and partnerships

The organization in collaboration with key stakeholders shall evaluate potential governance structures to manage mining legacies then select the most appropriate one for their jurisdiction and/or project.

Where local traditional custodians of land have been subjected to disruption from mining and persistent mining legacies, novel governance frameworks should be explored; for example a shared governance model centred around kinship leadership underpinned by valuing the connections between land, people and the environment.

The organization shall seek beneficial socio-economic and environmental outcomes by developing and sustaining social license through collaborative stakeholder relationships with evidence of this intent and progress recorded in the socio-economic plan. Recognizing that funding mechanisms are often required to incentivise cross-sector partnerships, such mechanisms should be established up front and sustained. Where stakeholders change throughout time, partnership arrangements shall be adjusted to sustain the partnerships and mutual socio-economic benefits.

4.3 Objectives and criteria

The organization shall clearly define the objectives for its mining legacy program ensuring that they are aligned with UN SDGs, and are developed in consultation with stakeholders.

Designing, implementing and reviewing a mining legacy program, shall take into account the varying needs of stakeholders and collective objectives for managing the program within unique contexts and histories. When the objectives are developed they shall:

- take into account the legal basis for managing mining legacies,
- address environmental, social, cultural and economic aspects,
- be accessible and be able to be easily interpreted,
- seek to reduce liability and risk, and
- create value and opportunity.

When developing criteria for remediating mining legacies, organizations shall:

- be capable of measuring the performance of actions against objectives,
- be developed in consultation with stakeholders, and

- identify timeframes, milestones and responsibilities with clear accountability for achievement of the objectives.

4.4 Legal requirements

The legal requirements for managing mining legacies shall be identified, documented and periodically updated and may include those relating to

- land ownership and tenure (if any),
- liability ownership and transfer arrangements,
- land use zones and associated restrictions or covenants, contaminated land and buffer zones,
- site access procedures,
- sensitive areas: sacred and culturally significant sites, conservation requirements, and
- institutional controls for pre- and post-reclamation stewardship.

Where legal requirements are absent or legal barriers exist, the organization shall develop a strategy that adopts good practice to overcome those barriers and establishes legal requirements compatible with reclamation.

4.5 Inventory

The organization shall systematically create and maintain an inventory of its mining legacies with sufficient information to inform planning and management, plus estimate total program liability.

An inventory shall provide access to existing information so it can be updated from time to time as knowledge is gathered, and progress is made, developing incrementally with new information (see [Figure 2](#)), including all information that supports the prioritization of sites.

Where there is insufficient information on mining legacies to begin prioritizing work, the risk assessment ([6.1](#)) together with stakeholder engagement, shall identify information needs. In this case a structured program of investigations shall be implemented to gather data and information ([4.10](#)). New information shall then be progressively added to the inventory.

The inventory shall

- contain sufficient information of adequate quality to enable risk assessment and prioritization of mine sites for investigations and/or works to be undertaken,
- note the sources and quality of spatial data in a spatial data management system that identifies the location of each mining legacy site, together with accurate data on land use, settlements and population density in the vicinity of the site(s),
- include spatial layers and four-dimensional monitoring data for (hydro-) geology and geochemistry, climate, sensitive receptors in the vicinity and in the receiving environment, identifying relevant environmental, cultural and social characteristics, including catchment values to be protected,
- record the historic and contemporary impacts and characteristics of each area, site and/or group of sites, such as; the commodity mined, size of mine, mine openings (e.g. shafts, adits), mining methods used, technology applied, residual infrastructure, land and mine tenure, mine maps (mine survey data plus deposit and non-mineralised caprock characteristics)
- include the spatial position (in three dimensions) of all materials that are contained in the waste facilities (in 3D), including substances and/or chemicals,
- link inventory to records from past and/or ongoing interactions between communities and the mining legacy(ies),

- integrate multiple data bases to present data in a relevant, accessible and meaningful way, while maintaining interoperability with other geospatial information system (GIS) databases according to local or international data frames.

