Final Report Project 1.9

Mine closure guidance: Review and comparative analysis

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Author Affiliation

a. The University of Western Australia

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Contact Details

Dr Pietro Guj

Email: pietro.guj@uwa.edu.au

CRC TiME Contact

hello@crctime.com.au

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1.0 Executive Summary

Increasingly stringent societal expectations and the drive towards sustainability have, in recent years, resulted in significant enhancements in mine closure (MC) planning and implementation by industry and pressure on most mining jurisdictions to update and refine their mine site rehabilitation policy and procedures.

The following comparative analysis of eleven selected key global, regional, and Australian jurisdictional MC guidance documents is based primarily on research originally carried out at the request of the Northern Territory (NT) Government with the objective to inform current improvements to its MC regulatory regime.

In general, some international institutional guidance (e.g. World Bank, Asia-Pacific Economic Cooperation (APEC)) is targeted primarily at governments while others (e.g. International Council of Mining & Metals (ICMM), the Mining Association of Canada (CMA)'s Towards Sustainable Mining (TSM)) target industry. By contrast, Australian jurisdictional guidance focuses primarily on informing and facilitating compliance by mining industry operators.

International guidance tends to be by way of single comprehensive or cohesively structured documents covering all aspects of MC. By contrast jurisdictional guidance generally consists of a 'main' document supported by a multitude of 'ancillary' documents dealing with specific MC issues (e.g. exploration versus mining, small versus large operations, financial assurance, rehabilitation of legacy mine sites etc.) nested within a regulatory system cascading from mining and environmental laws and related enforceable regulations, down to 'how to' compliance instructions.

Although ideally guidance documentation should be suitable for use to the greatest level possible by the various assessment and regulatory government instrumentalities (e.g. mining, environmental and state development etc.) involved in the MC processes, this is rarely the case which further increases the number of relevant documents.

As different MC guidance documents are very different in style, length, emphasis, and the extent they dwell on various MC activities/processes, a fair, like-for-like comparison in their entirety is virtually impossible. Consequently, this study analysed the quality/fitness-for-purpose of individual chapters/sections of each guidance document in relation to 11 key 'MC activities' and 13 different 'Useability Attributes' as an effective method to obtain a weighted assessment and score for each document, thus enabling comparison.

Finally, the total weighted MC activity score and the total weighted useability score of each document were combined into a single aggregate weighted score on which their summary ranking order as shown in the table below is based.

ICMM's 2019 Integrated Mine Closure – Good Practice Guide was placed at rank 1 followed by WA's, Victoria's, Queensland's, and the World Bank's documents. While the Western Australian MC guidance would represent the best initial basis on which to draw when shaping the future MC guidance in Australia, it could be complemented with the best aspects of MC guidance from other jurisdictions as for instance the Victorian Government's 2020 "Rehabilitation bonds – mineral

exploration, mines and quarries" and related cost estimation calculator, as well as from the ICMM's Good Practice Guide.

Given the different timing and types of disturbances it would be practical to separate guidance relating to the exploration stage up to and including a pre-feasibility study from that relating to mine development/construction and operations. These in turn should be separate from documentation of policies and practices relating to rehabilitation of legacy mine sites that are primarily used by government rather than industry.

Guidance Document	*Total Weighted Activity Score*	*Total Weighted Useability Score*	*Total Aggregate Weighted Score*	*Ranking Order*
ICMM[1]	177	207	384	1
Western Australia	156	214	370	2
Victoria[2]	138	194	341	3
Queensland	132	177	318	4
World Bank	139	177	316	5
Australia[3]	131	182	313	6
APEC	99	185	284	7
ISO	87	157	244	8
ANZMEC/MAC (Can.)	53	124	177	9
IGF	25	113	138	10
TSM/MCA (Aust.)[4]	28	99	127	11

Notes: 1 – 2019 Mine Closure Guidance. 2 – Metalliferous mine guidance not applicable to declared (coal) mines. 3 – 2016 Leading Practice for Sustainable Development Mine Closure Handbook. 4 – General framework only.

The analysis also revealed the presence of a few gaps where recent policy trends and emerging societal priorities have not yet been fully captured in current guidance. For example, further attention may need to be devoted to areas such as setting social/socio-economic objectives and transition strategies, formulating clear pathways to relinquishment, addressing inconsistencies relating to mines under care and maintenance and, more comprehensive coverage of alternative land uses, re-purposing, and re-use of mining assets. Greater emphasis should also be placed on post-closure impacts and opportunities in the regional planning context beyond the boundary of individual mining leases.

2.0 List of abbreviations

AMD	Acid Mine Drainage
AMEC	Association of Mining and Exploration Companies
APEC	Asia-Pacific Economic Cooperation
CME	Chamber of Mineral and Energy Western Australia
CRC TiME	Cooperative Research Centre for Transformations in Mine Economies
DEMIRS	WA's Department of Energy, Mines. Industry Regulation and Safety
DITT	NT's Department of Industry, Tourism and Trade
DWER	WA's Department of Water and Environmental Regulation
EIS	Environmental impact stage
ICMM	International Council on Mining and Metals
IFC	International Finance Corporation (part of World Bank Group)
IGF	Intergovernmental Forum on Mining, Minerals, Metals & Sustainable Development
ISO	International Standards Organisation
TSM	Mining Association of Canada's 'Towards Sustainable Mining'
LMU	Northern Territory Legacy Mines Unit
LoM	Life of mine
MAC	Mining Association of Canada
MC	Mine closure
MCA	Mineral Council of Australia
MCP	Mine closure plan
MMA	NT's Mining Management Act
Qld	The State of Queensland
TSF	Tailings Storage Facility
Vic	The State of Victoria
WA	The State of Western Australia
WB	World Bank
WABSI	Western Australia Biodiversity Science Institute

3.0 References to "main" guidance documents

Throughout this report, reference is made to the "main" guidance document of individual institutions or jurisdictions which represents the highest-level guidance in most instances supported by a suite of "ancillary" guidance documents. Accordingly, we refer to the following as main guidance documents in the order in which they are listed:

- World Bank main guidance: World Bank 2021. Mine Closure: A toolbox for governments, 87p. World Bank Group, Washington.
- ICMM main guidance: ICMM 2019. Integrated Mine Closure — Good Practice Guide 2nd Edition, 138p. International Council on Mining and Metals, London.
- IGF main guidance: IGF 2021. Global Review: Financial Assurance Governance for the Post-mining Transition, 43p. International Institute for Sustainable Development, Winnipeg.
- ISO–Part 1 guidance: International Organization for Standardization 2021a. ISO 21795-1 Mine closure and reclamation planning — Part 1: Requirements, First edition 2021-10, 16p. International Organization for Standardization, Geneva.
- ISO–Part 2 guidance: International Organization for Standardization 2021b. ISO 21795-2 Mine closure and reclamation planning — Part 2: Guidance, First edition 2021-10, 71p. International Organization for Standardization, Geneva.
- TSM–MC Framework guidance: Mining Association of Canada 2008. Towards Sustainable Mining - Mine Closure Framework, 1p. Mining Association of Canada, Ottawa.
- APEC guidance: APEC Mining Task Force 2018. Mine Closure Checklist for Governments, 96p. Asia Pacific Economic Cooperation, Singapore.
- Australia-MC main guidance: Department of Industry, Innovation and Science 2016. Mine Closure Leading Practice Sustainable Development Program for the Mining Industry, 121p. Australian Government, Canberra).
- ANZMEC–MCA guidance: Australia and New Zealand Council Minerals and Energy Council and Minerals Council of Australia 2000. Strategic framework for mine closure, 22p. Australian Government and Minerals Council of Australia, Canberra.
- Victoria main guidance: Victoria Department of Jobs, Precincts and Regions 2020. Preparation of rehabilitation plans. Guideline for mining and prospecting projects, February 2020, 73p. Victorian Government, Melbourne. It should, however, be noted that this guideline does not apply to declared mines (i.e. Hazelwood, Loy Yang and Yallourn in the Latrobe Valley) and mines able to operate under the Code of Practice for Low Risk Mines (2014).
- Queensland main guidance: Queensland Department of Environment and Science 2023. Guideline Progressive rehabilitation and closure plans (PRC plans), 71p. Queensland Government, Brisbane.
- Western Australia main guidance: Western Australia Department of Energy, Mines, Industry Regulation and Safety 2023. Mine Closure Plan Guidance - How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans, 73p. Western Australia Government, Perth.

4.0 Acknowledgements

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6.0 INTRODUCTION

6.1 Background

Increasingly stringent societal expectations and the drive towards sustainability have, in recent years, resulted in significant enhancements in mine closure (MC) planning and implementation by industry and site rehabilitation policy and procedures by most mining jurisdictions and leading international mining institutions.

Mine closure is a complex, multidisciplinary undertaking, requiring a coordinated effort from government and industry, in consultation with communities and other stakeholders, ideally upon commencement of mine planning and throughout the life of mine (LoM) designed to:

- Establish a shared vision for post-mining land use based on rigorous and regularly updated mine-closure plans (MCP) supported by indicative cost estimates and rehabilitation milestones. This aims to provide confidence that remediation will be completed to a contemporary standard, acknowledging that mining plans, community expectations, and environmental standards evolve over time.
- Ensure sites are safe, geotechnically stable, non-polluting, and capable of sustaining an agreed, ideally the most beneficial, post-mining land use.
- Plan for the social and economic transition of workers and communities following closure.
- Provide adequate financial assurance for government to effect closure plans even if a company fails financially and abandons the site without covering its closure-related liabilities and honouring its commitments.
- Relinquish the site back to government or a third-party following closure where possible.

6.2 Objective

This comparative analysis of selected leading national and international mine closure and rehabilitation guidance has the objective to inform and facilitate progressive future improvement to mine closure regulatory regimes in general and in Australia particularly to achieve consistently high closure outcomes.

The project follows and use material generated during the compilation of a study commissioned by the Northern Territory (NT) Government designed to assist in their current review of MC and other mining regulatory policies and procedures by identifying which, on balance, may best the best blueprint to satisfy the NT's needs subject to adaptation to local conditions and integration with elements of other guidance documents to fill any identified weaknesses or gaps.

6.3 Scope of comparison and main guidance source documents

After consideration, it was decided the review should include comparison of guidance by a number of selected global, regional and Australian, mine closure guidance documents including those by:

- international institutions such as the:
    - World Bank (WB),
    - International Council on Mining and Metals (ICMM),
    - Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF), and the

    - International Standards Organisation (ISO)
- Mining industry associations, such as the Mining Association of Canada's (MAC) *Towards Sustainable Mining* (TSM) framework recently adopted by the Minerals Council of Australia (MCA), and
- Australian Government guidance, both at the Commonwealth and at the state level, namely those of Queensland, Victoria, and Western Australia.

While each of these documents is generally comprehensive in terms of the MC activities/processes covered, some of them, particularly at the Australian jurisdictional level, are supported by a broad range of nested ancillary documents that address specific topics in greater detail and generally from a more practical point of view.

The above selection of jurisdictions was made based on a number of considerations.

Firstly, the NT was not selected because of its current in-depth review of its mining regulatory regime, to which the original research was meant to contribute, leading to significant legislative amendments to the *Environment Protection Act 2019.* These will introduce, among others, a new environmental (mining) licence framework to be enforced on 1 July 2024 when the current *Mining Management Act 2001* will be repealed.

Western Australia and Queensland were selected because of their close similarity to the NT in terms of climatic conditions, ranging from tropical to desertic, of scarce and dispersed population including a large number of remote Aboriginal communities, geological and mineral potential, prevalent land uses etc.

By contrast Victoria provided a recently updated and well-documented example relating to a more temperate climate, denser population etc.

Regretfully MC guidance from South Australia, New South Wales and Tasmania were not included, even though a cursory examination revealed they have comprehensive and reasonably well-structured MC regulatory regimes. The reason for these omissions was to lighten the otherwise significant workload and because most of their key items appeared to be adequately and similarly covered in the selected guidance documents.

Although a range of key stakeholders were identified, consultations were limited to mining industry representative bodies and selected Australian regulatory departments and focused on their view on general MC policy and procedures rather than specific issues with any of their members. Accordingly, exemption for this project from formal human ethical review was granted by the UWA Ethics Committee.

6.4 Project resources and governance

The project was undertaken by researchers of the University of Western Australia (UWA) in consultation with officers of regulatory bodies from the selected Australian mining jurisdictions (e.g. WA, Qld, and Victoria) and from the NT, key mining representative bodies and selected mining companies. These consultations helped better understand the needs and expectations of these key stakeholders and to inform the analysis and report. Other key stakeholders' representative bodies such as Aboriginal Land Councils and Corporations, farming and pastoralist associations, mining communities and other interested parties were identified but not directly consulted at this stage. This information is expected to inform future Northern Territory Government engagement.

7.0 METHODOLOGY: OVERCOMING COMPARISON CHALLENGES

7.1 Mine closure governance policy framework

Mine closure guidance is to be found not just in documents featuring the word 'guidance' in their titles but also in a variety of related or even unrelated ancillary documents. The term 'nesting' is often used to refer to the location of a regulatory instrument within a hierarchy that cascades from an act of parliament within a jurisdiction and encompasses related regulations, statutory enforceable guidelines, general guidelines, and guidance (Figure 1).

The words guidelines and guidance are often used synonymously but in some cases the adjective 'general' is used to emphasises whether they are not enforceable. Use of the verbs 'shall' or 'must' emphasises to the user that the related provisions are a requirement of an enforceable act or regulations and clearly distinguishes them from general guidelines or guidance.

Ideally a preamble at the top of documents should make it clear to users where any regulatory instrument is located within the hierarchy and to what degree its provisions are enforceable under the relevant act or regulations. This requires transparency, usually by quoting the clause of the Act or Regulations containing the guideline-making power, to indicate whether the guideline is statutory guideline or whether it represents a supporting general guidance document.

Some industry associations (e.g. ICMM, MAC), international institutions (e.g. World Bank/IFC Group), and the Australian Government (e.g. Leading Practice Sustainable Development booklets), while providing overarching, comprehensive guidance documents on mine closure, also provide supporting guidance in the form of toolkits, good practice guides etc. on specific aspects of mine development and closure which together constitute a non-statutory nesting framework.

In the end, elements of non-enforceable guidelines and guidance become enforceable once they are incorporated into an approved mine closure plan (MCP) as a condition of holding the mining tenure and/or required under the prevailing environmental legislation.

To the extent that different phases of the mining cycle involve different types and severity of disturbance, most jurisdictions differentiate their rehabilitation requirements during the exploration phase up to initial feasibility studies from those relating to mine development and subsequent mining operations, with some subdividing the latter into small and large operations.

In the majority of cases, the policy and practice relating to abandoned (legacy) mine sites is also covered in separate documents. This makes sense in so far that their requirements, other than for possible funding mechanisms involving industry contributions, are primarily intended to influence the activities of government departments.

In the vast majority of jurisdictions, exploration and mine site rehabilitation are planned and managed in compliance with the requirements imposed by a number of separate legislative processes administered by different assessment and regulatory government bodies.

To the greatest level possible, guidance documentation should be suitable for use by these various government instrumentalities involved in the MC processes, e.g. mining tenement regulators, mining

safety, environmental and water regulators, environmental protection agencies, land and planning regulators, local governments etc.

Ideally, for the sake of clarity and to facilitate industry compliance, one set of combined MC guidance covering all, or at least the majority of MC requirements, with clear linked reference to 'ancillary' guidance, would be preferred.

However, given the different timing and types of disturbances many jurisdictions find it practical to separate guidance relating to the exploration stage up to and including a pre-feasibility study from that relating to mine development/construction and operations and in some cases to distinguish between small- and large-scale mining.

Separate documentation is also generally found regarding policies and practices relating to rehabilitation of legacy (abandoned or orphan) mine sites that are primarily for use by government rather than industry.

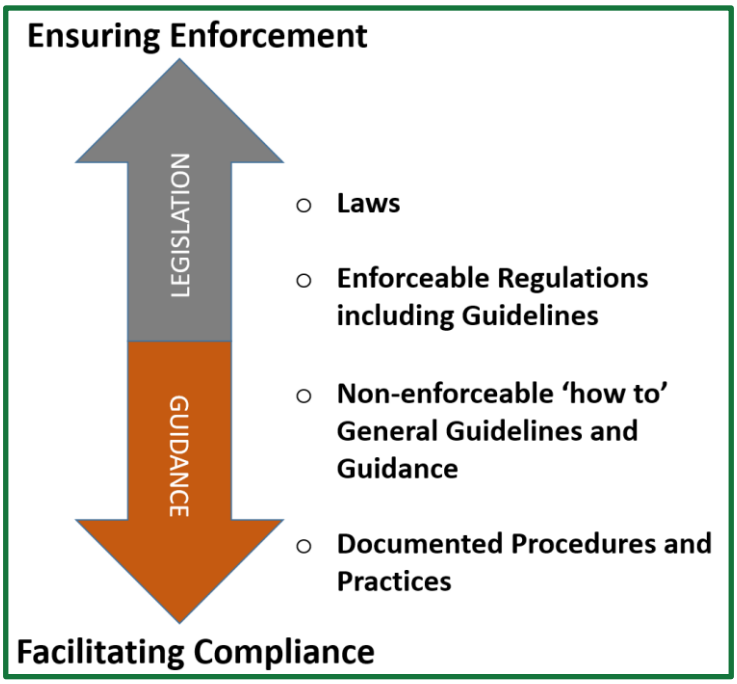

Figure 1: Modified after World Bank (2019) – Mine Closure: a Toolbox for Governments

7.2 Comparing like with like

7.2.1 General considerations

Although all guidance documents address most, but not always all, the key activities/processes involved in MCPs and implementation, they tend to do so to a different level of detail and practical useability.

This makes a valid comparison of various documents as a whole virtually impossible other than based on broad subjective judgement.

7.2.2 Activity Slices

To circumvent this problem and achieve a fair, like-with-like comparison the **'Table of Contents'** of each source document was broken up into the 11 different key **'Activity Slices'** listed in Table 1 in approximate

chronological order of occurrence during mine life, thereby facilitating their individual analysis, comparison, and ranking. The table also differentiates between 'enabling' activities, i.e. essential steps in the ongoing process leading towards one or more of the slices identified as 'outcomes' and provides their relative ranking weights.

The list is not collectively exhaustive and new desirable activity slices could be identified. For instance, 'investment in long-term social and economic resilience', currently captured within the scope of activity slice N9 'Enabling post-mining social transition', and, in the context of the states/territories with significant remote First Nations communities, more emphasis could be placed on 'Traditional Owners engagement and planning' as subsets/complements to slice number 3 'Identifying stakeholders and ongoing engagement'.

Furthermore, it must be recognised that not all 'Activity Slices' are equally important. Accordingly, in carrying out the comparison each activity slice was allocated a qualitative weight on a scale ranging from 1 to 5, where 1 represents low and 5 excellent quality/fitness for purpose.