The inventory and its databases shall be funded and managed in a manner that is supported over time and may require involvement of an independent organization, where this ensure greater long-term security and accessibility (such as a research or a public institute).

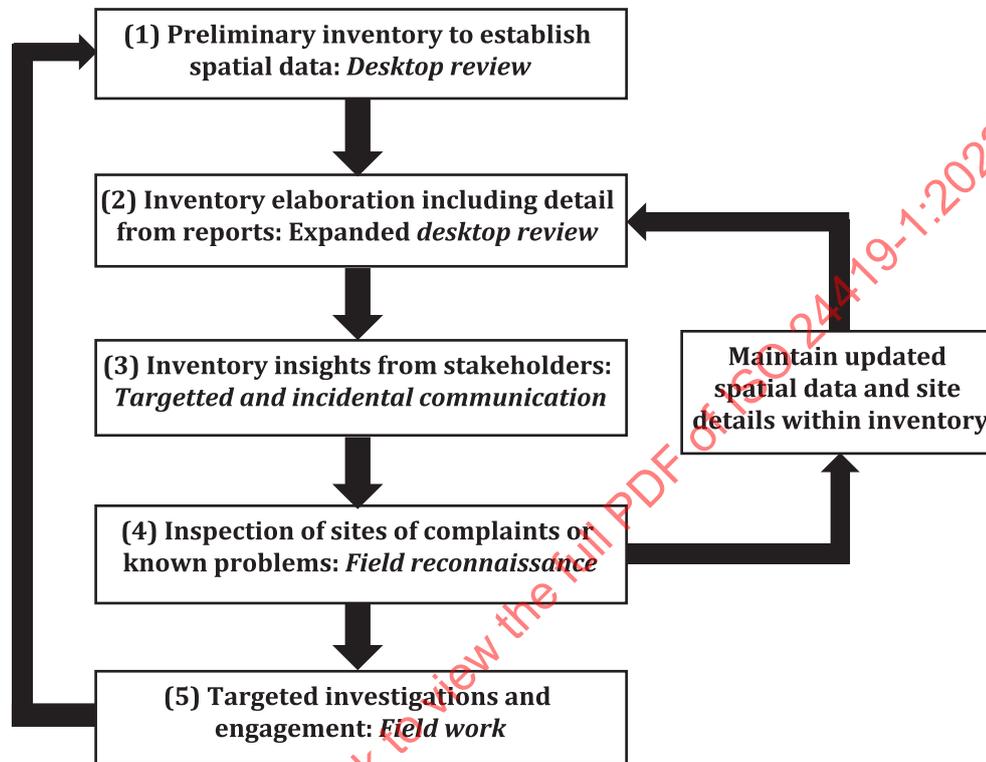


Figure 2. — Mining legacy inventory development

4.6 Cost estimation and liability accounting

The organization shall record the assets and liabilities of the mining legacies, subject to professional and legal accounting standards.

Cost estimation for managing mining legacies shall draw upon the management plan in order to meet objectives.

Following the risk assessment, costs of implementation shall be calculated to ensure funds are budgeted within specified time frames in order to implement the management plan.

4.7 Funding mechanisms

The organization shall develop and apply funding mechanisms appropriate to the scale and complexity and duration of management of the inventory of mining legacies. All funding options shall be considered that meet the objectives.

The organization shall ensure that they provide resources that can keep pace with mining legacy work required. Due diligence processes should ensure acquisitions account for purchased liability to ensure there are sufficient funds to remediate the mining legacies in agreed time frames.

Budgets shall be prepared and resourced for the program to meet the objectives within specific time frames.

The organization should allow funding for scientific research to test and trial reclamation initiatives.

Sources of funds should be diverse, multiple and innovative and include; general revenue, specific taxes, levies or royalties, or interest on financial assurance/bonds that are held as part of activities that fall within the requirements of ISO 21795-1, charitable trust funds, regional development grants. Existing examples include

- “Good Samaritan” legislation as a means of offsetting liability,
- capital funds that accumulate interest to pay for liabilities, and
- public-private-partnerships where collaboration provides shared resources to manage mining legacies (refer to ISO/TR 24419-2).

4.8 Competence, capacity and resourcing

The organization shall ensure that responsibility for compliance with each clause of this document is clearly assigned to persons or groups for the purpose of accountability and auditability, with resources to carry out the work.

The organization shall appoint appropriately trained and experienced personnel to establish, lead and sustain the management of mining legacies with competency, capability and resources to bring together the multidisciplinary expertise needed. The organization shall ensure the personnel leading the program:

- have the necessary competencies identified through a skills audit,
- have multidisciplinary expertise aligned with the needs of the program,
- maintain continuity to achieve objectives,
- are empowered with flexibility and resources to engage external experts as required to expand the capacity and competence to meet the needs of the work, and
- maintain professional development, keeping abreast of innovations as well as updates to relevant technical standards or guidelines and engaging in training on appropriate use of frameworks and instruments (4.9).

The organization shall annually review completion of work against planned schedule and engage additional resources where required to ensure progress meets internal and external stakeholder expectations.

4.9 Frameworks and instruments

The organization shall apply recognized good practice frameworks and instruments to ensure rigor in the program (some of which are illustrated in ISO/TR 24419-2). Such frameworks shall support the prioritization of tasks.

A risk management framework shall be developed and applied to evaluate and guide managing the uncertainties of achieving project objectives together with the potential benefits.

Socio-economic instruments shall be applied when engaging with stakeholders, assisting with accessing and managing data and identifying key issues of concern to the public, thereby informing the socio-economic plan (5.2) that will also support gaining social license. These should include stakeholder identification and engagement instruments, social baseline assessment and skills audit frameworks.

Where existing frameworks are inadequate, investigations and research shall guide the development of new, purpose-specific frameworks.

Where numerical modelling is used, the results shall be reported with a description of inputs, methodology and assumptions. Modelling results should be critically examined by experts and evaluated with regard to their limitations.

Frameworks and instruments should be applied by practitioners with the appropriate expertise to meet the site-specific requirements. Frameworks and instruments are useful for

- site investigations,
- contingency planning,
- project management,
- quality assurance,
- contaminant modelling,
- water balance modelling,
- cultural heritage assessment and management
- economic opportunity and evaluation,
- social impact assessment, and
- community capacity building.

4.10 Documented information

The organization shall establish and maintain a system that manages the documented information that shall include but not be limited to

- inventory ([4.5](#)),
- electronic records, photos, maps, hard copy files,
- commitment register recording commitments to stakeholders ([5.1](#)),
- management plan ([6.3](#)),
- quality assurance/quality control (QA/QC) plan,
- stakeholder participation plan ([5.1](#)),
- socio-economic plan ([5.2](#)),
- reclamation plan,
- stewardship plan ([8.2](#)),
- contingency plans ([4.9](#)); and
- final report.

Documented information shall be maintained in a way that is capable of expanding as new data are gathered and added to the system. Such information shall include documented information relevant to managing the mining legacy, but not be limited to:

- facts, findings and important information learned from previous phases of operation,
- site plans, permits and licenses, work programmes,
- relevant legislation,

- work schedules,
- procurement process and database of experts,
- equipment lists,
- employment records,
- material types and volumes,
- safety inspections,
- research and development,
- community consultations,
- commitments,
- assumptions for liability accounting,
- reconciliation of costs,
- compliance database,
- geospatial information system (GIS) spatial data,
- evidence of assessments (e.g. strengths, weaknesses, opportunities and threats, and cost-benefit analysis),
- sensitive receptors (e.g. downstream water users, environmental values, etc),
- incidents (environmental, social and/or human health and safety),
- criteria and monitoring results, and
- media interactions.

Documented information shall be accessible to stakeholders with commonly available hardware and software. If required by stakeholders, certain information should be kept confidential. Plain language explanations of complex technical documents shall be provided for non-expert audiences.

Attention shall be paid to provisions for ensuring documented information will be easily transferable into future editions of the relevant software.

Hard copy documented information required for managing mining legacies shall be scanned and stored in a similarly accessible form to protect information from loss or damage.