Table 1: List of activity slices worksheets

	Activity Slice	***Characteristic***	***Ranking***
1	Clearly interpreting regulatory guidance framework	Enabler	2
2	Recording baseline data and ongoing life of asset monitoring	Enabler	3
3	Identifying stakeholders and ongoing engagement	Enabler	4
4	Setting closure objectives/outcomes/success criteria	Enabler	4
5	Risk assessment/opportunities	Enabler	4
6	Identifying post-mining alternative land uses and repurposing	Outcome	5
7	Estimating financial assurance and closure costs	Outcome/Enabler	4
8	Reviewing mine closure plan	Outcome/Enabler	3
9	Enabling post-mining social transition	Outcome	5
10	Rehabilitation post-mining	Outcome	5
11	Rehabilitating abandoned/orphaned mine sites	Outcome	3

7.2.3 Useability Attributes

In addition, the main and ancillary MC guidance documents examined also varied very widely in terms of their length (from a few to hundreds of pages), character (theoretical, legalistic, practical), structure and comprehensiveness (single document or nest of related documents), consistent style in terms of span and depth of coverage of different MC aspects, clarity and readability, currency etc. These differences influence the degree of utility of each document in informing sound policy formulation and structuring guidelines and guidance in the context of MC. The identification and ranking of the 13 **'Useability Attributes'** listed in Table 2 is an attempt to determine what constitutes desirable, fit-for-purpose, practical guidance in the context of this analysis.

Table 2: List of useability attributes

	Useability Attributes	*Useability Rank*
1	Comprehensive guidance	5
2	Practical advice	5
3	Single or multiple integrated documents	4
4	Clear language	4
5	Supporting tables and illustrations	4
6	Helpful 'example forms' or 'templates'	4
7	Adaptability to different climatic conditions	4
8	Consistency of style and depth	3
9	Worked-out examples/case studies	3
10	Ease of web access	3
11	Relevant calculators provided	3
12	Recently updated	2
13	Links to training modules	2

7.2.4 Structure of the Excel comparison database ('Info Pack')

To facilitate the analysis, data were collected into a pseudo three-dimensional matrix using an Excel spreadsheet where the:

- Columns represent the various **source mine closure guidance** documents,
- Rows represent individual **chapters/sections in the tables of content of each document**, and
- Different worksheets represent various specific mine-closure-related **activity slices.**

Because of its three-dimensional character this data collection methodology was nick-named the 'Rubik Cube' approach (Figure 2).

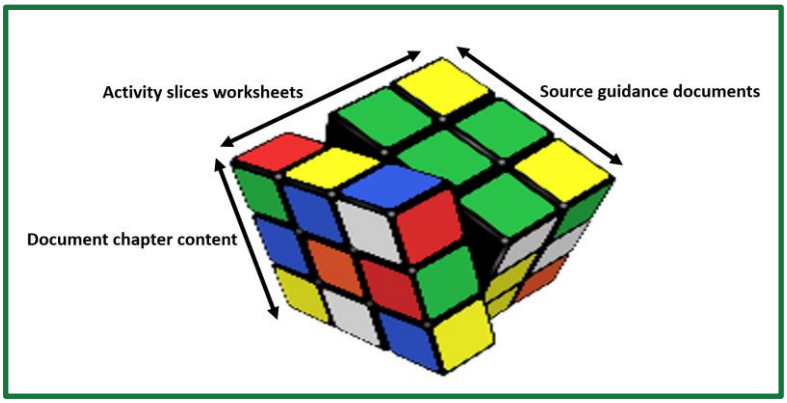

Figure 2: Schematic representation of the structure of the Information Package Excel matrix (Image reproduced subject to attribution to Creative Commons)

To facilitate interpretation, the tables of content of the main and ancillary guidance documents displayed in each Activity Slice worksheet in Info Pack have been characterised as follows:

- Chapters/sections relevant to the specific activity/process are colour-coded in yellow

- Summarised comments relating to some of the relevant chapters/sections have been introduced below their headings, colour coded in brown and accompanied to the right by a qualitative L = low, M = medium or H = high relevance score
- Summarised comments have also been provided for each document as a whole below the main title, colour coded in pale blue and accompanied to the right by a 1 to 5 increasing order of relevance.

An example showing an extract from the 'Estimating financial assurance and closure cost' Activity slice is provided in Figure 3. In this case, the 2023 mine closure guidance with a score of 1 is not very specific regarding financial assurance, while the ancillary 2021 'Mining rehabilitation fund reporting guidelines' at rank 5 is extremely informative and valuable in this context.

7.2.5 Criteria for assigning scores to individual guidance documents in activity worksheets and the process of comparative ranking

The criteria that justify the 1 to 5 ranking as shown to the right of the summary comments for each document are listed in Table 3.

Allocation of a similar 1 to 5 score was also applied to the 'useability' attributes of all the MC guidance documents examined.

		Western Australia [6]	
Mine Closure Plan Guidance - How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans *2023*		*Mining Rehabilitation Fund Reporting Guidelines* *2021*	
Conprehensive general mine closure guidanc, but low relevance to financial assurance limited toa short and generic chapter	*1*	Comprehensive and practical financial assurance guidance supported by worked out example and a cost estimation calculator	*5*
Purpose		Purpose	
Scope		Objectives	
Form and content of a mine closure plan		Scope	
		Legislation	
1 - Cover page(s)		Tenements with a Rehabilitation Liability below $50,000 not required to make a	L
2 - Project summary		1 - Reporting mining related disturbances	
3 - Identification of closure obligation and		*1.1 - Overview*	
4 - Stakeholder engagement		disturbance: 'active', 'open' or 'in use'. Also 'under rehjabilitation' and 'rehabilitated'	L
5 - Baseline and closure data and analysis		*1.2 - Mining activities*	
5.1 - Other closure related data		drilling or scraping over successive years. Categories A, B, C or E: Mining: Covered by Mine Closure Plan. Different mining activities and types of disturbances detailed in Appendix 1.	H
closure		*1.3 - 'Land under rehabilitation' and 'Rehabilitated land'*	
6 - Post-mining land-use(s)		reclassified as 'Rahabilitated land' only after DMIRS assesses that rehabilitation work has been carried out according to MCP. Worked out example of a 3-year progressive rehabilitation project. Table of A to G 'Progressive Rehabilitation	M

Figure 3: Extract from the 'Estimating financial assurance and closure cost' Activity/process slice worksheet of Info Pack displaying the relevant colour coding, comments and ranking scores.

Table 3: List of criteria used in allocating a score to each guidance document as a whole in individual Activity worksheets.

Score	*Characteristics*
5	Very comprehensive, clearly written and helpful practical guidance on this mine closure activity emphasising best practice and explaining the 'why', 'what', 'how' and 'when' of the activity. This is supported if applicable by toolkits/tools, case studies, templates and/or worked examples of useful or required forms for recording or submitting data, and where appropriate references to relevant guidance and budget/financial calculators produced by the same organization. In addition, guidance for this closure activity produced by source organizations is transparent about regulatory context including its status relative to superior legislative instruments and if applicable is part of an annotated template table of contents for the submission of a mine closure report or any associated sub-reports/forms.
4	Comprehensive and practical guidance on this mine closure activity supported by some applicable characteristics of the 5 score above. If applicable, this is complemented by references to relevant third-party supporting material and toolkits/tools.
3	Some guidance on this mine closure activity with limited supporting tools, information, toolkits/tools or references to related information by the same or third-party organization.
2	Introductory guidance that covers the 'why' and 'what' of this mine closure activity.
1	Brief policy-level statement on this closure activity.
U	Practically silent on this closure activity.

7.2.6 Steps in achieving final comparability and ranking

The steps in the process used in achieving comparability and ranking for various mine closure guidance documents are shown in Figure 4 and include:

MC Activity comparison and ranking:

- Firstly, weighting the scores of each MC guidance document for each of their 11 individual document-level Activity Slices by their respective significance ranks, then
- Summing them to obtain the 'Total weighted MC Activity score' for each document.

Comparison and ranking among various documents using this measure is considered reasonably objective based on the in-depth analysis of the content of each individual main and ancillary guidance document.

Useability comparison and ranking:

- Weighting the scores of each MC guidance document for each of the 13 Useability Attributes by their respective significance ranks, then
- Summing them to obtain the 'Total weighted Useability score' for each document.

Comparison and ranking among various documents using this measure is considered relatively objective because based the authors' experience while reading all the main and ancillary guidance documents and reaching a reasonable degree of agreement between their opinions about them.

Combined MC Activity and Useability comparison and ranking:

- Finally the above two measures were added to obtain the 'Total combined weighted MC Activity and Useability score' for each document.

It may be argued that the total weighted MC activity score and the total weighted useability score measure two distinct and, to some degree, unrelated sets of MC guidance characteristics with inherently different levels of significance and that combining them on an equal basis may not be warranted. However, as discussed in more detail in Chapter 9, this concern is essentially irrelevant in the context of the results obtained in the present analysis.

Probably the most subjective judgement in these processes has been the assignment of ranks to various MC activities and useability attributes. These ranks were the subject of extensive discussions culminating in general agreement among the authors. Although no formal sensitivity analysis was performed, it is likely that minor changes in emphasis regarding ranks would not materially change the nature of the conclusions reached in this report.

The main steps in achieving final comparability and ranking among the various MC guidance documents analysed are summarised in Figure 4.

7.3 Stakeholders identification and consultation

7.3.1 The nature of land holding in Australia

Asides from limited areas of freehold properties, land tenure in Australia is primarily either Crown Land, mostly the subject of long-term pastoral leases, nature and/or other reserves, or various forms of Aboriginal land and in some cases unalienated.

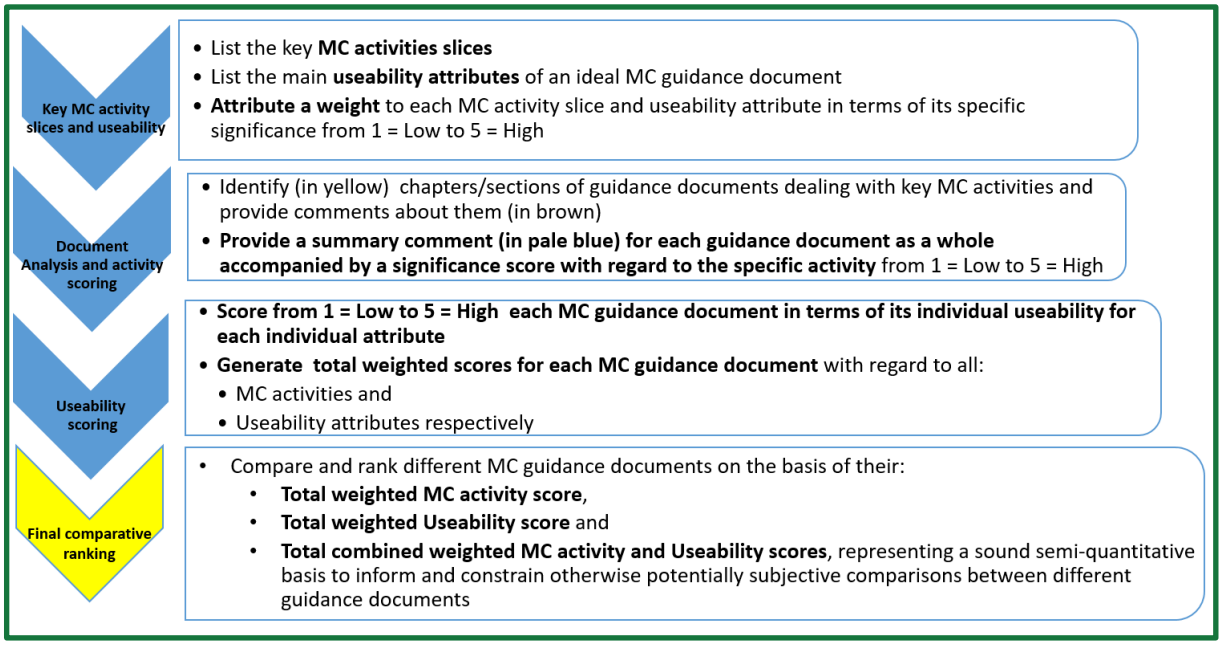

Figure 4: Outline of the steps in the process used in achieving comparable rankings for various mine closure guidance documents.

Access to Aboriginal Land is governed by a complex mix of broadly based Commonwealth laws, (e.g. the *Native Title Act 1993 (Cth))* or state/territory specific laws (e.g. the *Aboriginal Land Rights (NT) Act 1976 (Cth)*). The latter, unique to the NT, confers to Aboriginal land trusts inalienable land rights and the power to veto land access.

Native title, by contrast, applies Australia-wide, covering a set of rights and interests over land and waters based on traditional First Nations law and customs, unless extinguished by a limited number of pre-existing titles (e.g. freehold, some granted mining tenements etc.). Native Title may co-exist with other forms of tenure, e.g. pastoral leases. Exploration and mining licence applications on land under a determined Native Title or claim may be approved under 'expedited procedures' which, if objected to by an Aboriginal title holder or claimant, confer to it a 'right to negotiate'.

These interests are represented by individual Indigenous Corporations and Land Councils that assist Aboriginal and Torres Strait Islander peoples to negotiate access through Indigenous Land Use Agreements (ILUAs) typically covering projects from their exploration stages to mining and rehabilitation. Because of their broad scope and the need to cover uncertain future circumstances, these complex legal documents require adequate time for their negotiation and drafting.

7.3.2 Key stakeholders

Although a range of key stakeholders were identified while compiling this report, it was felt that for practical reasons only mining industry representative bodies and selected Australian regulatory departments (as listed in Table 4), should be consulted during the analysis.

Table 4: Key stakeholders consulted.

Identified and consulted stakeholders	*Acronym*	*Comments*
Exploration and Mining Representative Bodies		
Minerals Council of Australia	MCA	National industry advocate body representing interests of exploration and mining companies, State-based mineral advocate bodies, consulting groups and service companies.
Association of Mining and Exploration Companies	AMEC	National industry advocate body representing interests of exploration and mining companies, consulting groups and service companies. Strong focus on 'juniors'. Consultation included AMEC staff and members.
The Chamber of Minerals and Energy of Western Australia	CMEWA	State-based industry advocate body representing interests of mining companies, consulting groups and service companies. Strong focus on 'majors'.
State/Territory Government regulatory and other bodies		
Northern Territory Department of Environment, Parks and Water Security	DEPWS	Territory regulator of environmental and water impacts
Northern Territory Department of Industry, Tourism and Trade	DITT	Territory industry regulator including minerals and energy

WA Department of Energy, Mines, Industry Regulation and Safety	DEMIRS	State regulator of mining and petroleum exploration and production activities
WA Department of Water and Environmental Regulation	DWER	State regulator of environmental and water impacts
Victoria Mine Land Rehabilitation Authority	MLRA	Statutory authority working with community, industry, and government to facilitate the rehabilitation of declared mine sites in Victoria

The purpose of all consultations was firstly to obtain feedback on the approach the authors took in the comparative analysis phase of the project. Particularly acceptance of the legitimacy of analysing the quality/fitness-for-purpose of individual chapters/sections of each guidance document in relation to 11 key MC activities as a process to obtain an overall summary assessment and score for each document and thus enabling comparison between them. In addition, their opinion was also sought regarding the validity of the score based on 13 “useability” attributes.

All stakeholders commented that the approach was very sound and detailed, and that the level of detail was probably necessary given the varying purpose (guidance to governments, industry information, and government regulation), structure and content of documents published by international institutions, industry bodies and regulators.

The second purpose of the consultation was to obtain comments from either an industry or regulator perspective on the effectiveness and practicality of complying with and/or administering the current guidance documents, avenues for potential improvements and identification of any gaps in the current guidance framework.

Exemption from formal human ethical review for this part of the project was granted by the UWA Ethics Committee. The ground for exemption was because the proposed research project satisfies Criterion 5.1.17 (d) of the National Statement of Ethical Conduct in Human Research (NSECHR) (2023) namely: "the research uses only information that is publicly available through a mechanism set out by legislation or regulation and that is protected by law, such as mandatory reporting information, information obtained from registries of births and deaths, coronial investigations or reports of the Australian Bureau of Statistics". In addition, consultations were limited to mining industry representative bodies and government regulatory agencies, did not identify specific individuals or involve the collection and release of potentially human-affecting data, placing our research in the "Minimal risk" category as defined in Chapter 2.1 of the NSECHR.

8.0 ANALYSIS AND COMPARISON OF GUIDANCE DOCUMENTS ON THE BASIS OF INDIVIDUAL ACTIVITY SLICES

8.1 Activity Slice 1: Clearly interpreting regulatory and guidance framework

8.1.1 General considerations

For industry and government, the legal enforceability of government policy and legislation is a critical risk because the costs for government not being able to enforce legislation, or of industry not complying with the regulatory framework are very high in terms of legal, reputational, and financial impacts.

Distinguishing between what is enforceable in laws, regulations, and guidelines sometimes ends up in the judicial arena and is particularly fraught in relation to "guidelines" and "guidance" documents where the boundary between enforceable and partially enforceable regulatory requirements and non-enforceable policy statements can become blurred.

A useful insight into this type of issue is provided by Century Mining Limited v Department of Environment and Science [2021] QLC 3, a Queensland Land Court review of an internal departmental review decision involving a dispute between the parties over the estimation of the quantum of mining rehabilitation assurance required by a guideline issued under Section 550 of the Queensland Environmental Protection Act 1994. Similar significant cases in the context of the NT include the recent Supreme Court case regarding the McArthur River lead-zinc Mine (Minister for Mining v. NGOs) and the 2019 judgement concerning the Frances Creek iron ore Mine (Territory Iron Pty Ltd v. Minister for Mines and Energy).

8.1.2 Best practice considerations

To improve clarity around enforceability of laws and regulations, it is best practice to:

- Include specific regulation- and guideline-making powers in principal acts and ensure that the act "includes the regulations and guidelines made under the act". The principal act and regulations need to be very specific about the wording of powers they delegate.
- Make provision in the act for offences to include breaches of the act, regulations, and statutory guidelines. Statutory guidelines are generally those that are published in the jurisdiction's government gazette.
- In non-statutory guidelines and guidance documents, clearly indicate sections that are taken directly from the act, regulations or statutory guidelines and hence may be enforceable.
- Include adherence to a mine closure plan in the act or regulations and as a condition of holding the mining tenement making the plan enforceable, with failure to implement the plan becoming a breach of conditions, potentially making the tenement liable to forfeiture. The current closure plan should be listed on the tenement register and be available for public viewing.
- In title pages to guidance documents, clearly list where the document nests within the regulatory hierarchy, including any documents such as procedural documents that may be listed below the guidance document. Other useful documents, potentially published by a third-party organisation, should be listed as references.

- Maximise useability by writing guidance documents in a clear, “helpful” style, rather than a legalistic or “official” style, and include where appropriate illustrations, tables, examples, partially completed templates etc.

8.1.3 Findings and leading practice guidance

This topic (Table 5) was approached in different ways by institutional compared to jurisdictional guidance documents reflecting the low relevance of the topic to general and technical guidance produced by institutions compared to the guidance documents produced by jurisdictional regulators which focus on regulatory procedures and technical support.