Arrangements shall be made for separate, secure storage of a duplicate set of documented information preferably with a public authority and according to pertinent regulations. The documented information should be reviewed and updated as required but also on a regular schedule, depending upon the significance of the information to the program.

5 Stakeholder participation

5.1 Stakeholder identification and engagement

Stakeholder participation shall be aligned with the governance framework applied (4.2) to gain and maintain social license. The organization shall identify stakeholders and engage them in respectful participation processes while developing a stakeholder participation plan that is updated regularly to record intentions and progress.

Stakeholders engaged in managing mining legacies should include but are not limited to:

- mining companies,
- governments (all levels),
- current and future landowners: Indigenous and others,
- communities including local businesses,
- catchment managers,
- non-government organizations,
- researchers and other professionals,
- artisanal and small-scale miners, and
- entrepreneurs and investors.

All formal and informal agreements made with stakeholders shall be recorded in a commitment register (4.10).

Organizations shall pursue opportunities for Indigenous reconciliation when managing mining legacies. This shall be undertaken by developing and maintaining a mutually respectful relationship with indigenous people, researching Indigenous history, culture and contributions, while acknowledging harmful policies and practices that have impacted Indigenous ways of life. The organization shall outline specific actions and agreements with Indigenous people to manage the mining legacy.

Stakeholder participation shall:

- ensure participation is integrated into all phases including planning, risk identification, option selection, reclamation, monitoring and long-term stewardship,
- ensure participation advances and strengthens the socio-economic plan and its implementation, and
- recognize that an important function of participation is to identify risks and opportunities important to stakeholders, (ISO 31000).

Stakeholder participation plans should record stakeholder input and ensure appropriate participation with them by:

- outlining how stakeholders will be/have been identified, what level of engagement and interests each stakeholder/group seeks, and guided by this understanding, communicate with and ensure participation of stakeholders,
- identifying the cultural connections between communities and former mines to recognize, protect and sustain those traditions, routines, groups and networks,
- acquiring the knowledge from former employees and those connected to the mining legacy,
- outlining the activities that will be undertaken in order to ensure transparency and build public trust,
- demonstrating to stakeholders how their input is incorporated into plans, decision making, partnerships, and knowing what information updates are required,
- explaining how free, prior and informed consent will be demonstrated, to preserve Indigenous people's cultural resources, expression and way of life, and
- engaging and communicating with stakeholders in a manner and form that is appropriate to their education, cultural values and technical understanding.

Stakeholders shall be consulted on significant changes in scope and be involved in the project completion review.

When developing a contingency plan or hazard reduction program, the organization shall ensure that environmental, social and cultural values are not destroyed or harmed.

Stakeholder knowledge shall also be respectfully accessed.

5.2 Socio-economic planning

Stakeholders and specialist expertise shall be engaged to collaboratively develop a socio-economic plan that creates social benefit. Where there is potential for social benefit, opportunities should be given to local communities to participate in managing mining legacies. This includes building capacity to allow local employment and procurement to maximize opportunities and strengthen social license for projects.

The organization shall outline the process of developing the socio-economic plan so it is clear which stakeholders were engaged (when and how) together with their perspectives: report on commitments, review progress and update the plan. The organization socio-economic plan shall seek to:

- create transparency by communicating to local and wider audiences to raise awareness of social impacts of the mining legacy so that these are addressed through this plan,
- provide support to communities affected by the mining legacy to improve living standards,
- involve affected stakeholders in decision making to include local knowledge and collaboratively solve the challenges,
- identify opportunities for employment, training and other ways of leveraging local capacity and knowledge to sustain the social fabric of communities,
- integrate cultural connections to places by identifying reconciliation activities that return land, culture and access,
- collaborate with those at active mines operating nearby and potentially interacting with a mining legacy to gather information (e.g. closure plans and timing, community needs analysis), and
- integrate shared governance and partnership agreements (4.2).

6 Management planning

6.1 Risk management

Risk management shall meet the objective of leaving minimal residual risk and requirement for stewardship while adding value wherever possible.