Institutional guidance documents produced by the World Bank and APEC highlight what aspects of mine closure should be legislated and what elements should be left to policy and guidelines. Australia–MC main guidance briefly outlines common law remedies that can arise out of poor rehabilitation practices. However, the useability of such remedies in overseas jurisdictions may be limited due to different common law frameworks, the legal costs involved for plaintiffs, and the jurisdiction’s degree of judicial independence.

The ICMM main guidance does not deal with the regulatory framework of legislation and guidelines but is itself at the centre of a guidance framework consisting of many mine closure-related guidance documents.

The Victoria main guidance document is written in a clear, helpful manner and prominently sets out up front how it nests within the governance framework for mine closure in Victoria, including identifying that the guidelines are authorised by Regulation 43. It very transparently separates information required by legislation/regulations from general guidance by using the terms “must” and “required” for regulated requirements and references two other in-house guidance documents, one of which, on community engagement, is very good, although it does not deal with social transition issues.

Page 1 of the Victorian guidance clearly states that it does not apply to the three ‘declared mines’ in the Latrobe Valley — Loy Yang, Yallourn and Morwell, all large open-cut coal mines, the most recent of which, Loy Yang, began site works in 1977 before the advent of modern mine closure guidelines. Rehabilitation of declared mines in Victoria is the responsibility of the Mine Land Rehabilitation Authority (MLRA), a statutory organization that works with government, the community and industry to facilitate the rehabilitation of declared mine sites to ensure they are safe, stable and sustainable for the beneficial use of future generations. Declared mines possess geotechnical, hydrogeological, water quality or hydrological characteristics that are deemed by the Victorian Minister for Resources to pose significant risk of harm to the community, environment and infrastructure. Currently, there are no guidance documents for the rehabilitation of declared mines.

Queensland’s main guidance document is written in a somewhat legalistic, official manner with emphasis on procedural matters in addition to some technical guidance. It was published at a time of transition when existing mines with a site-specific environmental authority were to begin to provide a Progressive Rehabilitation and Closure Plan (PRCP) under amended legislation, which introduces a degree of complexity into the document. It is statutory guideline that expands on what was prescribed for a PRCP and Schedule in the Environmental Protection Act 1994. The EP Act guideline-making power (Section 550) is mentioned lower in the guideline. The PRCP must be submitted with an application form (template provided on website), a Community Engagement Plan (template provided on website), and a PRCP Schedule for which a template and example are provided in the guideline. Amendments of Environmental Authorities, PRCPs and Schedules is covered in a separate, densely written 50-page non-statutory procedural guidance document entitled “Guideline major and minor amendments" (dated 26/9/2023)

that only in part deals with mining. In addition, the 2023. “Guideline — Progressive certification for resource activities” and associated application form (available on website) provides helpful advice on post-closure certification of domains meeting rehabilitation requirements along a pathway to potentially full relinquishment of environmental liabilities.

Western Australia’s main guidance document is written in an unambiguous and practical style with the regulatory and guidance document framework very clearly stated on the inside cover with useful tables showing its place in the hierarchy of State mining legislative instruments, and the version history.

This was reinforced early in the document by a statement of the authorising link for the Statutory Guideline that the guidance document supports. This guidance document is supported by a general administrative procedures guidance document applying to all mining-related environmental applications and also endorses the use of the WABSI (2019) report for developing mine closure objectives and completion criteria for Western Australia mines. Enforceability of commitments made in approved Mining Proposals and Closure Plans is achieved by making holding an approved mine closure plan a condition of title.

In 2021, to provide a pathway to relinquishment, WA published a “Mine Closure Completion Guideline -- For demonstrating completion of mine closure in accordance with an approved Mine Closure Plan”. The document is well written and helpful but its nesting within the statutory hierarchy is not clear, and it is not referenced by the main guidance.

In summary, Western Australia and Victoria have transparently set out how their guidance documents link to authorising legislation. Their main guidance documents are capable of standing alone with Victoria indicating via key words guideline provisions copied from the Regulations, and WA using a grey stipple to indicate links to the statutory guideline it supports. Also, both states structure their main guidance documents around a desirable step-by-step guide to the form and content of the closure plan using suggested headings of sections, while still allowing some flexibility.

8.2 Activity Slice 2: Recording baseline data and ongoing life of asset monitoring

8.2.1 General considerations

The basis of informed and ultimately effective mine closure planning, including identification of data gaps, risk assessment, post closure visioning, land use decisions, objective setting, effective closure success criteria, is based on early baseline data recording of all aspects of the physical and environmental parameters within the exploration tenements that exist prior to the grant of one of more mining tenements. Social and socioeconomic baseline data may also be important for social transition closure planning of some mines and will by necessity mean extending data gathering to nearby communities in the region surrounding the mine and feeder infrastructure corridors.

Post grant of the mining tenure, monitoring of baseline physical and environmental and social/socioeconomic data in the project area including both exploration and mining tenure, and in the surrounding region should continue with more parameters added within specific mine domains. These data are used by the miner, regulators, surrounding communities and other stakeholders, including potentially other exploration and mining projects in the region. A quality, largely publicly available,

longitudinal physical, environmental, and social/socioeconomic database has enduring value for many purposes.

Table 5: Extract from Info Pack displaying summary comments and score of individual guidance documents relevant to the 'clearly interpreting regulatory and guidance framework' activity slice.

MINE CLOSURE PLAN (MCP) GUIDANCE - CLEARLY INTERPRETING REGULATORY AND GUIDANCE FRAMEWORK

Colour-coding: Yellow = Relevant, Light blue = Whole of document comments and assessment - Degree of Relevance: 1=Low to 5=High

	Global				Regional		National			
	World Bank		*ICMM*		*APEC*		*Australia*		*ANZMEC/MCA*	
Title	*Mine Closure: A Toolbox for Governments*		*Integrated Mine Closure - Good Practice Guide 2nd Edition*		*Mine Closure - Checklist for Governments*		*Mine Closure Leading Practice Sustainable Development Program for the Mining Industry*		*Strategic Framework for Mine Closure*	
Year	*2021*		*2019*		*2018*		*2016*		*2000*	
Summary Assessment	Makes well argued, high-level recommendations on the governance/regulatory nesting framework for closure including what elements should be legislated and others that should be either policy (the intent) or guidelines (the how). References IFC 2007 nested handbook on stakeholder engagement (200 pages).	1	Is silent on regulatory nesting/governance structures but document itself is nested with many other relevant guidance documents produced by ICCM. From a mining company perspective, makes strong recommendations on the governance required within the mining company for effective closure.	1	Discusses in general terms what elements of closure should be legislated and enforceable and those that should be left to policy and guidelines. Provides useful triangular diagram to support discussion.	1	Provides a high-level review of the role legislation and policies play in shaping mine closure as well as common law principles that apply to poor closure practices.	2	Brief high-level overview of the legislative and policy framework for closure at Commonwealth and state levels.	1

	State							
	Victoria		*Queensland*		*Western Australia*			
Title	*Preparation of rehabilitation plans. Guideline for mining and prospecting projects*		*Guideline: Progressive Rehabilitation and Closure Plans*		*Mine Closure Plan Guidance - How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans*		*Mining Rehabilitation Fund Reporting Guidelines*	
Year	*2020*		*2023*		*2023*		*2021*	
Summary Assessment	Written in a clear, helpful manner and prominantly sets out up front how it nests within the governance framework for mine closure in Victoria, including identifying the authorising links from legislation to regulations and guidelines. It very transparently separates information required by legislation/regulations from general guidance and references two other in-house guidance documents.	5	A detailed statutory guideline combining procedural and technical guidance that expands on what was prescribed for PRC Plan and Schedule in the Environmental Protection Act 1994. The EP Act guideline-making power (Section 550) is mentioned lower in the guideline. PRC Plan must be submitted with an application form (template provided on website), a Community Engagement Plan (template provided on website), and a PRCP Schedule for which a template and example are provided in the guideline.	4	Written in a clear helpful style with nesting very clearly stated up-front with useful tables showing its place in the heirarchy of State legislative instruments and version history. This reinforced early in the document by a statement of the authorising link for the Statutory Guideline that this guidance supports. This guidance is supported by a general administrative procedures guidance applying to all environmental applications and endorses the use of the WABSI (2019) report for developing mine closure objectives and completion criteria.	5	This is written in a helpful, clearly written style with nesting within the regulatory heirarchy very clearly stated up front with useful tables showing how it fits into the heirarchy of State legislative instruments and version history. The guideline making power in the Act was clearly identified.	5

8.2.2 Best practice considerations

The following elements of best practice have been identified:

- Data collected into a geographic information system (GIS) should include physical characteristics (topography, geology, soil geochemistry, precipitation, water and air quality, etc.), environmental characteristics (flora, fauna, biodiversity, stygofauna etc.), social and socio-economic information (community consultation and feedback, land use and ownership, demography, cultural heritage, annual income, etc.) and knowledge of regional and local government planning schemes.
- Some of this information will need to be gathered outside of the mining tenure to include upstream and downstream surface and sub-surface drainage systems, dust monitoringand local communities that may supply labour and commercial services to the mine.
- Comprehensive data capture should begin as early as possible within the exploration stage, with comprehensive baseline data being collated once a resource has been identified and the pre-feasibility study is initiated.
- Within, and if relevant outside of the mining tenure, specific domains identified by reference to closure-related characteristics should be polygonised within a GIS database with baseline data, including new data on mine-related landforms, added throughout mine life and post closure. Domain examples include individual voids, individual infrastructure areas, waste dumps, tailings storage facilities, undisturbed areas, etc.
- In addition to the physical, chemical, environmental, and geotechnical characteristics, information held for each domain should include closure-related parameters such as closure outcome/objective, success criteria, estimated closure cost, and ongoing monitoring needs.
- Data from research, field trials and other investigations should be added to individual domains.
- By the end of life of mining asset, a significant amount of quality, ongoing monitoring data should have been added to the baseline database which then should be preserved in a secure database, with only a minimal amount of data remaining confidential.

8.2.3 Findings and leading practice guidance

Guidance documents published by global institutions provide the policy framework and in the case of the ICMM main guidance very practical advice on recording baseline data and ongoing monitoring using the domain approach which is the subject of a “tool” within the main ICMM guidance document. In part, the World Bank main guidance summarises the ICMM main guidance.

In addition to the assembly of physical, geochemical and environmental datasets, both institutions place emphasis on social and socioeconomic data capture for possible use in social transitioning strategies during and post-closure. The two ISO guidance documents provide a very structured approach to baseline data capture and ongoing monitoring of the baseline and new datasets, including social/socioeconomic parameters.

The national Australian main MC guidance, although not updated since 2016, provides reasonably comprehensive, practical guidance on recording baseline geographical, geological, climatic, ecological and socio-economic baseline data and ongoing monitoring and uses the Andy Well mine GIS as an example to demonstrate the importance of using the domain approach to data analysis.

The main Victorian guidance provides a moderate level of practical guidance on recording baseline technical data and the subsidiary (Victorian Department of Energy, Environment and Climate Action,

2023) guidance document on community engagement requires details of community consultations and feedback and recommends the miner identify and document throughout LoM the attitudes, expectations and values of geographic communities, communities of interest and communities of standing in the area, giving examples.

The Queensland main guidance document appears to focus almost entirely on the need for capturing and ongoing monitoring of baseline physical, and environmental data.

The Western Australia main guidance provides very comprehensive and multifaceted practical guidance on baseline data monitoring pre-mining and throughout LoM, within and beyond the mining tenement, covering details of stakeholder consultation and feedback, social and socio-economic data (where relevant) in addition to a full suite of physical, geochemical, climatic, biological, water, and regolith characteristics. It also recommends LoM monitoring of all mine-related landforms and collection of environmental data is continued and expanded throughout the project life to include data from research, field trials and investigations. Finally, it requires all technical reports to be appended to the three-year updates of the mine closure plan.

The Mining Rehabilitation Fund Reporting Guidelines (Western Australia Department of Mines, Industry Regulation and Safety, 2021) provide very practical and comprehensive guidance on how to document environmental disturbance as a basis for calculating the annual levy a mining tenement holder is required to pay into the Mining Rehabilitation Fund. This information amounts to ongoing LoM environmental and physical monitoring.

In summary (Table 6), the ICMM main guidance document, supported by several "good practice" boxes and two tools -- The Domain model; and Monitoring, Measurement and Inspections, are the most comprehensive and practical institutional guidance documents. Among the Australian states, Western Australia's main guidance is more comprehensive than the others, although the social monitoring proposed in the Victorian guidance document on community engagement is a useful suggestion.

A gap in most guidance documents produced by the three Australian jurisdictions reviewed is the need for miners to provide more baseline information on environmental and socio-economic characteristics outside of their mining tenement package. The impact of a large mining operation may be regional, and a number of mines in a region may have cumulative impacts greater than the sum of impacts from individual mines. This suggests that the domain approach used for physical, geotechnical, environmental, hydrogeological, and geochemical parameters should be expanded for capturing these and socio-economic parameters outside of the near mine tenement package.

8.3 Activity Slice 3: Identifying stakeholders and ongoing engagement

8.3.1 General considerations

Over the last 20 years, there has been heightened appreciation by mining companies, governments, and communities of the importance of stakeholder engagement in improving the quality of mine planning and the ability of the mine to be a catalyst and partner with communities and government in community and regional development during mine operations and post mine closure. This has led to an emphasis in many guidance documents on stakeholder identification and ongoing engagement.

8.3.2 Best practice considerations

Following a review of all guidance documents, the following elements of best practice have been distilled:

- Stakeholder identification and engagement should begin at the earliest possible stage of exploration and ramp-up from the pre-feasibility stage and continue throughout life of mine and potentially post-closure if there are on-going liabilities.
- The miner should accept that local community involvement in mine closure planning will be less active early in mine life for long-lived mines, say 10 years or more, but will naturally increase as mine closure approaches or in the case of projects with shorter lives. Best practice is to engage with many community members and sub-groups and not just one or two community leaders.
- The local community, in particular, plus local and regional governments should be involved in decision-making concerning mine closure planning — post-closure vision, objectives, and success criteria.
- Particular attention should be paid to engaging with First Nations people who may have traditional rights over the mine area and beyond.
- The miner needs to assess the ability of different stakeholders to effectively engage and contribute to the closure planning process in terms of providing training or funding of costs involved in specialist support to disadvantaged stakeholders so that their views are heard.
- The preferred engagement styles stakeholders and stakeholder groups, and all feedback from stakeholder meetings throughout mine life should be documented.
- Miners should maintain a register of stakeholders as these may change over time and ensure that MC plans account for possible changes in their expectations.
- It is critical that stakeholders are involved in planning and decisions about post closure land use, and if applicable, repurposing of land and mine infrastructure.
- Local community members, locally sourced employees, local businesses and employees generally should be involved in planning the social and socio-economic transition post mining. Local and regional governments and NGOs should also play a role.
- Involving local community members in rehabilitation during mine operations and post-closure monitoring and rehabilitation is good practice.

MINE CLOSURE PLAN (MCP) GUIDANCE - RECORDING BASELINE DATA AND ONGOING LIFE OF ASSET MONITORING

Colour-coding: Yellow = Relevant, Light blue = Whole of document comments and assessment - Degree of Relevance: 1=Low to 5=High

	Global								Regional			
	World Bank		ICMM		ISO				TSM/MAC		APEC	
Title	*Mine Closure: A Toolbox for Governments*		*Integrated Mine Closure - Good Practice Guide 2nd Edition*		*Mine Closure and Reclamation Planning: Part 1 Requirements (ISO 21795-1)*		*Mine Closure and Reclamation Planning: Part 2 Guidance (ISO 21795-2)*		*Towards Sustainable Mining - Mine Closure Framework*		*Mine Closure - Checklist for Governments*	
Year	*2021*		*2019*		*2021*		*2021*		*2008*		*2018*	
Summary Assessment	From a legislative and policy perspective provides high level and reasonably comprehensive and practical advice on the contents of technical (physical, geochemical, environmental) and socio-economic monitoring programs from pre-operational to post-closure as a basis for strategic, risk-based post-closure rehabilitation, re-purposing and socio-economic transitioning. Also discusses role of government. References among others ICMM and APEC guidance documents.	4	Practical, comprehensive advice including several "good practice" boxes and has two tools -- The Domain model; Monitoring, Measurement and Inspections that are themselves reasonably comprehensive and practical. Emphasises the need for quality data based on subdivision of the site into distinct domains, including socio-economic monitoring.	5	Provides high-level policy guidance related to the need for ongoing recording and long term storage of baseline physical, chemical, environmental and socio-economic data throughout LoM and beyond.	2	Provides a detailed level of policy advice and a very structured approach to assist in decision making around on-going LoM baseline data monitoring of physical, chemical, geotechnical, environmental and socioeconomic parameters. The requirement for baseline data monitoring is woven through many sections of the guidance and includes practical recommendations.	3	Gathering of baseline monitoring data is mentioned in the Biodiversity Conservation Management Protocol but is not supported by guidance on how these data should be collected. The protocol recommends the ICMM if guidance is needed. Several supporting assessment Protocols have Indicators that imply monitoring and reporting, including the Safety and Health Protocol, and Water Stewardship Protocol.	1	Provides governments with some high level policy advice on baseline data recording and ongoing monitoring.	2

	National		State							
	Australia		Victoria		*Queensland*		Western Australia			
Title	*Mine Closure Leading Practice Sustainable Development Program for the Mining Industry*		*Preparation of rehabilitation plans. Guideline for mining and prospecting projects*		*Guideline: Progressive Rehabilitation and Closure Plans*		*Mine Closure Plan Guidance - How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans*		*Mining Rehabilitation Fund Reporting Guidelines*	
Year	*2016*		*2020*		*2023*		*2023*		*2021*	
Summary Assessment	Reasonably comprehensive, practical guidance on recording baseline geographical, geological, climatic, ecological and socio-economic baseline data and ongoing monitoring during life of project. Gives practical example of Andy Well mine GIS to demonstrate importance of using domain approach to data analysis.	4	Moderate level of practical guidance provided on recording baseline technical data (e.g. climate, geographic, geological, biodiversity, water sources and characteristics, history of natural disasters etc). Social and socio-economic data gathering and on-going LoM baseline monitoring not emphasised.	3	Basic level of guidance mainly focussing on the baseline technical datasets that may be required. Social and socioeconomic baseline information, unless gathered by the company as a by-product of community engagement, is not mentioned.	3	Very comprehensive and multifaceted practical guidance on baseline data monitoring pre-mining and throughout LoM, within and beyond the mining tenement. Covers social and socio-economic data (where relevant) in addition to a full suite of physical, geochemical, climatic, biological, water, and regolith characteristics. Also recommends LoM monitoring of all mine-related landforms and collection of environmental data is continued and expanded throughout the project life to include data from research, field trials and investigations. Requires all technical reports to be appended to Mine Closure Plan.	5	Very practical and comprehensive guidance on how to document environmental disturbance as a basis for calculating the annual levy a mining tenement holder is required to pay into the Mining Rehabilitation Fund. This information amounts to ongoing LoM environmental monitoring.	5

Table 6: Extract from Info Pack displaying summary comments and score of individual guidance documents relevant to the 'recording baseline data and ongoing life of asset monitoring' activity slice.

8.3.3 Findings and leading practice guidance

World-wide institutional guidance documents (World Bank, ICMM, ISO) cover the entire best practice framework for effective stakeholder identification and engagement and the World Bank and ICMM main guidance documents provide comprehensive, practical guidance supported by best practice highlight boxes, case studies and nested subsidiary guidance documents and "tools" containing more detailed practical guidance. The World Bank main guidance in part summarises the ICMM guidance and references the International Finance Corporation[1] (2007) ~200-page handbook on stakeholder engagement. APEC's guidance, aimed at governments, provides high level policy advice for governments, and indirectly industry, and a useful stakeholder engagement case study.

The Australia-MC main guidance, a 2006 version of which is currently adopted as mine closure guidance by the NT, provides high level policy guidance with some practical insights into stakeholder engagement and community development with one rich case study. Two other booklets in this Leading Practice Sustainable Development Program series — "Community engagement" (Department of Industry, Innovation and Science, 2016b) and "Working with Indigenous Communities" (Department of Industry, Innovation and Science, 2016c) are comprehensive, practical guidance documents in their own right with the latter of particular relevance in Australian jurisdictions with mineral potential in regional and remote areas with small communities with many Aboriginal residents.

Although published in 2000, the ANZMEC/MCA guidance provides a comprehensive high level policy overview of stakeholder identification and engagement.

Our analysis (Table 7) shows a clear leader in stakeholder engagement guidance is the ICMM main guidance which is a very comprehensive and practical guidance with two tools, three good practice highlight boxes and one case study. It takes a longitudinal view of stakeholder engagement through life of mine and provides references to ICMM's website to four additional detailed, comprehensive and practical supporting guidance documents (three toolkits and a good practice guide – ICMM 2012 and 2015a, b, and c) that total 490 pages.

Guidance documents published by Australian State jurisdictions to varying degrees cover best practice elements.

Queensland's main guidance emphasises that community consultation is a legislative requirement but does not cover how to undertake consultation. To assist preparation of the Community Consultation Plan included with the PRC Plan there is a 1.5-page Information Sheet entitled "Community Consultation for PRCP".

The Victoria main guidance provides the most comprehensive and practical guidance of the Australian states, transparently identifying the regulatory requirements for community engagement referring to two additional nested guidance documents on the regulator's website entitled "Community Engagement Guideline for Mining and Mineral Exploration in Victoria" (Victorian Department of Energy, Environment and Climate Action, 2023) and the template for a community engagement plan. The "Community Engagement Guideline" is very comprehensive and practical

[1] Part of the World Bank Group.

with procedures for preparing a community engagement plan, examples of many requirements, and expands on the "how" of community engagement.

Western Australia's guidance is not as comprehensive as Victoria taking into account the latter's subsidiary Community Engagement Guideline, but nevertheless provides comprehensive practical advice including a template Stakeholder Engagement Register.

Guidance documents produced by the three Australian States reviewed do not provide specialised advice on engagement with Aboriginal communities and in general provide minimal or no advice on engagement for planning the post-closure social and socioeconomic transition.

8.4 Activity Slice 4: Setting closure objectives/outcomes/success criteria

8.4.1 General considerations

This is the most critical element of successful mine closure, undertaken initially in the lead-up to the application for mining tenure and then periodically during mine life. With effective stakeholder engagement including with local communities and governments, setting of closure objectives and success criteria drive continuous remediation and rehabilitation activities throughout mine life, post-mine land use decisions, and planning and implementation of the social and socioeconomic transition.

It stands to reason that mine closure plans relating to short-lived mining operations, say up to five years, will need to be more detailed and specific than those relating to mining operations with a longer life. In the latter case, the mine closure plan will need to be more flexible and be subject to more periodic reviews to ensure its relevance to emerging circumstances and progressive rehabilitation.

Most importantly, well-managed meetings to set closure objectives and success criteria should begin cooperative personal relationships between mine officials and stakeholders that will assist successful conduct of future meetings, resolution of complaints, and to a degree, shared ownership between the miner and stakeholders of the post-mine closure outcomes.

MINE CLOSURE PLAN (MCP) GUIDANCE - SETTING CLOSURE OBJECTIVES/OUTCOMES/SUCCESS CRITERIA

Colour-coding: Yellow = Relevant, Light blue = Whole of document comments and assessment - Degree of Relevance: 1=Low to 5=High

	Global								Regional			
	World Bank		*ICMM*		*ISO*		*ISO*		*APEC*		*TSM/MAC*	
Title	*Mine Closure: A Toolbox for Governments*		*Integrated Mine Closure - Good Practice Guide 2nd Edition*		*Mine Closure and Reclamation Planning: Part 1 Requirements (ISO 21795-1)*		*Mine Closure and Reclamation Planning: Part 2 Guidance (ISO 21795-2)*		*Mine Closure - Checklist for Governments*		*Towards Sustainable Mining - Mine Closure Framework*	
Year	*2021*		*2019*		*2021*		*2021*		*2018*		*2008*	
Summary Assessment	Relatively brief, high-level guidance distinguishing between impact of the project at jurisdictional level and lower level site-specific closure objectives/goals.Introduces the SMART terminology for assigning closure success criteria to objectives/goals involving input from stakeholders. No case studies provided.	2	Comprehensive and practical guidance incorporating ICMM Tool 3: Objective Setting, providing the user with a structured approach to establishing closure vision, principles and objectives. Has two best practice boxes, lists of questions to be addressed during process, and a useful high-level process diagram.	5	Somewhat repetitive high- and medium-level policy guidance on closure objective setting and commitments with limited supporting material.	2	Provides detailed practical guidance on objective setting and commitments and insights into possible success criteria that could be used.	4	Although this documents deals with government developing policy for the closure plan, it provides some high and medium level policy guidance for companies developing objectives and criteria for closure plans.	1	Provides a very brief high-level policy statement.	1

	National				State							
	Australia		*ANZMEC/MCA*		*Victoria*		*Queensland*		*Western Australia*			
Title	*Mine Closure Leading Practice Sustainable Development Program for the Mining Industry*		*Strategic Framework for Mine Closure*		*Community Engagement Guideline for Mining and Mineral Exploration in Victoria*		*Guideline: Progressive Rehabilitation and Closure Plans*		*Mine Closure Plan Guidance - How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans*		*A framework for developing mine-site completion criteria in Western Australia*	
Year	*2016*		*2000*		*2023*		*2023*		*2023*		*2019*	
Summary Assessment	Provides a degree of practical guidance on developing site-specific objectives, with input from stakeholders, beyond the basic safe, non-polluting, stable landforms, and able to sustain post mine land uses. It also promotes use of SMART and outcome-based criteria for meeting completion criteria.	3	Provides very high level policy advice on risk and outcomes based development, with stakeholder input and review during LoM, of closure objectives but little beyond safe , non-polluting, stable and appropriate for post-closure land uses. Two highlight boxes inserted into text.	1	Very practical guidance on objective setting for the entire site and individual domains. Appendix gives example rehabilitation plan templates on objectives and milestones for different mine types. Requires use of SMART criteria for measuring success of rehabilitation milestones and periodic review of objectives and milestones. Objectives allow post-mining alternative land uses compared to pre-mining. Social domain objectives not considered.	4	Requires very detailed Progressive Rehabilitation & Closure Plans and Schedules and provides several useful appendices to assist. Appears to assume that a mining project will be rehabilitated continuously towards the pre-mining environmental state. Social domain objectives could not be identified in the text.	3	Comprehensive, practical advice. Proponents must provide risk-based, site- and domain-specific closure outcomes consistent with the post-mining land use(s) that are realistic and achievable and completion SMART criteria. Outcomes and criteria should have stakeholder input and be reviewed with stakeholder input at least every three years. Does not require any objectives related to social domains.Alternative land uses post mining can be different to pre-mining. Suggests use of Western Australian Biodiversity Science Institute's 2019 framework. Post-mine land uses should take into account WA Contaminated Sites Act.	4	An excellent, comprehensive, practical and structured approach to developing mine closure objectives and completion criteria. Leads user step by step through the iterative linear process, carefully defining terminology. Begins with selecting post-mining land uses, through to defining completion criteria, providing many practical attributes that can be used for completion criteria.	5

Table 7: Extract from Info Pack displaying summary comments and score of individual guidance documents relevant to the 'identifying stakeholders and ongoing engagement' activity slice.

Unplanned closure contingency plans should also be developed as part of initial closure plans and should be refined when operations begin. Unplanned temporary closure resulting in a temporary period of care and maintenance can be initiated by political forces, market-related events (e.g. low commodity prices), supply chain disruptions and adverse climate events. Note that this temporary period of care and maintenance is different to a long-term period of care and maintenance after exhaustion of ore at the end of mine life which is discussed more fully in Section 8.10.3.

8.4.2 Best practice considerations

The following are elements of best practice for this aspect of mine closure guidance:

- To ensure contemporary mine closure there needs to be a balance between providing certainty to the operator and the regulator, while also ensuring flexibility to meet changing final land uses and community/reparatory requirements, backed by appropriate financial guarantees.
- Before objective setting, assemble available baseline data including relevant environmental and social data from outside the project area and information on previous rehabilitation outcomes from previously closed mines in the region.
- Obtain input on closure vision and objectives (outcomes) and post-closure land uses/re-purposing from stakeholders including company officials, government regulators, local communities, landowners including Aboriginal title holders.
- If requested by stakeholders, include socio-economic outcomes in addition to the basic biodiversity, non-polluting, safe, stable, and low ongoing environmental liability outcomes.
- Undertake risk and opportunities analysis of closure options to agree preferred option(s) and promote where feasible progressive rehabilitation.
- The initial Mine Closure Plan, which may be a framework document with little detail, should be submitted as part of the application for the mining tenure.
- Roll the plan down to domain level and develop closure objectives and criteria for closure success at domain level supported by milestones and SMART success criteria. Social and environmental objectives that apply outside the project area should also be included.
- The plan should be published in part or in full by the company and/or government.
- Review the plan with stakeholders at least every three years throughout life of mine, or more often if circumstances change beyond initial assumptions. The final review at least 2 years from planned closure should provide more detail in a “Closure Implementation Plan” or similar name.
- An unplanned temporary closure plan should be included in the mine closure plan.

8.4.3 Findings and leading practice guidance

Many guidance documents provided high level policy advice on this topic and only touched on the detailed “how” of developing a project vision, objectives, and success criteria at a domain level. All guidance documents listed the default objectives or outcomes of re-establishing pre-mining biodiversity, ensuring the site is non-polluting, safe, and geotechnically stable with minimal ongoing environmental liability. Several guidance documents provided case studies or tools to emphasise practical approaches. Overwhelmingly, guidance documents focussed on the environmental and technical aspects of closure objective setting and, with the exception of a few guidance documents, the setting of objectives or outcomes in the social and socio-economic spectrum was not emphasised.

Re-purposing of mine assets was mentioned in many guidance documents, and some provided additional practical guidance on options for post-closure land use and re-purposing that included more innovative solutions.

Encouragement for companies to publish the closure plan in part or in full was provided by some guidance documents and it was noted that some jurisdictions, most notably Western Australia, do this independently of the company. Transparency is essential in ensuring that a party taking over a mining asset clearly identifies, understands and accepts the liability that such an acquisition entails.

Our analysis (Table 7) showed that among the institutions, the ICMM main guidance was a clear leader, providing comprehensive and practical guidance incorporating ICMM Tool 3: Objective Setting. It also provides the user with a structured approach to establishing closure vision, principles, and objectives and two best-practice boxes, lists of questions that could be addressed during the planning process, and a useful high-level process diagram.

Queensland's main guidance document, although reasonably comprehensive, appeared to focus primarily on the basis that continuous rehabilitation would be undertaken with little scope for alternative land use or social site objectives, other than returning the site to its pre-mining environmental state.

Victoria's main guidance provided comprehensive practical advice and stated that with public and other stakeholder consultation post-mining land uses could be different to that of pre-mining. It contained useful appendices and references with further information.

Western Australia's main guidance also provided comprehensive and practical guidance and admits the option of alternative post-mining land uses different to that pre-mining. Constraints on setting closure objectives posed by contaminated sites were mentioned, and radiological issues associated with closing uranium and heavy mineral sand mines were addressed very practically in an Appendix. It also endorses the use the WABSI (2019) framework for developing mine site completion criteria in Western Australia as a tool to assist with the development of acceptable completion criteria within a mine closure plan. WABSI's guidance document is comprehensive, practical and a highly structured approach to the setting of objectives/outcomes and completion criteria. Unfortunately, the title of WABSI's guidance document underplays the full scope of its content which encompasses selecting post-closure land use options and objective setting (outcomes) before considering completion criteria. On balance, the combination of Western Australia's main guidance document and the companion WABSI tool makes Western Australia's guidance documents the leader among the State jurisdictions.

None of the reviewed State guidance documents overtly required mine closure plans to include, if relevant, post-closure social or socioeconomic objectives.

8.5 Activity Slice 5: Risk assessment/opportunities

8.5.1 General considerations

All the global, regional, national and jurisdictional MC guidelines and guidance documents consistently emphasise the need for MCPs to include effective risk-identification, assessment, mitigation and management covering all stages of the mine life cycle. There is general agreement that identification of potential key environmental and socioeconomic closure risks at the very start of the planning process is essential as it may influence operational design and the setting of the

initial closure objectives and related closure and post-closure activities. The latter may be progressively refined during and particularly towards the end of the life of the mine in response to emerging information. A risk-based approach to MC planning is also increasingly seen as valuable in reducing MC cost and uncertainty and in identifying potentially value-adding opportunities particularly relating to post-closure alternative land uses and mining assets repurposing. There is emerging awareness of risks evolving in response to climate change particularly in terms of water resources quantity and quality.

8.5.2 Best practice considerations

The vast majority of guidelines and guidance documents examined categorised risks into the following five groups:

- Economic
- Environmental
- Financial
- Health and Safety, and
- Social

In addition, the ICMM's Tool 8 also lists 'Schedule' and 'Reputation' as risks primarily borne by the mining company.

There is also remarkable agreement in asserting that best practice is to adhere to the systematic Risk Management Guidelines, developed by the Council of Standards Australia and the Council of Standards New Zealand, known as AS ISO* 31000:2018 that encompass the following eleven principles:

1. Identify the risk in terms of probability and impact
2. Assess risks using qualitative and quantitative techniques
3. Evaluate changes to mitigate or avoid risk
4. Determine if residual risks are acceptable when compared with benefits for proposed change(s)
5. Manage risks by establishing controls, procedures, guidelines, actions, limits, etc., where necessary
6. Monitor the effectiveness of controls through periodic evaluation or review that includes consideration of changing conditions or needs
7. Consider all relevant factors
8. Look at past experience
9. Think about worst-case scenarios
10. Assess uncertainty
11. Act!

MINE CLOSURE PLAN (MCP) GUIDANCE - SETTING CLOSURE OBJECTIVES/OUTCOMES/SUCCESS CRITERIA

Colour-coding: Yellow = Relevant, Light blue = Whole of document comments and assessment - Degree of Relevance: 1=Low to 5=High

	Global								Regional			
	World Bank		*ICMM*		*ISO*		*ISO*		*APEC*		*TSM/MAC*	
Title	*Mine Closure: A Toolbox for Governments*		*Integrated Mine Closure - Good Practice Guide 2nd Edition*		*Mine Closure and Reclamation Planning: Part 1 Requirements (ISO 21795-1)*		*Mine Closure and Reclamation Planning: Part 2 Guidance (ISO 21795-2)*		*Mine Closure - Checklist for Governments*		*Towards Sustainable Mining - Mine Closure Framework*	
Year	*2021*		*2019*		*2021*		*2021*		*2018*		*2008*	
Summary Assessment	Relatively brief, high-level guidance distinguishing between impact of the project at jurisdictional level and lower level site-specific closure objectives/goals.Introduces the SMART terminology for assigning closure success criteria to objectives/goals involving input from stakeholders. No case studies provided.	2	Comprehensive and practical guidance incorporating ICMM Tool 3: Objective Setting, providing the user with a structured approach to establishing closure vision, principles and objectives. Has two best practice boxes, lists of questions to be addressed during process, and a useful high-level process diagram.	5	Somewhat repetitive high- and medium-level policy guidance on closure objective setting and commitments with limited supporting material.	2	Provides detailed practical guidance on objective setting and commitments and insights into possible success criteria that could be used.	4	Although this documents deals with government developing policy for the closure plan, it provides some high and medium level policy guidance for companies developing objectives and criteria for closure plans.	1	Provides a very brief high-level policy statement.	1

	National				State				State			
	Australia		*ANZMEC/MCA*		*Victoria*		*Queensland*		*Western Australia*		*Western Australia*	
Title	*Mine Closure Leading Practice Sustainable Development Program for the Mining Industry*		*Strategic Framework for Mine Closure*		*Community Engagement Guideline for Mining and Mineral Exploration in Victoria*		*Guideline: Progressive Rehabilitation and Closure Plans*		*Mine Closure Plan Guidance - How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans*		*A framework for developing mine-site completion criteria in Western Australia*	
Year	*2016*		*2000*		*2023*		*2023*		*2023*		*2019*	
Summary Assessment	Provides a degree of practical guidance on developing site-specific objectives, with input from stakeholders, beyond the basic safe, non-polluting, stable landforms, and able to sustain post mine land uses. It also promotes use of SMART and outcome-based criteria for meeting completion criteria.	3	Provides very high level policy advice on risk and outcomes based development, with stakeholder input and review during LoM, of closure objectives but little beyond safe , non-polluting, stable and appropriate for post-closure land uses. Two highlight boxes inserted into text.	1	Very practical guidance on objective setting for the entire site and individual domains. Appendix gives example rehabilitation plan templates on objectives and milestones for different mine types. Requires use of SMART criteria for measuring success of rehabilitation milestones and periodic review of objectives and milestones. Objectives allow post-mining alternative land uses compared to pre-mining. Social domain objectives not considered.	4	Requires very detailed Progressive Rehabilitation & Closure Plans and Schedules and provides several useful appendices to assist. Appears to assume that a mining project will be rehabilitated continuously towards the pre-mining environmental state. Social domain objectives could not be identified in the text.	3	Comprehensive, practical advice. Proponents must provide risk-based, site- and domain-specific closure outcomes consistent with the post-mining land use(s) that are realistic and achievable and completion SMART criteria. Outcomes and criteria should have stakeholder input and be reviewed with stakeholder input at least every three years. Alternative land uses post mining can be different to pre-mining. Suggests use of Western Australian Biodiversity Science Institute's 2019 framework. Did not require any objectives related to social domains. Post-mine land uses should take into account WA Contaminated Sites Act and Regulations.	4	An excellent, comprehensive, practical and structured approach to developing mine closure objectives and completion criteria. Leads user step by step through the iterative linear process, carefully defining terminology. Begins with selecting post-mining land uses, through to defining completion criteria, providing many practical attributes that can be used for completion criteria.	5

Table 8: Extract from Info Pack displaying summary comments and score of individual guidance documents relevant to the 'setting closure objectives/outcomes/success criteria' activity slice.