The organization shall identify the risks posed by;

- the mining legacy;
- implementing the preferred solution; and
- potential failure of the implemented solution.

The organization shall identify and assess risks by utilising multiple sources of data, information and knowledge including that from stakeholders, to protect and create value, to improve performance, encourage innovation and support sound decision making for the achievement of objectives (consistent with ISO 31000).

The organization shall implement control measures that emerge from the risk assessment process and document them in the management plan that indicates what works and other activities are needed within short, medium and long-term time frames.

The organization shall develop and apply a risk management framework:

- that outlines how risk and opportunity assessment is carried out, while ensuring safe access to, and work conditions of, the site to keep personnel safe,
- which includes proven control measures to achieve objectives and reports on control measure performance,
- that engages appropriate expertise including stakeholders to identify and prioritize risks and guide control measures,
- that is regularly reviewed and updated to ensure control measures are achieving objectives, and
- which applies four-dimensional monitoring and analysis to ensure a sound understanding of ongoing processes

The organization shall regularly review risks to ensure objectives (4.3) are being achieved by:

- identifying risks important to stakeholders aligned with the governance framework
- detecting significant changes, progress or delays, and new knowledge,
- responding to emergent risks by engaging specialised expertise to complement in-house expertise,
- evaluating opportunities to align organizational and stakeholder needs with sustainable development principles,
- keeping understandings of risks, control measures and priorities up to date,
- triggering communication, and
- adjusting to minimize residual risk.

6.2 Creating opportunities

The organization shall evaluate potential opportunities to optimize beneficial reuse compatible with local and regional land use plans.

Stakeholders shall be included in an opportunity assessment to identify values and benefits.

In order to conserve and/or restore cultural connections with landscapes, historic, Indigenous, industrial or other heritage at or in the vicinity of the mining legacy, these features or areas shall be recognized and incorporated into management.

Repurposing of the site shall be considered along with other opportunities to facilitate social benefit by: promoting healthier communities, improving aesthetics, enhancing ecosystem services, creating employment, revitalising regional areas and increasing visitation where tourism is important (see [Table 1](#)).

The organization shall undertake a thorough assessment of the potential value of the waste in keeping with the principles of a circular economy, before reclamation takes place, so that closure integrates and promotes future utilization of the residual waste facility.

Potential reuses of mining legacies shall respect land ownership, incorporate cultural heritage, recreation, education and research, biodiversity, as well as possible commercial uses and could include:

- re-mining of sites,
- secondary processing of mine wastes for critical and other mineral value,

- use in biodiversity and water offset schemes,
- carbon sequestration projects,
- using waste material for building materials, road construction and artificial soil creation,
- renewable energy generation,
- industrial or commercial parks,
- agriculture and forestry,
- residential areas,
- tourism ventures,
- landfill facilities, and
- providing a water supply needed by other industries.

The organization shall recognize the site constraints that include:

- biophysical attributes,
- community needs and expectations,
- cultural heritage value and use,
- environmental and socio-economic values,
- costs of potential liability, and
- approval pathways.

Partnerships shall assist in encouraging reuse options through private sector commercial agreements or government led programs.

6.3 Management plan

A management plan shall be developed for each mining legacy and/or mining legacy program for multiple legacies in a region, to explain how risks and opportunities will be managed. The management plan shall be appropriate to the scale of the mining legacy and the nature of the risks and include:

- the objectives and completion criteria (4.3),
- any legal requirements (4.4),
- hazard reduction program (7.2),
- technical recommendations and options identified and how the preferred reclamation option was selected and agreed (based on detailed design 7.3),
- guiding principles of frameworks and instruments (4.9),
- benchmarks with 'state of the art' methods for achieving leading practice,
- how stakeholders were involved in the process (5.1), and
- contingency plans (4.10),
- socio-economic plan (5.2),
- site investigations (7.1),
- reclamation plan(s), (7.3),

- project budget and duration (4.6 and 4.7),
- human resources assigned to the project (including external expertise) (4.6 and 4.8),
- inventory and documented information (4.5, 4.10),
- performance and compliance monitoring and review reporting (biophysical, cultural and socio-economic) (8.1), and
- stewardship plan (8.2).