Appendix D of the World Bank's 'Mine closure: A toolbox for government' lists 30 common areas of risk relevant to MC for which individual probabilities and impacts may have to be estimated in building the relevant risk matrix. This process is also clearly illustrated by the ICMM's Tool 8 'Risk/opportunity Assessment and Management'.

8.5.3 Findings and leading practice guidance

Both the World Bank's, and particularly the ICMM's documents, provide comprehensive, informative and practical guidance regarding risk/opportunity assessment and management.

At a national level excellent guidance is provided by the Commonwealth's 2016 'Mine Closure Leading Practice Sustainable Development Program for the Mining Industry' and at the jurisdictional level by guidance by Victoria and Western Australia in particular. The latter includes a general discussion in text, but above all a series of appendices providing clear practical instructions and worked out examples of risk assessment and management procedures with regard to different mining stages/activities and domains. It also includes very useful flow charts of some of the related processes.

All leading guidance documents suggest basing the risk/opportunity assessment and management process in compliance with the AS ISO* 31000:2018 Risk Management – Guidelines, developed by the Council of Standards Australia and the Council of Standards New Zealand.

An extract from Info Pack displaying the Summary comments and individual ranking of guidance relevant to risk assessment and management is displayed in Table 9.

8.6 Activity Slice 6: Identifying post-mining alternative land uses and repurposing

8.6.1 General considerations

Historically, post-closure land-use policy, regulations and guidance have been dominated by the concept of Rehabilitation. In its strictest interpretation this was originally seen as returning the land, after ensuring its physical and chemical stability and safety, to as close a state as possible to its pre-mining pristine conditions or uses. In practice, the original ecosystems, revegetation and functions cannot be reinstated in certain mining domains and, even if they could, this would not always necessarily represent an optimal use for the land from a socio-economic point of view.

Most modern MC guidelines and guidance predicate that possible alternative post-closure land uses should be considered from the early MC planning stages and be revised as necessary in response to evolving regulatory, economic and community considerations during the life of the mine to identify other potentially more beneficial alternative uses. Ideally this analysis and planning should also take into consideration potential benefits and costs in the regional context.

MINE CLOSURE PLAN (MCP) GUIDANCE - RISK ASSESSMENT

Colour-coding: Yellow = Relevant, Light blue = Whole of document comments and assessment - Degree of Relevance: 1=Low to 5=High

	Global								Regional		National	
	World Bank		*ICMM*		*ISO*		*ISO*		*APEC*		*Australia*	
Title	*Mine Closure: A Toolbox for Governments*		*Integrated Mine Closure - Good Practice Guide 2nd Edition*		*Mine Closure and Reclamation Planning: Part 1 Requirements (ISO 21795-1)*		*Mine Closure and Reclamation Planning: Part 2 Guidance (ISO 21795-2)*		*Mine Closure - Checklist for Governments*		*Mine Closure Leading Practice Sustainable Development Program for the Mining Industry*	
Year	*2021*		*2019*		*2021*		*2021*		*2018*		*2016*	
Summary Assrssment	Comprehensive key document covering all aspects of mine closure in reasonable depth, including generalised discussion of the risk assessment process supported by an excellent tabulation in Appendix D of the potential impact of various risky circumstances.	4	Comprehensive key document covering all aspects of mine closure in reasonable depth, including specific discussion of the risk assessment process supported by an excellent process diagram and by the extensive, detailked and practical Tool 8. The emerging implications on risk assessment of climate change are also discussed in Tool 7.	5	Very brief and generalised discussion of risk assessment with reference to ISO 31000 standards.	1	Risk assessment represents a minor and generalised component of this extensive document. It should follow the guidance given in AS/NZL ISO 31000.	2	Although this excellent document has no chapter/section specifically devoted to risk assessment, a 'risk-based' approach permeated all processes from initial mine closure planning to post-closure activities.While comprehensive the document is general and conceptual in character and does not provide any practical 'how to' guidance.	3	Excellent, comprehensive and well-written, but essentially general, document. Relative limited practical guidance in terms of risk assessment except for the very useful Appendix 2.	4

	National				State							
	ANZMEC/MCA		*MCA*		*Victoria*		*Queensland*		*Western Australia*			
Title	*Strategic Framework for Mine Closure*		*Mine rehabilitation: Rehabilitation, closure planning and regulation (4 page brochure)*		*Preparation of rehabilitation plans. Guideline for mining and prospecting projects*		*Guideline: Progressive Rehabilitation and Closure Plans*		*Mine Closure Plan Guidance - How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans*		*A framework for developing mine-site completion criteria in Western Australia*	
Year	*2000*		*2018*		*2020*		*2023*		*2023*		*2019*	
Summary Assessment	Although dating back to 2000, this comprehensive document is still relevant to mine closure in general but essentially of no use in the context of risk assessment.	1	This colourful brochure, designed for general public use has no reference to risk assessment and only one reference to risk in the context of rehabilitation of the Bluestone Mines' Renison Bell tin mine tailings storage facility .	1	An awareness of risk and of the need for risk assessment throughout the mine cycle permeates this excellent guideline document.	5	Although this guideline refers to risk in a number of areas, it only contains a relatively short section dealing with any information specifically relating to risk assessment. It does, however, indicate that risk assessment would be carried out in compliance with AS/NZS ISO 31000 Risk management—principles and guidelines.	2	This excellent document provides very detailed and practical guidance regarding the need for and how to carry out risk identification, assessment and management throughout the whole mining cycle.	5	This completion criteria documents provides practical and detailed guidance in terms of risk assessment and management and represents a significant complement to the more broad 2023 WA's 'Mine closure plan guidance'.	5

Table 9: Extract from Info Pack displaying summary comments and ranking of individual guidance documents relevant to the 'risk assessment and management' activity slice.

Wherever possible, physical and chemical stability and restoration of the original ecosystems and functions, together with decommissioning and/or demolition of mining facilities in a manner which ensures public safety and minimization of adverse visual effects, will continue to heavily influence the main risk-based criteria for the formulation of the initial MC plan. This is particularly the case in Australia where most mines are located on Crown land in the scantly populated and dry interior, where alternatives to pastoralist use are few and far apart. Even in the NT where just under 50% of the land is either under native title or reserved for the use and benefit of Aboriginal communities, most mine sites tend to be distant from the communities, limiting alternative post-mining uses. This, in combination with the now prevailing fly-in fly-out approach to mining has resulted in mining facilities being primarily impermanent and easily removed after mine closure.

However, under different logistic circumstances, a range of post-closure socioeconomic considerations relating to alternative, potentially more beneficial uses for different mining domains and facilities have been acquiring increasing prominence in recent years.

The process of identifying and analysing, after considering related requirements and constraints, activities and land uses other than the original ones with the capacity to generate income and/or other economic benefits from mine closure, and of discarding non-viable ones, is referred to as repurposing. In this context, consultation with key stakeholders early in the process to take into consideration their views and expectations in MC planning is generally considered highly desirable.

Different areas of a mining lease may be rehabilitated in different ways depending on the nature of the ultimate repurposed land use potentially leading to different reclaimed landforms appropriate for the selected use. This approach may help to attract third parties to the land after relinquishment thus providing an offset for ongoing post-closure operating and maintenance costs.

It is generally recognised that, given the often long life of mines and the rapid pace of innovation in terms of possible future post-mining alternative uses of the land that has been accelerated in response to climate change pressure, not all feasible alternative uses for the land may be identified at the early MC planning stages and that as a consequence, MC plans should ideally be reviewed at regular time intervals or as needed to include emerging potential alternative uses.

8.6.2 Best practice considerations

The following are critical elements of best practice for this aspect of mine closure guidance:

- Consideration of alternative land uses and repurposing should be integral to the earliest phases of MC planning and reviewed throughout the life of the mine.
- Key stakeholders should be identified and consulted in the early stages of MC planning to determine their post-closure expectations and to take them into consideration in the MC plan wherever possible.
- Potential alternative beneficial uses of the land should be identified for different mining domains within the mining lease as their individual intended use would influence the form and degree of rehabilitation to be applied to each domain beyond making it safe and physically and chemically stable.
- Recognition that potentially beneficial new alternative land uses may emerge during the life of the mine that need to be evaluated and, if warranted, accommodated in the MC plan during its regular reviews.
- Awareness that increasing pressure to decarbonise due to climate change is and will continue to stimulate innovation in terms of new policy and practical adaptation responses

some of which are likely to make good use of repurposed post-mining appropriately rehabilitated land and of disused mining facilities.

8.5.3 Findings and leading practice guidance

All MC guidance documents examined addressed the need to identify alternative post-mining land uses early in the MC planning process. However, most of them displayed a traditional and relatively narrow approach to the related rehabilitation and a relatively constrained range of potential alternative land uses. This is inconsistent with sections dealing specifically with repurposing, that by and large, tend to be based on case studies of actual post-mining uses of land many of which not considered in the general handling of the topic. One may be justified in believing that many of these uses would have not been considered in the earlier MC planning stages and were in many cases in the nature of an afterthought, that is to say considered very close to the time of closure. In many ways this is not surprising, because many of the mines being closed had been operating for many years and therefore developed at a time when MC planning was not formally part of the approval process or in its infancy.

Repurposing and reuse of mining assets appears to be an area where MC policy formulation and updating of related guidelines and guidance tend to lag the very rapid development of innovative practices, in effect making this, as discussed later in this report, a guidance 'gap'.

As shown in Table 10, among the various international MC guidance examined, those of the World Bank and particularly the ICMM were prominent, while at the jurisdictional level Western Australia's WABSI (2019) 'A framework for developing mine-site completion criteria in WA' was the highest-ranking guidance.

8.7 Activity Slice 7: Estimating financial assurance and closure costs

8.7.1 General considerations

Virtually every mining jurisdiction has legacy or orphan mines sites (in some cases up to several tens of thousands) that were abandoned without any or only partial rehabilitation having been carried out by their original miners, imposing a potentially significant financial liability on government for their eventual final rehabilitation. The options open to government to address their abandoned mine sites problems are specifically discussed elsewhere in this report.

MINE CLOSURE PLAN (MCP) GUIDANCE - IDENTIFYING POST-MINING ALTERNATIVE LAND USES

Colour-coding: Yellow = Relevant, Light blue = Whole of document comments and assessment - Degree of Relevance: 1=Low to 5=High

	Global						Regional		National	
	World Bank		*ICMM*		*ISO*		*APEC*		*Australia*	
Title	***Mine Closure: A Toolbox for Governments***		***Integrated Mine Closure - Good Practice Guide 2nd Edition***		***Mine Closure and Reclamation Planning: Part 1 Requirements (ISO 21795-1)***		***Mine Closure - Checklist for Governments***		***Mine Closure Leading Practice Sustainable Development Program for the Mining Industry***	
Year	***2021***		***2019***		***2021***		***2018***		***2016***	
Summary Assessment	An excellent review of alternative post-closure land uses and asset repurposing and their identification with emphasis on consultation with stakeholders early in the mine closure planning stagesand their continuing review during the LOM in pre paration for the necessary socio-economic transitioning	***4***	Very comprehensive chapter on 'Post-closure land use, supported by the practical application Tool 4.	***5***	Alternative land use represents a minor yet important component of this broad scoped document	***1***	This excellent, otherwise comprehensive document devotes a relatively short section to post-mining land use primarily from a policy point of view.	***1***	This comprehensive document devotes a section to alternative land use that, while general in nature, provites interesting details of two examples of successful alternative land use in NSW and the Rurhregion of Germany	***2***

	State							
	Victoria		*Queensland*		*Western Australia*			
Title	***Preparation of rehabilitation plans. Guideline for mining and prospecting projects***		***Guideline: Progressive Rehabilitation and Closure Plans***		***Mine Closure Plan Guidance - How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans***		***A framework for developing mine-site completion criteria in Western Australia***	
Year	***2020***		***2023***		***2023***		***2019***	
Summary Assessment	These well presented guidelines strongly emphasise the need to identify the range of possibly feasible alternative land uses for the individual domains of a mininig project and determine the post-rehabilitation form of each domain necessary to support the different land uses.	***3***	This very detailed and prescriptive, but hard to read, documents provides guidance as to the process whereby allowable Post Mining Land Uses (PMLUs) are established, supported by references to relevant Sections of the EPA and examples of completed forms in Appendix 2.	***4***	Given the broad nature of this guidance the chapter relating to post-mining land uses (PMLUs) is relatively general and refers for more detail to the 2019 WA's 'A framework for developing mine-site completion criteria' for more exhaustive discussion of the topic.	***3***	Excellent and detailed coverage of mine closure aspects and processes relating to post-mining land uses (PMLUs) supporting the 2023 WA's 'Mine Closure Plan Guidance'	***5***

Table 10: Extract from Info Pack displaying summary comments and score of individual guidance documents relevant to the 'identifying post-mining alternative land uses' activity slice.

To eliminate or at best mitigate this risk, most mining jurisdictions have introduced some form of financial assurance that guarantees that funds will become available for government to carry out the necessary site rehabilitation if a mine is abandoned.

Irrespective of the financial instrument used, in an ideal world the amount of assurance should cover the full cost for the State to rehabilitate a site at its stage of disturbance if a miner were to abandon it in default on its rehabilitation obligations. An exact matching, however, may prove hard to achieve because the extent of rehabilitation to be carried out changes continuously due to new disturbance and progressive rehabilitation. In most jurisdictions mining companies self-assess and continuously review their site rehabilitation liabilities with the regulator carrying out occasional field checking of their realism and requiring adjustments if necessary.

In addition, the relevant rehabilitation cost estimation also changes continuously due to the combined effect of general inflation and real cost escalation requiring continuous updating of the unit cost tables in the recommended cost estimation calculators.

In effect financial assurance or security is a blunt tool to limit the risk to government based on a generally gross approximation of the actual closure costs that would be incurred if the site were to be abandoned.

Informal communications, however, indicate that in recent times, following the requirement for companies to provided financial assurance and generally improving environmental and social awareness, the incidence of companies defaulting on their rehabilitation commitments has become less common.

The amount of financial assurance should be the subject of regular, ideally annual, reviews of the relevant unit cost rates to compensate for MC cost escalation over time. However, frequent reviews are, not surprisingly, resented by industry and generate lobbying political pressure on government.

The choice of financial instrument to be used ranges from (i) a cash deposit through various types of (ii) unconditional performance bonds guaranteed primarily by banks but also by insurance companies, (iii) contribution to trust funds or, at the limit, (iv) reliance on the documented creditworthiness of specific mining companies and their reluctance to affect their reputation and licence to operate by not living up to their rehabilitation commitments. In many instances banks would provide a bank guarantee at a sensible fee only under the condition that the company requiring it provides collateral or frequently by establishing a bound interest-bearing account for the same amount with them. Consequently, while strong financial assurance mitigates the risk to government, it constrains the financial capacity and willingness of mining companies to proceed with mine developments particularly in cases where potentially multi-million-dollar financial liabilities are involved.

8.7.2 Best practice considerations

The following are critical elements of best practice for this aspect of mine closure guidance:

- Estimate the magnitude of the land rehabilitation costs consistent with related mine-closure objectives at the start of the mining activities and adjust it regularly in response to progressive rehabilitation and new areas of disturbance not included in previous estimates.
- Simplify compliance, where possible, by basing total rehabilitation cost estimates on the application of appropriate, regularly published rehabilitation unit rates per hectare for

different domains and types of disturbances reflecting the complexity and cost of their related rehabilitation activities and the risks inherent in inadequate rehabilitation. Rates should be indexed for cost escalation over time and should be adjusted, by exception, to reflect the specific logistical and physicochemical circumstances of individual projects.

- Performance guarantee bank bonds reflecting the total current cost estimates of rehabilitating the land (not the company's accounting rehabilitation provisions) are the most common form of financial assurance in preference to equivalent cash deposits (that would impact more severely on a company's financial resources to be directed to its projects).
- Regular contributions to an industry-wide, mine site rehabilitation fiduciary fund may not be a desirable alternative if the number of mines in a jurisdiction is comparatively low reducing the capacity for adequate funds-accumulation speeds.
- Limited reliance on commitments by large and reputable mining companies to carry out acceptable rehabilitation in the absence of financial assurance merely to protect their corporate reputation and 'social licence to operate'.
- Miners should be provided with a set of clear and easy to fill forms for various domains and types of disturbances as well as realistic examples of completed forms and assistance where needed through easy access to relevant competent government officers.
- The whole process should be facilitated by the provision of a friendly and regularly updated, ideally Excel-based, mine-closure cost estimation calculator. The calculator not only would provide users with relevant rehabilitation unit rates per hectare for different domains and types of disturbances, but also display the unit cost of their source detailed component activities on which they are based, and which are to be regularly updated.
- The land rehabilitation cost estimates submitted by miners for approval as the basis of their financial assurances and their progressive changes over time should be the subject of occasional physical auditing and the regulations should provide for adequate penalties to be imposed in case of appreciable misalignment.

8.7.3 Findings and leading practice guidance

All guidance documents emphasise the importance of establishing effective financial assurance.

Broader international institutional guidance generally provides descriptions of the choice of arrangements and financial instruments open for adoption by regulatory jurisdictions ranging from general in nature to very detailed and comprehensive. In some cases, it also includes reference to mine closure cost estimation calculators of specific jurisdictions and expresses generalised qualitative preferences. From a practical point of view guidance provided by the IGF is the most detailed and valuable.

By contrast, national and state guidance focuses exclusively on the mine closure financial assurance policy regime adopted by each individual jurisdiction, only providing compliance rules, detailed procedural instructions and cost estimation calculators relevant and specific to it. To the extent that the related financial assurance regime would be acceptable to potential other users (e.g. other jurisdictions) and applicable to their specific conditions, this type of guidance can in fact be the most valuable from a practical point of view.

Table 3.7shows that among the global and regional institutions, the IGF was a clear leader, providing comprehensive and practical guidance.

8.8 Activity Slice 8: Reviewing mine closure plan

8.8.1 General considerations

An umbrella mine closure plan developed in the lead-up to lodging an application for mining tenure will need to be reviewed throughout the life of the mining tenure. Subsidiary plans or schedules for unplanned early closure or suspended operations under care and maintenance, stakeholder engagement plan, socio-economic impact plan, social transition plan, decommissioning plan, post closure rehabilitation and monitoring plan, etc. also need to be reviewed.

Developing these plans usually involves effective engagement with a spectrum of external stakeholders to ensure a level of ownership of the resulting plans. While there are many possible triggers for major reviews of mine closure plans, most mines will implement small incremental changes during the process of mining between reviews that need to be collected periodically in a formal review. At particular milestones during mine life, subsidiary plans are needed by regulators, and particularly within a few years of the planned end of mining and processing operations when detailed post closure plans are required.

8.8.2 Best practice considerations

Summary best practice elements for this aspect of mine closure guidance include the following:

- Ideally, mine closure plans should be reviewed continuously.
- Practically, the closure plan, including the closure cost estimate and social aspects, should be reviewed about every 3 to 5 years, or when material changes occur in the mine's operating environment.
- Subsidiary plans and schedules, such as unplanned early closure or suspended operations under care and maintenance, stakeholder engagement plan, socio-economic impact plan and social transition plan should be reviewed at the same time.
- A thorough risk and opportunities analysis and the results of monitoring of physical, chemical, continuous rehabilitation success and trials, and socio-economic parameters should inform the review.
- Reviews should involve at least the same stakeholders that were involved in the development of the seminal closure plan submitted as part of the mining tenure application.
- It is critical that local community members and local governments are involved in these reviews because communities become more knowledgeable about mining and their views commonly change during life of mine.
- Near (2 to 3 years) the end of mining and ore processing operations, a decommissioning plan, and post closure rehabilitation and monitoring plan need to be compiled and preferably be reviewed annually thereafter.

MINE CLOSURE PLAN (MCP) GUIDANCE - FINANCIAL ASSURANCE GUIDANCE

Colour-coding: Yellow = Relevant, Light blue = Whole of document comments and assessment - Degree of Relevance: 1=Low to 5=High

	Global																	
	World Bank		*ICMM*				*IGF*		*ISO*				*TMS/MAC*					
Title	*Mine Closure: A Toolbox for Governments*		*Integrated Mine Closure - Good Practice Guide 2nd Edition*		*Financial Concepts for Mine Closure*		*Global Review: Financial Assurance Governance for the Post-mining Transition*		*Mine Closure and Reclamation Planning: Part 1 Requirements (ISO 21795-1)*		*Mine Closure and Reclamation Planning: Part 2 Guidance (ISO 21795-2)*		*Towards Sustainable Mining - Mine Closure Framework*					
Year	*2021*		*2019*		*2019*		*2021*		*2021*		*2021*		*2008*					
Summary Assessment	Comprehensive key document covering all aspects of mine closure in reasonable depth, including generalised discussion of cost estimation and financial assurance as well as of abandoned mine sites	3	Conprehensive key document of which cost estimation and financial assurance represent a relatively modest part. This document is integrated with 8 well-presented training modules.	3	Although written in summarised, dot-point style, this is a very comprehensive and key source document. No references or web links	4	Well-presented key document specifically relevant to financial assurance. Useful review of main international financial assurance regimes	5	Minimal reference to cost estimation and financial assurance appears in this wide-ranging document	1	Cost estimation and financial assurance represent a modest part of this wide-ranging document	2	This one-page document contains 8 summarised mine closure priciples including (N.4) establishing financial assurance	1				

	Regional		National					
	APEC		*Australia*		*ANZMEC/MCA*		*MCA*	
Title	*Mine Closure - Checklist for Governments*		*Mine Closure Leading Practice Sustainable Development Program for the Mining Industry*		*Strategic Framework for Mine Closure*		*Mine rehabilitation: Rehabilitation, closure planning and regulation*	
Year	*2018*		*2016*		*2000*		*2018*	
Summary Assessment	An excellent and comprehensive coverage of mine closure issues but dealing with cost estimation and financial assurance in a very general way	2	An excellent document dealing comprehensively with all mining closure activities/processes including cost estimation and financial assurance albeit in a generalised fashion.	3	A very estensive but somewhat dated document with limited and generalised relevance to cost estimation and financial assurance	2	A colourfully edited 8-page brochure aimed at a general audience	1

	State													
	Victoria				*Queensland*						*Western Australia*			
Title	*Preparation of rehabilitation plans. Guideline for mining and prospecting projects*		*Rehabilitation bonds - minerals exploration, mines and quarries*		*Guideline: Progressive Rehabilitation and Closure Plans*		*Financial assurance, provisioning and rehabilitation for environmental authorities*		*User guide for estimated rehabilitation cost calculator for mining*		*Mine Closure Plan Guidance - How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans*		*Mining Rehabilitation Fund Reporting Guidelines*	
Year	*2020*		*2020?*		*2023*		*2023?*		*2022*		*2023*		*2021*	
Summary Assessment	Extensive and informative general guideline document with modest relevance regarding cost estimation and financial assurance	**1**	Excellent guidance specific to cost estimation and financial assurance supprted by provision of forms, examples and cost calculator	**5**	Extensive and very detailed documentdealing with all mine closure aspects except for cost estimation and financial assurancethat is mentioned only once in the Introduction with reference to recent legislative amendments	**1**	This detailed and rather prescriptive document complements the Guideline and provides a hub of numerous web links to other related and more practical guidance documents and to a rehabilitation cost calculator for mining	**4**	Very comprehensive, practical, step-by-step instructions on how to download and use the cost estimation calculator for mining	**4**	Conprehensive general mine closure guidance, but low relevance to financial assurance limited to a short and generic chapter	**1**	Comprehensive and practical financial assurance guidance supported by worked-out example and a cost estimation calculator	**5**

Table 11: Summary extract from Info Pack providing relevance and ranking of global institutional and national/state jurisdictional guidance in the area of financial assurance.

8.8.3 Findings and leading practice guidance

The major international institutional guidance documents (Table 12) such as the World Bank, ICMM, and ISO emphasise an adaptive management approach involving an on-going cycle of risk and opportunity analysis, continuous monitoring of environmental success and socio-economic parameters, review of mine closure plans, followed by implementation of review outcomes. Only the World Bank main guidance, in line with its title of a toolbox for governments, suggests a policy that governments should require a three-to-five-year review of mine closure plans from miners.

APEC and ANZMEC/MCA generally suggest ongoing reviews of mine closure plans and when circumstances change but also recommend that periodic major reviews be undertaken every three to five years. The Australia-MC main guidance focusses on reviews at major milestones during mine life and at other triggers.

All institutional guidance documents recommend that major reviews, and this would probably extend to those initiated by changes in the mine's operating environment, be done with input from external stakeholders.

Guidance documents from two Australian jurisdictions (Victoria and Queensland) require that miners seek approval for changes to mine closure plans and associated ancillary documents which appears to involve some level of bureaucratic process complexity depending on the change(s) requested.

Victoria's main guidance provides detailed guidance on how to update a rehabilitation plan, rehabilitation milestones and if a major change, the mine Work Plan. The process has a number of steps — the miner needs first to consult with local government, other relevant State government agencies, the landowner and submit their views or concurrence in writing on the change proposal before submitting it to the Regulator. Detailed guidance on how to prepare and submit an administrative update (notification) and/or a variation is set out in Department of Jobs, Precincts and Regions (2020) "Preparation of Work Plans and Work Plan Variations – Guideline for Mining Projects". Regular periodic rehabilitation plan updates are not required.

Although the Queensland main guidance contains only brief advice on amending progressive rehabilitation and closure plan (PRCP) schedules, it is supported by an application form and an extremely comprehensive 50-page, non-statutory procedural guideline (Department of Environment and Science, 2023) entitled "Guideline major and minor amendments" that deals with mining and other industries. The complexity involved is dependent on whether the update or change is minor or not minor, and whether it involves the PRCP Schedule, or the PRCP and PRCP Schedule, or the Environmental Authority, or all three. Procedural process diagrams accompany the text. Regular periodic updates to the progressive mine closure plan and schedule are not required.

In contrast to Victoria and Queensland, Western Australia guidance requires updates to mine closure plans generally every three to five years for some especially long-term projects accompanied by a text table summarising the changes from the earlier plan. The revised Mine Closure Plan can be viewed by the public using the online MINEDEX database.

The issue with requiring even relatively minor changes to be notified to, or approved by government is that not all mines may notify or seek approval of minor changes, and potentially more major changes. By requiring regular periodic reviews of mine closure plans be submitted to government, all changes should be incorporated into the revised plan resulting in a higher level of compliance.

In summary, the major international institutions all offer practical and reasonably comprehensive advice on continuously reviewing mine closure plans, with the World Bank and APEC recommending reviews should be submitted to government every three to five years. This is the approach taken by Western Australia which also provides very clear guidance on the form and content of mine closure plans and makes mine closure plans and revisions available to external stakeholders via its website.

8.9 Activity Slice 9: Enabling post-mining social transition

8.9.1 General considerations

Increasing awareness of the criticality of effective stakeholder engagement for the long-term success of a mining project has in the last 10 years placed more focus on the social and socioeconomic transition of some mine-dependent stakeholders during and after mine closure. Mine-dependent stakeholders include those whose income and lifestyle have been dominated by the mine, and without adequate support in the post closure period from third parties, have few options for income replacement. Regional and remote communities, landowners, and businesses in areas with minimal or no alternative employment and income-generating opportunities are in this category. Local governments that derive income from rates and service charges imposed on mining ventures may also suffer from reduced income post mine closure with flow-on effects on the level of services they are financially capable of providing to communities.

Mine closure plans, generated with stakeholder input, must envision viable post-mining land uses and businesses and potentially re-purposing of mine-related infrastructure to effectively plan the post-mining social and socioeconomic transition. Even then, options for post-closure social transitioning may be limited in many situations.

8.9.2 Best practice considerations

The following elements of best practice were largely summarised from ICMM (2019) which is widely acknowledged as the authoritative document for guidance on this subject:

- “Social transition” is preferred to the term “social closure” because the latter has negative connotations for some stakeholders.
- The mine closure plan with local community stakeholder representatives’ input should incorporate a risk-based, post-closure vision with objectives for post-closure land uses, potential re-purposing options and the social/socioeconomic transition.

MINE CLOSURE PLAN (MCP) GUIDANCE - REVIEWING MINE CLOSURE PLAN

Colour-coding: Yellow = Relevant, Light blue = Whole of document comments and assessment - Degree of Relevance: 1=Low to 5=High

	Global									
	World Bank		*ICMM*		*ISO*		*ISO*		*TSM/MAC*	
Title	*Mine Closure: A Toolbox for Governments*		*Integrated Mine Closure - Good Practice Guide 2nd Edition*		*Mine Closure and Reclamation Planning: Part 1 Requirements (ISO 21795-1)*		*Mine Closure and Reclamation Planning: Part 2 Guidance (ISO 21795-2)*		*Towards Sustainable Mining - Mine Closure Framework*	
Year	*2021*		*2019*		*2021*		*2021*		*2008*	
Summary Assessment	High level policy statement that legislation and industry best practice should require the closure plan and closure cost estimate, to be reviewed involving stakeholders about every 3 to 5 years to reflect material changes in the mine's parameters. Says most jurisdictions require operator to prepare a final closure plan as the mine approaches actual closure.	3	This entire guidance for miners is imbued with references to reviewing on a risk basis all plans developed during life of mine and beyond. Numerous planning graphics display review feedback loops to indicate the impact of continous monitoring -- e.g. Figure 1	3	This entire guidance providing high level advice to miners is premised on risk and opportunity analysis, adaptive management, quality systems and continual review of plans.	2	This guidance is a moderately comprehensive and practical, domain by domain approach, including social domains, to reviewing all aspects of mine closure plans. This involves monitoring, risk and opportunities analysis, adaptive management review of alternatives and selection of prefered option, revision of plan and implementation. Considerations and possible options are listed for each domain.	3	Consists of three, strong, high-level policy commitments MAC members make to review closure plans.	1

	Regional		National		State					
	APEC		*Australia*		*Victoria*		*Queensland*		*Western Australia*	
Title	*Mine Closure - Checklist for Governments*		*Mine Closure Leading Practice Sustainable Development Program for the Mining Industry*		*Preparation of rehabilitation plans. Guideline for mining and prospecting projects*		*Guideline: Progressive Rehabilitation and Closure Plans*		*Mine Closure Plan Guidance - How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans*	
Year	*2018*		*2016*		*2020*		*2023*		*2023*	
Summary Assessment	Provides high level but practical policy advice to governments to require miners to review and update mine closure plans on a regular basis or when circumstances change with 5 years proposed as a maximum period for review.	2	From the feasibility stage, through milestone stages in mine life and beyond, provides practical, medium-level policy advice for miners on triggers for reviewing mine closure plans.	3	Provides detailed guidance on how to update a rehabilitation plan, rehabilitation milestones and if a major change, the mine Work Plan. Detailed guidance on how to prepare and submit an administrative update (notification) and/or a variation is set out in Preparation of Work Plans and Work Plan Variations – Guideline for Mining Projects. It appears as though regular periodic updates are not required.	4	The advice, only 250 words, is supported by an application form and an extremely comprehensive 50 page (19 pages main text and 31 pages of appendices) non-statutory procedural guideline entitled "Guideline Major and minor amendments" (dated 26/9/2023) that in part deals with mining. The review may involve the PRCP Schedule, the PRCP and PRCP Schedule, or the Environmental Authority, or all three. Many procedural process diagrams accompany the text.	4	Although brief, this practical guidance relies on the remainder of the guidance which is relevant because it steps the user through the compilation of a Mine Closure Plan in a very conventional, structured way. The guidance states the Mining Act requires Mine Closure Plans be reviewed and submitted for approval every three (3) years or such other time as specified in writing. The revised version, as well as a summary table listing sections that have been changed and why must be submitted for approval.	5

Table 12: Extract from Info Pack displaying summary comments and score of individual guidance documents relevant to the 'reviewing mine closure plan' activity slice.

- Investment by the company in social/socioeconomic transitioning should occur throughout life of mine and be incorporated into the full cost of closure and should be directed at building social and economic resilience in the local community and local businesses to survive post-mining. This could include establishment of Community Benefit Trusts, enabling stakeholders as members to inform how money collected is used wisely or invested for the post-mining future.
- Community development, local business development advisory services, and training and reskilling of employees and community members should form a large part of building resilience.
- Government and potentially NGOs should be involved in planning for and implementation of social transitioning strategies with their involvement and ownership increasing post-closure.
- Monitoring of social and socioeconomic baseline parameters should continue through closure and post-closure.

8.9.3 Findings and leading practice guidance

Table 3.9 shows a wide range in the degree to which different guidance documents address this topic and many guidance documents, with the exception of one or two high-level policy statements, do not contain detailed policy or practical guidance. Some individual guidance documents (e.g. the World Bank) are transparent in summarising the ICMM main guidance in their guidance. To some extent, the variation between guidance documents reflects how recently social transitioning (and previously social closure) has gained increased focus in mine closure literature.

Both the APEC and Australia-MC main guidance documents are reasonably comprehensive and practical with APEC providing four case studies relevant to the topic and the Australia-MC main guidance document is supported by two companion guidance documents in the same series — Community engagement and development handbook (Department of Industry, Innovation and Science, 2016a), and the Working with Indigenous Communities handbook (Department of Industry, Innovation and Science, 2016b) which provide some practical advice and case studies.

Virtually no guidance on social closure transitioning is provided by the three State jurisdictional documents. This appears to represent a gap in the guidance documents published by Queensland and Western Australia which have mining operations in regional and remote areas more likely to be associated with mine-dependent communities.

Overall, the ICMM main guidance document is best practice for this topic and is recognised as such by guidance documents published by other institutions. It provides very comprehensive and lengthy guidance from an industry perspective on social transition strategies and practices including illustrative graphs, two tools, two case studies and 3 best practice highlight boxes. The ICMM Community development toolkit (ICMM, 2012), Good practice guide -- Indigenous people and mining (ICMM 2015a), and Understanding company-community relations toolkit (ICMM, 2015b) are also relevant.

8.10 Activity Slice 10: Rehabilitation post-mining

8.10.1 General considerations

Although progressive rehabilitation is undertaken during operations, rehabilitation will be required at end of mining and mineral processing to return mine site domains to viable and, wherever

practicable, self-sustaining, biodiverse ecosystems compatible with a healthy environment and potentially with human activities. Early in this period, removal of mine infrastructure will be undertaken if not required by a subsequent land user. Major issues that need to be addressed during this period are acid rock drainage, slow establishment of biodiverse ecosystems in arid climates, the impact of macro- and micro-fauna, catastrophic weather events and climate change on constructed landforms and revegetation, and parts of mine sites that may be permanently included on contaminated sites registers maintained by some jurisdictions and particularly in the case of uranium, and most base metal mines.

8.10.2 Best practice considerations

- About two years prior to the end of mining and ore processing operations, regulators should require a “Post-closure rehabilitation and monitoring plan” or “Decommissioning and monitoring plan” or similar name.
- The post-closure phase should provide for adaptive management, and for ongoing environmental management and monitoring until completion criteria and post mining land-use requirements are met. Particular emphasis should be on ensuring human health risks are minimised.
- Mine closure and rehabilitation design must incorporate resilience measures and minimise the risk of incremental and catastrophic failure of constructed landforms and re-vegetation caused by weather extremes and climate change. The aim should be to reduce long-term maintenance requirements and liabilities.
- Attention should be paid to issues that pervade multiple rehabilitation domains such as water, acid rock drainage and dust management. Monitoring of upstream and downstream surface and sub-surface drainages and dust outside of the mining tenement package and regionally should continue to capture the environmental impacts of fugitive emissions from disturbed land, constructed landforms and voids.
- Ongoing stakeholder engagement is required during the post-mining rehabilitation period and if possible, companies and individuals from local communities should be involved in the rehabilitation and monitoring programs.
- Regulators should provide to miners a staged, verified milestone-based policy framework applying to a pathway for mining tenure and environmental obligations to be relinquished in part or in full back to the government or other parties. Some governments are now considering a new form of land tenure that mining tenure with long term environmental liabilities could be transferred into, unless there is a possibility that the tenure might contain a resource that could be mined in the future.
- Financial provisioning for any required post-relinquishment management and monitoring needs to be determined by the miner, regulators and potentially stakeholders.