7 Implementation

7.1 Site investigations

The organization shall undertake a desktop risk assessment and start populating the inventory (4.5) and database before sites are accessed for field risk assessment and investigations, to ensure worker safety and appropriate equipment is taken into the field. This includes available documented information, investigations and technical reports on the site (sub-surface and surface) and its surrounding areas. The history of the community and other stakeholder interactions shall be examined (see Figure 2).

Further investigations essential for evaluating risks and opportunities and developing a reclamation and stakeholder participation plan, shall be planned and implemented to address critical knowledge gaps.

For field reconnaissance to be efficient the organization shall include mobile, portable and real-time four dimensional monitoring data to ground truth information gathered from desktop review and preliminary insights from conceptual predictive models (e.g. for ground stability or source-pathway-receptor assessment).

Investigations shall use site information and data from field reconnaissance to develop an understanding of site processes, that informs risk assessment and management to develop a reclamation plan.

7.2 Hazard reduction program

A hazard reduction program shall identify and apply interim measures to ensure public and investigator safety. This does not replace the need for reclamation but creates safe access to the site by ensuring hazards are contained while the organization develops the detailed design. The hazard reduction program addresses physical works required as well as early participation with stakeholders to help ensure their safety and health by using their experience and knowledge to identify and understand critical hazards. The hazard reduction program shall be concurrent with developing the management plan and accessing finance for implementation.

Interim measures should directly reduce the hazards, and potentially change how the public interacts with the site while investigations and planning proceed.

Review of the effectiveness of the hazard reduction program shall be completed annually to ensure reassessment of hazards and effectiveness of control measures.

7.3 Reclamation planning

Evaluation and selection of reclamation options for mining legacy features shall meet the objectives by integrating investigation results and supporting information.

The organization shall involve stakeholders in the evaluation of options to allow for discussion and the development of a collective understanding of expectations in order to identify and make transparent the preferred option, as it advances from conceptual design to detailed design.

Work shall be undertaken to develop the design within a reclamation plan. This includes development of landform specifications, material and water balances and water management. Once the design reaches detailed design stage, an independent peer review shall be commissioned to ensure the designs will achieve the objectives.

Project schedules which take into account weather, resource limitations and unplanned situations such as emergencies shall be included as contingency plans in the reclamation plan.

Construction specifications, workforce plan, work schedules and budget designs shall be included in the reclamation plan to clearly articulate the works to be done necessary for implementing the preferred option.

Depending upon the size and complexity of the mining legacy:

- a constructability assessment of the preferred reclamation option shall be considered to ensure it can be implemented;
- procurement options that both addresses the needs of the project and shall include the opportunity for local employment (5.2 and 6.2).

Quality assurance and quality control shall be implemented to ensure that the project meets design specifications to achieve objectives and meet professional standards. This information shall be documented in the reclamation plan.

7.4 Executing the management plan

The organization shall execute the management plan within agreed timeframes. Implementation shall include consultation with stakeholders defined in the stakeholder participation plan (5.1) in pre-scheduled, regular and agreed stakeholder meetings.

The organization shall undertake regular reviews and update of the scope, schedule and budget of the management plan during implementation. This review process shall address remaining areas of uncertainty before works are implemented.

Implementation shall be led by professionally accredited project managers and other professionals that have appropriate scheduling, budgeting and supervision experience.

Should there be a need to review the design during implementation an independent peer reviewer or panel, depending upon the complexity of the design change proposed, shall be commissioned to ensure the designs achieve the objectives.

A final report shall be prepared which documents activities conducted including any changes that varied from the approved design specifications.

During implementation, an integrated stewardship maintenance, monitoring and aftercare plan shall be developed (8.2).

8 Stewardship, performance and reporting

8.1 Performance review

The organization shall review its management of mining legacies periodically to evaluate effectiveness and improve management by returning to address shortcomings in implementation, while providing transparency by reporting on:

- achievement against objectives and completion criteria,
- progress on implementation of management plans,
- four-dimensional monitoring data and analysis,