MINE CLOSURE PLAN (MCP) GUIDANCE - ENABLING POST-MINING SOCIAL TRANSITION

Colour-coding: Yellow = Relevant, Light blue = Whole of document comments and assessment - Degree of Relevance: 1=Low to 5=High

	Global											
	World Bank		*ICMM*		*IGF*		*ISO*		*ISO*		*TSM/MAC*	
Title	***Mine Closure: A Toolbox for Governments***		***Integrated Mine Closure - Good Practice Guide 2nd Edition***		***Global Review: Financial Assurance Governance for the Post-mining Transition***		***Mine Closure and Reclamation Planning: Part 1 Requirements (ISO 21795-1)***		***Mine Closure and Reclamation Planning: Part 2 Guidance (ISO 21795-2)***		***Towards Sustainable Mining - Mine Closure Framework***	
Year	***2021***		***2019***		***2021***		***2021***		***2021***		***2008***	
Summary Assessment	Very comprehensive and lengthy guidance on socio-economic transitioning and repurposing that emphasises both the company and government role, and mentions other stakeholders. Refers to ICMM guide as the most recent and comprehensive and to IFC's Stakeholder engagement: A good practice handbook for companies doing business in emerging markets guidance.	**4**	Very comprehensive and lengthy guidance from an industry perspective on social transition strategies and practices including illustrative graphs, two tools, two case studies and 3 best practice highlight boxes. The ICMM Community development toolkit, Good practice guide -- Indigenous people and mining, and Understanding company-community relations toolkit are also relevant.	**5**	Very focussed on financial assurance governance but briefly comments that costs related to socioeconomic transitioning be included into closure cost estimaes.	**1**	Brief mention that closure plans must include plans for social transitioning and that costs be included in the closure plan.	**1**	Very briefly mentions post closure social transitioning.	**1**	One sentence in a one page document refers to companies committing to mitigate socio-economic impacts of mine closure and help communities develop plans for long term economic development.	**1**

	Regional		National			
	APEC		*Australia*		*ANZMEC/MCA*	
Title	***Mine Closure - Checklist for Governments***		***Mine Closure Leading Practice Sustainable Development Program for the Mining Industry***		***Strategic Framework for Mine Closure***	
Year	***2018***		***2016***		***2000***	
Summary Assessment	Comprehensive advice on the issue and provides practical strategies to mitigate the impact of the main effects of social transitioning. Has four case studies.	**4**	Provides introductory guidance and three case studies on social transition strategies in the Mine Closure Handbook with minor additional guidance in the Working with Indigenous Communities handbook.	**4**	Briefly mentions post-closure social transition	**1**

Table 13: Extract from Info Pack displaying summary comments and score of individual guidance documents relevant to the 'enabling post-mining social transition' activity slice.

8.10.3 Findings and leading practice guidance

In general, this period of mine life is a vexed one for miners, governments and stakeholders because of the uncertainties associated with remaining environmental liabilities and the uncertain timelines involved in release of the land back to government, or transference to another owner. Two guidance documents provide the most cogent advice on this topic. The ICMM main guidance provides very comprehensive and practical guidance on the technical aspects of post-operational to relinquishment rehabilitation and monitoring. It canvasses options to mitigate acid mine drainage (AMD) and the effects of different climates, and climate change, on post closure geotechnical and geochemical stability. In addition, ICMM has four relevant tools, and references INAP (2009) for detail on mitigating impacts of AMD. The World Bank guidance document references ICMM and APEC as the most recent and comprehensive documents on this issue.

The Australia-MC main guidance also provides comprehensive advice on this subject and cautions that because problems such as AMD may have long lag times before they become evident, it may be necessary to monitor the success of revegetation, the effectiveness of cover systems and any impacts on water resources for 10 to 20 years or more. The guidance also outlines a structured six step process as a pathway to relinquishment, with two case studies.

APEC states that regulators should provide mining companies with a pathway to final relinquishment of mine sites. This is a useful introduction to this topic from a government perspective which is of value to companies.

There is some consensus between most guidance documents that 5 to 20 years is required to assess whether a self-sustaining and biodiverse ecosystem is being established. Ultimately, if rehabilitation shows some success during this period, it should put the miner on a pathway to release from environmental obligations and full relinquishment of the mining tenure. However, it is clear there are few recent examples in Australia where this environmental nirvana has been demonstrated and for many miners, the pathway to release from environmental liabilities and surrender of the mining tenure is a grey area associated with uncertainty and on-going risk. This uncertainty is reflected in most guidance documents that fail to adequately establish a policy framework for the pathway to relinquishment.

Queensland's guidance document requires that rehabilitation milestones for the decommissioning and later phase would be listed in the Schedule to the Progressive Rehabilitation and Closure Plan (PRCP) for which a useful example is provided in an Appendix. Special, but relatively brief guidance is provided on studies required for risks posed by mining voids, including those in flood plains. Surrender of the Environmental Authority and PRCP in part or in full is possible though the guidance does not make clear how these activities under the EPA interface with the process of relinquishment of the mining tenure. Additional practical and reasonably comprehensive guidance on the pathway to relinquishment of environmental liabilities is provided by the Queensland "Guideline – Progressive certification for resource activities" which expands on the meaning of non-polluting, structurally stable, erosionally stable, and environmentally sustainable and states that applicants may make a progressive certification application for any size area that has been successfully rehabilitated to statutory requirements, even if operations remain active on another part of the site or adjacent to the progressive certification area.

Both the Victorian and Western Australian guidance documents offer comprehensive and practical guidance on post-mining rehabilitation with much detail on common risks associated with closure rehabilitation efforts.

Within the WA main guidance document, Appendix 7: An overview of specific mine closure issues and Appendix 8: Guidance on pit lake assessment through a risk-based approach, are very comprehensive and practical, richly illustrated appendices (totalling 22 pages). Western Australia mentioned that some mine domains (e.g. tailings storage facilities) may need to be listed on WA's Contaminated Sites Register. WA appears to provide a staged pathway to relinquishment of environmental liabilities using its "Mine Closure Completion Guideline — For demonstrating completion of mine closure in accordance with an approved Mine Closure Plan". While practical and comprehensive, it is unclear how this guideline produced by the mining regulator interacts with the Environmental Protection Act and the Contaminated Sites Act.

On balance, the ICMM main guidance provides best practice in a technical sense on this topic and Western Australia provides leading practice from regulators.

For miners, the issue of a lack of a clear pathway to relinquishment of environmental liabilities and mining tenure represents a gap in most guidance documents reviewed. The six-step process outlined by the Australia-MC main guidance document is a possible practical way forward towards a framework policy but more detailed policy analysis and certainty for miners is required from regulators.

Mining legislation in some jurisdictions permits an open-ended period of care and maintenance at the end of active mining following exhaustion of ore during which post-mining rehabilitation is undertaken. This practice, in Australia's case, combined with an unclear pathway to relinquishment, has resulted in a poor record of finally discharging mine environmental liabilities and transfer of the mining and potentially land tenure to a new owner/user (often the government). Official statistics frequently do not distinguish between mines in a temporary period of unplanned care and maintenance after which operations may resume from mines in planned, open-ended, long-term end of mine life care and maintenance. This issue is being addressed by some jurisdictions including the Northern Territory by introducing more stringent definitions of what care and maintenance means and requirements for regular reviews of mines under care and maintenance.

The issue is that a mine in care and maintenance at end of mine life can be a safe haven for miners unwilling to make the investment decision to finally embark in the process of final relinquishment. This results in more mines for the regulator to manage in the longer term, delays alternative use for the land, and fosters the public perception that mines are permanent land users. Misuse of care and maintenance provisions leads to sub-optimal utilisation of the land resource, exposes government to potential risks and therefore represents a serious weakness in closure policy and guidance.

Another gap, initially flagged in section 8.2.3, is the lack of attention in most reviewed Australian jurisdictional guidance documents to rehabilitating environmental and social impacts caused by the mine but occurring outside of the mining tenement package at a broader regional level.

8.11 Activity Slice 11: Rehabilitating abandoned/orphaned mine sites

8.11.1 General considerations

Virtually every mining nation has a legacy of abandoned mine sites numbering from a few up to tens of thousands. In terms of their importance, they range from insignificant shallow diggings with their related mullock heaps, mostly dating back to historical gold rushes, to very large mines, both open cut and underground with related waste dumps and tailings storage facilities, potentially representing serious safety, health and environmental hazards.

Informal communications indicate that incidences of new abandonment of mine sites are relatively infrequent in Australia in part due to the introduction of financial assurance provisions by most jurisdictions. However, in some instances where the operator fails to adequately rehabilitate the site and the financial assurance proves insufficient to fully rehabilitate it, the site may be added to the legacy sites inventory.

Reference to abandoned mine sites is only to be found in some global and regional mine closure guidance providing advice to government as to how to formulate an appropriate policy, but not in jurisdictional MC guidance documents directed at industry. However, detailed abandoned mine site policy documents published by most Australian jurisdictions including the NT (with the notable exception of Victoria) have been included in the relevant Info Pack activity slice comparison of Table 14.

All documents essentially describe a process that involves (i) establishing a registry of abandoned sites, (ii) analysing risk and developing criteria to prioritize sites for remediation, (iii) estimating the cost of remediation and (iv) devising mechanisms to finance their remediation.

From a practical point of view, rehabilitation of an abandoned mine site by government does not substantially differ from rehabilitation after the end of the mine life by the responsible mining company. The main concerns relate to prioritisation and timing of rehabilitation given the prevailing scarcity of financial resources for the purpose.

8.11.2 Best practice considerations

The following are critical elements of best practice in terms of abandoned mine site rehabilitation policy and procedures:

A comprehensive, GIS-based, abandoned mine sites inventory should be established, providing information regarding the location of sites relative to urban centres/communities and roads exposing the public to safety hazards, potentially polluted drainages, the aerial extent of waste dumps, tailing dams and other disturbances etc.

MINE CLOSURE PLAN (MCP) GUIDANCE - REHABILITATION POST-MINING

Colour-coding: Yellow = Relevant, Light blue = Whole of document comments and assessment - Degree of Relevance: 1=Low to 5=High

	Global								Regional	
	World Bank		*ICMM*		*ISO*		*ISO*		*APEC*	
Title	*Mine Closure: A Toolbox for Governments*		*Integrated Mine Closure - Good Practice Guide 2nd Edition*		*Mine Closure and Reclamation Planning: Part 1 Requirements (ISO 21795-1)*		*Mine Closure and Reclamation Planning: Part 2 Guidance (ISO 21795-2)*		*Mine Closure - Checklist for Governments*	
Year	*2021*		*2019*		*2021*		*2021*		*2018*	
Summary Assessment	Comprehensive and practical advice to governments on what elements of closure should be in policy and legislation. References INAP (2009) Global Acid Rock Drainage Guide. Requires companies to provide post-closure monitoring plan and meet some or all closure success goals before relinquishment can occur in part or in full (respectively).	3	Very comprehensive and practical guidance on the technical aspects of post-operational to relinquishment rehabilitation and monitoring. Canvassess options to mitigate acid rock drainage and the effects of different climates, and climate change. Contains 4 relevant tools, and references INAP (2009).	5	Provides mainly high-level policy advice for the period post cessation of mining and processing operations. Requires an operations, maintenance and monitoring plan be developed for the mine site for the post-closure period.	1	Mainly medium-level technical and policy advice for the post operational reclamation phase of mine life, including the social transition. While providing medium-level technical advice on the planning for closure of many site domains, also considers issues are common to many domains such as water management, landforms and the impact of climate and climate change.	3	Provides a useful introduction to this topic from a government perspective which is of value to companies. Advises that regulators should provide mining companies with a pathway to final relinquishment of mine sites. One case study provided. Discussion implies this is a difficult issue for both government and companies.	3

	National									
	Australia		*ANZMEC/MCA*		*Queensland*		*Queensland*		*Western Australia*	
Title	*Mine Closure Leading Practice Sustainable Development Program for the Mining Industry*		*Strategic Framework for Mine Closure*		*Guideline: Progressive Rehabilitation and Closure Plans*		*Guideline - Progressive certification for resource activities*		*Mine Closure Plan Guidance - How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans*	*Mine Closure Completion Guideline - For demonstrating completion of mine closure in accordance with an approved Mine Closure Plan*
Year	*2016*		*2000*		*2023*		*2023*		*2023*	*2021*
Summary Assessment	Provides a medium level of comprehensive and practical advice on the pathway to relinquishment after the end of mining operations, with three case studies. The guidance provides a structured six step process as a pathway to relinquishment. States that funding for any required post-relinquishment management and monitoring will need to be determined by the miners, the regulatory authorities and stakeholders.	4	Provides very high level practical advice to companies on post mining operations rehabilitation and relinquishment.	2	Reasonably comprehensive and practical advice on the decommissioning and later phase of the mine site captured in both the guidance for the PRC Plan and the PRCP Schedule. Special, but relatively brief guidance provided on studies required for risks posed by mining voids in flood plains. Rehabilitation milestones for decommissioning are listed in the PRCP Schedule (useful example in Appendix 2). Surrender of the EA and PRCP is addressed in 'Guideline - Progressive certification for resource activities'.	3	Applicants may apply for progressive certification for any size area that has been successfully rehabilitated to statutory requirements, even if operations remain active on another part of the site. Provides practical and reasonably comprehensive guidance and propoes indicative minimum time periods of 5 and 15 years for grazing land and native ecosystems (respectively) to be established and resilient to climate variability. The Guideline appears to contemplate that only grazing, farming or native vegetation will constitute the post-mining land use.	4	Clearly written, reasonably comprehensive and practical advice. At least two years prior to decommissioning, regulator requires the regular update of the mine closure plan to contain more specific detail on the planning and implementation of the decommissioning phase and provides a list of categories it requires detail on, including compliance with the Contaminated Sites Act 2003 and ongoing stakeholder engagement. Mentions the "usual 10 years" for post mining monitoring of rehabilitation.	4	Sets out in detailed, practical detail required content of the Mine Closure Completion Report on a table of contents basis. Mine Closure Completion reports can be submitted in a staged approach as mine disturbance domains are rehabilitated, or for the entire site. Guideline is agnostic concerning post-closure land use.Unclear how other legislation (Environmental Protection Act, Contaminated Sites Act etc) may interact with the pathway to relinquishment in this guideline.	4

Table 14: Extract from Info Pack displaying summary comments and score of individual guidance documents relevant to the 'rehabilitation post-mining' activity slice.

- Desktop characterisation should be followed by adequate field inspections to determine the nature and severity of related risks and establish priorities leading to the formulation of a formal remediation plan.
- Remediation activities should ideally be systematically conducted by a dedicated legacy mining team and their scheduling should reflect a long-term source or allocation of funds specifically for them.
- While the most urgent and severe cases may warrant funding through consolidated government revenue, jurisdictions should put in place specific funding mechanisms for on-going rehabilitation of abandoned mine sites. These will normally be based on a levy imposed on the mining industry specifically earmarked for the purpose (e.g. NT) or on the interest earned on a general industry rehabilitation fund (e.g. WA).
- In addition, jurisdictions may require or encourage applicants for tenements covering areas where there are abandoned mine sites to undertake an agreed amount of rehabilitation where this does not interfere with their proposed operations. When voluntary this is often referred to as the 'Good Samaritan' approach.
- As it may take many years to fully implement the legacy mines rehabilitation plan, facilities may be put in place to manage the key sites in the queue and monitor that their conditions do not deteriorate over time to an extent that would make them potential serious hazards requiring more urgent rehabilitation.
- The potential socio- economic value of an abandoned mine site should also be assessed in consultation with interested stakeholders when developing a management and/or rehabilitation plan. Where management and/or rehabilitation will result in private benefit, a cost sharing arrangement between interested parties should be pursued.

8.11.3 Findings and leading practice guidance

To the extent that rehabilitating abandoned mine sites is invariably the responsibility of government, guidance on how to address the issue is not, strictly speaking, directed to industry but more towards helping government set appropriate policy and procedures to address the issue. This is reflected in the fact that reference to abandoned mine sites is only to be found in some global or regional mine closure guidance documents. No reference to abandoned mine sites is found in any of the mine closure guidance documents of individual Australian states but most of them, particularly Queensland, WA and the NT, have extensive documents that explain their policy, approach and programs to address the issue. These include in the case of the NT the establishment of a dedicated Legacy Mine Unit (LMU) and ongoing funding mechanism by way of a dedicated levy on industry through its Mining Remediation Fund (MRF) that display many 'best practice' characteristics.

MINE CLOSURE PLAN (MCP) GUIDANCE - REHABILITATING ABANDONED/ORPHAN MINE SITES

Colour-coding: Yellow = Relevant, Light blue = Whole of document comments and assessment - Degree of Relevance: 1=Low to 5=High

	Global		Regional		State		State		State	
	World Bank		*APEC*		*Queensland*		*Northern Territory*		*Western Australia*	
Title	*Mine Closure: A Toolbox for Governments*		*Mine Closure - Checklist for Governments*		*Risk and Prioritisation Framework for Abandoned Mine Management and Remediation*		*Legacy Mines Policy*		*Abandoned mines policy*	
Year	*2021*		*2018*		*2021*		*2023*		*2016*	
Summary Assessment	Chapter 11 provides an excellent summary or the legacy mines issuesand related clean up policy and how to establishing a jurisdictional registry of abandoned sites, criteria to prioritize their remediationthe and determination of the related costs as well as identifying possible sources of finances for the remediation of abandoned sites.	3	Chaper 3.3 of this checklist provides an excellent coverage of the risk involved in legacy mine sites and recommend best parctice for government in addressing the related issues. Emphasis is on ensuring a common definition of what constitutes an abandoned mine site, on how to compile a register and prioritise remediation on the basis of risks to the health and safety of the public and environment. Cost determination and sources of funding are also briefly dealt with.	3	A very comphensive document detailing a three-stage process involving preliminary desctop screening followed by field risk assessmen and prioritisation for further investigation or remediation. Once ranked, business cases are developed to support funding applications. The document is supported by a number of detailed flow charts illustrating the whole process.	5	This clearly written document outlines 5 main policy principles, i.e.:Protect the public and the environment from the impacts of legacy mine sites, using a risk-based approach, engaging with relevant stakeholders, providing value and benefit for the Territoryy, under strong governance and transparency fordecisions. Outlines the priorities of the Legacy Mines Unit and is supported by a clear process flow chart. to minimise safety risks and environmental impacts".	5	The document sets clear policy objectives and principles including risk and value based prioritisation, data collection and information sharing and governance. It then covers the related practical measures as to how the legacy mines issue is to be addressed in WA using a comprehensive but clear flow diagram as the framework for discussion.	5

Table 15: Extract from Info Pack displaying summary comments and score of individual guidance documents relevant to the 'rehabilitating abandoned/orphan mine sites' activity slice.

9.0 RANKING OF GUIDANCE DOCUMENTS ON THE BASIS OF THEIR WEIGHTED ACTIVITY SLICES AND USEABILITY SCORES

9.1 Overall document comparison and ranking after combining their weighted activity slices and useability scores

Although it may be argued that the total weighted MC activity score and the total weighted useability score measure two distinct and to some degree unrelated sets of MC guidance characteristics, a third measure of comparability was derived by combining these two measures in Table 18 where the combined score is also ranked in descending order in its rightmost column. Not surprisingly the combined score features ICMM at rank one followed by WA at two and Victoria at 3.

Table 16: Summary table displaying the total weighted MC activity and useability scores and their aggregated combination leading to the ranking order of the various CM guidance documents analysed

Guidance Document	*Total Weighted Activity Score*	*Total Weighted Useability Score*	*Total Aggregate Weighted Score*	*Ranking Order*
ICMM[1]	177	207	384	1
Western Australia	156	214	370	2
Victoria[2]	138	194	341	3
Queensland	132	177	318	4
World Bank	139	177	316	5
Australia[3]	131	182	313	6
APEC	99	185	284	7
ISO	87	157	244	8
ANZMEC/MAC (Can.)	53	124	177	9
IGF	25	113	138	10
TSM/MCA (Aust.)[4]	28	99	127	11

Notes: 1 – 2019 Mine Closure Guidance. 2 – Metalliferous mine guidance not applicable to declared (coal) mines. 3 – 2016 Leading Practice for Sustainable Development Mine Closure Handbook. 4 – General framework only.

10.0 AREAS OF FUTURE POLICY ENHANCEMENT AND DEVELOPMENT

The present analysis revealed the presence of a few 'gaps' where recent policy developments and guidance have not yet fully captured emerging societal expectations and priorities. For example, further attention may need to be devoted to areas such as setting social/socio-economic objectives and transitioning strategies, formulating clear pathways to relinquishment and, to a lesser degree, to ambiguity as to what constitutes care and maintenance, regional impacts of mining beyond the mining leases and a more comprehensive coverage of re-purposing and reusing of mining assets. These issues are discussed below including suggestions as to ways of bridging these 'gaps' in future MC guidance formulation and drafting.

10.1 State guidance documents should encourage social and socio-economic closure objectives and social transitioning strategies

While setting of social and socio-economic objectives and formulation of social transitioning strategies are separate gaps in State guidance documents, they are strongly linked with the root cause — the lack of emphasis on requiring social and socio-economic closure objectives in State guidance documents. This is despite the strong emphasis on these aspects of closure in institutional guidance documents such as the World Bank group (IFC 2007) and the ICMM, and the Australian Department of Industry, Innovation and Science (2016a, b and c), with the last two also publishing separate handbooks on working with Aboriginal communities.

Social and socio-economic closure objectives are most critical when the risk assessment undertaken as part of setting closure objectives identifies a risk that communities will develop a socio-economic dependency on the mine and thus creating a need for careful attention to planning social transitioning strategies. This need is most pronounced in rural and remote parts of most Australian states and the Northern Territory in particular.

Under the heading "Stakeholder Engagement", Western Australia's main guidance document lists Principle 5: "Wherever practical, work with communities to manage the potential impacts of mine closure" and states "While the operational phase brings many social and economic changes and opportunities to communities, mine closure will bring different challenges. Development of community programs should be aimed at strengthening a community over the long term." It goes on to state that the mine closure plan should provide baseline information on social and economic aspects "(where relevant)" leaving it up to the discretion of the miner, and the regulator reviewing the plan as to the import of these data and the potential need for a social and socio-economic transition plan.

The WA Biodiversity Science Institute framework for developing mine-site completion criteria in Western Australia (Young et al., 2019), which Western Australia's main guidance recommends miners consult, lists in its Table 2.6 (Recommended attributes applicable for the definition of completion criteria) the quantitative attribute "Social progress: health, education, employment, livelihoods and incomes" under the social/economic aspect of completion criteria.

The Victorian Community Engagement Guidelines for Mining and Mineral Exploration (2023) require the company to identify and document throughout life of mine the attitudes, expectations and values of geographic communities, communities of interest and communities of standing in the area. However, this does not address quantitative measures relating to socio-economic aspects of stakeholder communities and social transitioning.

Queensland's main guidance and the Queensland Department of Environment and Science (2019) emphasize environment-related closure objectives and environmental rehabilitation, although the main guidance document does encourage miners to engage early with the community to identify and manage social and economic community expectations related to mine closure.

While State guidance documents do not emphasize the need for social and socio-economic closure objectives, or for social and socio-economic transitioning strategies, there is some evidence that individual companies undertake this work. For instance, Newcrest Mining Limited's 2022 Mine Closure Plan for the Telfer Mine in Western Australia (Newcrest Mining Limited, 2022), which references the ICMM main guidance (ICMM 2019), states that the company was compiling a Social Closure Plan based on an internal risk assessment and future consultation with key stakeholders including the local First Nations group and communities.

In summary, the nature of these two gaps relate to a lack of emphasis on the need for social and economic closure objectives and for social/economic transitioning strategies in State guidance documents. It is probable that the risk analysis undertaken by individual companies as part of developing closure objectives or ongoing risk analyses during the life of the mine will identify a need for social transitioning strategies and there is evidence that individual companies are developing social transition plans. It is also possible that regulators reviewing mine closure plans are already identifying these gaps in mine closure plans submitted by miners operating in relevant regions.

Hamblin et al. (2022) recognized the lack of explicit requirements for social transition strategies in Australian State jurisdictions and described it as a significant gap in State guidance documents. They recommended more research into this issue and appeared to favour a flexible regulatory solution that could possibly involve the Commonwealth Government.

Addressing this gap should include amendments to State guidance documents so that they provide more guidance information on social and socio-economic closure objectives and social transitioning strategies and require them on an "if not – why not" basis.

10.2 The pathway to relinquishment of environmental and tenure liabilities needs to be clearer

Mining industry representatives consulted in preparing this report requested that State regulators provide more guidance and certainty on how to relinquish mining company liabilities under environmental and mining legislation after rehabilitating land disturbed by mining to a safe, geotechnically stable, non-polluting state consistent with its planned future land use. This would allow them to surrender their mining tenure to the government or transfer it to another owner. For the three states reviewed, this is unlikely to occur in the case of severely disturbed land, for at least 10 to 20 years after cessation of mining operations. Parts of the mining tenure with little or no disturbance may be surrendered sooner after cessation of mining operations. The more problematic

issue is identifying a process to deal with open pits, including a long term, post mining tenure "owner" of the land.

Both Western Australia (Mine Closure Completion Guideline — For demonstrating completion of mine closure in accordance with an approved Mine Closure Plan, 2021) and Queensland (Guideline — Progressive certification for resource activities, 2023) provide guidance on this issue, from a mining regulator (WA) perspective and from an environmental regulator (Qld) perspective. The Queensland guidelines suggest, at a minimum, five and fifteen years of monitoring prior to application for certification of grazing and native ecosystem rehabilitation respectively. Neither of these State documents provide a clear pathway to relinquishment of any residual environment risks at the time that the mining tenure and potentially the land tenure is surrendered to the government or transferred to a subsequent landowner/user.

Legislated liability for environmental impacts may extend beyond relinquishment of mining tenure. For instance, Section 114B of the Western Australian Mining Act (1978) imposes on a tenement holder a "Continuation of liability after expiry, surrender or forfeiture of mining tenement" for "any act done or default made on or before that date".

Common law liability under the torts of negligence, nuisance (escape of contaminated water, dust or other materials from the former mine site), or breach of statutory duty would continue to exist long after surrender of the mining tenure to government or transfer to a new owner.

In the Australian context, Tiemann et al. (2019) drew attention to Australia's poor record in successfully relinquishing mining tenure, with many former mines languishing in the economic limbo of ongoing care and maintenance status after exhaustion of ore. The authors point out that the high costs associated with divesting a company of environmental liabilities means that the company will treat it as an investment decision which requires certainty of process when multiple government agencies, populated by generally risk-averse public servants may need to give approvals.

This issue has also been traversed by Hamblin et al. (2022), including in case studies, resulting in many aspects of the pathway to relinquishment being identified as "Future Research Points", particularly in view of the number of potential regulators that may be involved in approving final relinquishment of environmental liabilities associated with mining tenure.

Drawing on lessons from Queensland, Purtill and Littleboy (2023) characterized mine rehabilitation and the process leading up to final relinquishment of all environmental liabilities by a mining company as a wicked problem — one that is usually social or cultural in nature, difficult to solve with many interrelated causes about which there is insufficient information and many competing stakeholders with divergent views.

The Australia-MC main guidance, based on a case study of a large, progressively closed, longwall coal mine in central Queensland, outlined a six-step high level process for final relinquishment of environmental liabilities. The process developed (Figure 5) probably influenced the compilation of Queensland's 2023 Guideline - Progressive certification for resource activities.

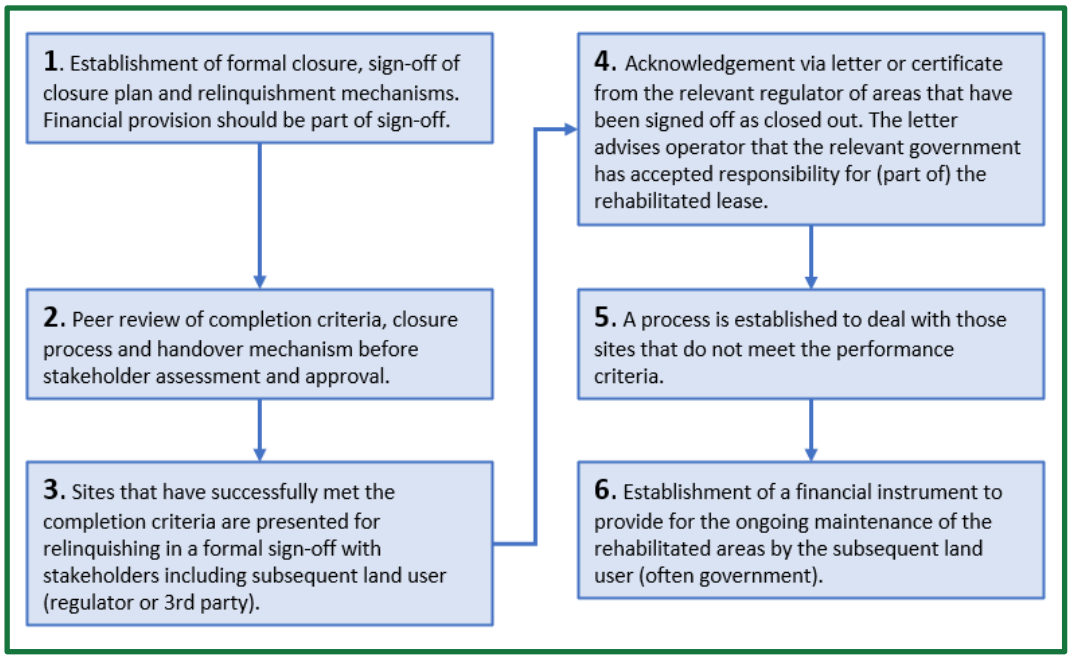

Figure 5: Six stage process for path to relinquishment of environmental liabilities associated with a large complex longwall coal mine in Qld. (Source: Slightly modified from Australia's main guidance)

Given this is a common need across all Australian jurisdictions, and the Australian government has already shown some leadership in outlining the high level six-point pathway to relinquishment in its Australia-MC main guidance, consideration should be given to encouragement of relevant Commonwealth agencies to coordinate with State and territory agencies to undertake policy development on this aspect of mine closure.

10.3 Conditions under which tenure may be maintained under care and maintenance need to be clarified

The commercial feasibility of mining operations is highly sensitive to ore grade and at times volatile commodity prices. Furthermore, different ore bodies present different levels of possible trade-off between ore grades and tonnages in determining their cut-off grades — that is to say defining what tonnages of ore would be economically exploitable at different commodity prices and what proportion of the overall mineralized material will not be mined because it is sub-economic.

In cases where there is a broad range of tonnage-grade trade-offs, mining may continue in spite of falling commodity prices by high-grading, i.e. selectively mining higher-grade blocks and as a consequence reducing the overall tonnage of reserves.

Where the level of possible trade-off is low, mining will be temporarily suspended, and the operation put on 'care and maintenance' in the expectation that it may resume production if and when commodity prices improve. While it makes sense to minimize costs while the operation is temporarily shut, some level of expenditure would still be necessary to ensure that all operational assets and systems are maintained in a condition that would facilitate effective and rapid re-starting of production should commodity prices improve. Retaining tenure under care and maintenance would also be justified in cases where the main ore body may be largely exhausted but still be

surrounded by vast areas of sub-economic material and/or potential for possible extensions and satellites untested by exploration.

The practical reality, however, is in many cases very different. Operational mining assets and other facilities are, more often than not, dismantled and sold or relocated leaving behind rapidly deteriorating immobile facilities and structures, with the project to all effect and purposes having been abandoned. The reason for this behavior is simple. Retaining the leases under care and maintenance at relatively low cost defers the time when significant mine closure and rehabilitation expenditure will have to be incurred or the leases may be farmed out to a third party that may be willing to assume some or even all of the rehabilitation liabilities. This behavior has inherent risks to state jurisdictions that would ultimately become responsible for any of these sites that may subsequently be abandoned.

It is generally accepted that there is a clear need for a better and more stringent definition of what constitutes care and maintenance and of under what set of conditions the leaseholders should be forced to initiate mine closure and rehabilitation. This process should be informed by a thorough assessment of both the potential value and probability of a possible reopening and hence the opportunity cost created by rehabilitating land that may become the subject of future exploration and development, keeping in mind that rehabilitation per se would not sterilize any mineral resource that may be present but merely add an element of cost to its possible future delineation and development.

On the other side of the argument, there is evidence that, particularly during boom times, many old mining sites are the theatre of renewed exploration investment and in some cases of reopening. In the NT, this is the case for most of the 19 or so mining project currently in the approval phase.

10.4 Post-closure repurposing needs greater planning consideration

As already pointed out, in most of Australia, where the vast majority of mines are located on Crown land in the scantly populated and dry interior, potential alternative land uses more beneficial than pastoralist use tend to be limited.

Even in the NT where just under 50% of the land is either under native title or reserved for the use and benefit of Aboriginal communities, most mine site facilities irrespective of their distance from the communities, appear to offer limited scope for re-purposing. A major issue is that, even though communities may see some merit in taking over some of the mine infrastructure facilities for a non-mining purpose, there is generally a reluctance on the side of any party involved to accept responsibility for the cost of their ongoing maintenance and service provision. The counter-intuitive result is often the heart-breaking decommissioning and demolition of otherwise perfectly functioning facilities and, in some cases, of entire towns.

This, in combination with the now prevailing fly-in fly-out approach to mining has resulted in mining facilities being primarily impermanent and easily removed and re-used elsewhere or sold by their owners after mine closure.

Circumstances may be different in the case of less remote locations where economically valid alternative-use opportunities may be present. Many of these have been provided as practical case studies in some of the MC guidance documents examined, but while innovative and interesting, most appeared to have eventuated as an afterthought close or even after mine closure rather than

having emerged during planning activities. However more recently, identification and economic evaluation of post-mining alternative land uses has become more of a priority issue in mine lifecycle planning.

In this context, two recent studies (Holcombe and Keenan (2020) and Beer et al. (2023)) reviewing the current state of play represent a solid foundation for future ideation and analysis.

The first study reviewed 141 repurposing case studies throughout the world, defining 11 main land-use categories each including a number of sub-categories[2]. Interestingly, it observed that 94 out of the 141 cases were less than 50km from a community or township and that, even though the previous mining land use had been singular, its post-mining transition in many cases resulted in multiple uses. Traditional alternative uses such as community and culture, conservation and eco-system services, non-intensive recreation, and education and research constituted a total of 220 out of 313 observations dominated the uses. Repurposing appeared to be influenced by external factors such as location and economic viability and internal ones such as stakeholders and community engagement practices, company policies and standards and continuity of the company and the operation, with optimisation focusing primarily at the level of the project, rather than the surrounding region.

Beer et al. (2023) confirmed a similar distribution of repurposed uses and that the issue of repurposing has not been considered in an adequately systematic fashion but mostly on a unique project by project basis. This, they claim, may have resulted in lost economic opportunities, and potentially profound impacts at the regional level. Repurposing appears to be inhibited by traditional regulatory frameworks that focus primarily on safety and physical and chemical stability leading to traditional rather than more risky innovative uses and to some degree by lack of enthusiasm and peripheral vision on the sides of those with the power to bring about change in both mining boardrooms and government planning and policy development institutions.

Alternative, non-traditional post-mining uses, presented as case studies in MC guidance, specialised publications and the press in general, ranged widely including:

- Energy generation using disturbed land to locate wind turbines and solar panels, use of open cut mines for pump-back hydro systems and bioreactors, and use of mine shafts for storing energy by raising a heavy weight using solar power during the day and releasing it exploiting gravity when needed (graviticity) etc. The first use in particular is likely to grow in light of the current push for renewable energy initiatives prompted by climate change policies.
- Use of open cut and underground mine openings for secure storage of waste including low level radioactive waste, as vaults for archived documents, as data centres, for mushroom farming etc.
- Water storage and flood mitigation using mine openings. Potential utilisation of some 19,000 abandoned mine and quarry sites for this use, as well as for municipal waste containment, has been systematically investigated by Monash University (2020) in Victoria.

[2] Community & culture, Conservation & eco-system services, Non-intensive recreation, Education & research, Construction, Intensive recreation, Lake or pool, Agriculture, Light industrial, Alternative health, Forestry.

Although both Holcombe and Keenan (2020) and Beer et al. (2023) are essentially based on case studies and hence retrospective, they nonetheless also contain key considerations pointing to the need for identification and evaluation of non-traditional alternative land uses to be seriously considered earlier in the MC planning process and also involve regional considerations. In this context, there appears to be justification for various levels of government to assume a more active role. Indeed, early identification of potentially economically attractive repurposing uses, cast in a regional context, should influence not only the MCP but also some aspects of the mine design itself that could facilitate such a use.

Asides from attracting third parties, there may be justification for industry to consider diversification beyond mining, particularly in cases where long-lived mines create clusters of diverse support and other secondary industrial and commercial activities. Industry should identify opportunities to invest in and potentially expand the scope of some of these activities at a regional level, ideally in partnership with local communities and operators. In some cases, there is no reason to wait until mine closure to pursue some of these opportunities that may co-exist with mining operations.

Involvement and constructive collaboration with diverse commercial interests and communities in the region will align their interests with that of the mining company and develop a sense of shared responsibility and ownership, enhancing the reputation of the company and its social licence to operate not just in the region but elsewhere in the country.

10.5 Regional impacts from fugitive emissions from mining tenement packages are currently not adequately considered

Regulators in WA consulted as part of this study pointed to an issue that needs to be addressed more fully in WA's main guidance documents and our reading suggests also in other state jurisdictions reviewed in this report — contamination of surface and subsurface drainage systems outside of the mining tenement package by seepage from constructed landforms and mine voids, including by flooding of mine voids in floodplains. The latter issue is specifically addressed in the Qld main guidance document and in WA Department of Water (2013). One source of contamination the regulators quoted was from recent literature that indicates metals and metalloids can continue to enter terrestrial ecosystems from vegetation and soil fauna (ants and termites) on constructed mine landforms (particularly tailings storage facilities) long after mine closure.

They also added the possibility of inland salt-water intrusion into coastal aquifers intersected by mining voids.

Our review of State guidance documents also suggests more guidance is required on the need for dust monitoring as part of ongoing baseline monitoring before and throughout mine life including the post-mining rehabilitation phase within the mining tenement package and regionally.

This section and section 10.1 taken together suggest more emphasis in guidance documents is required to ensure miners undertake both environmental parameters gathering and social/socio-economic monitoring outside the mining tenement package and regionally.

11.0 DISCUSSION AND CONCLUSIONS

11.1 Discussion

The aim of guidance documents is to provide the 'how to…' for users, whether it be to comply with legislation and regulations, or achieve best practice in mine closure and rehabilitation.

Statutory guidelines and subsidiary documents (also frequently called 'guidelines') are often collectively considered 'guidance', thus spanning a spectrum from legally enforceable to unenforceable conditions with users without a legal background often unable to distinguish between legally enforceable and unenforceable documents and clauses within a single document.

To assist industry professionals working in the mine closure space to comply with often complex regulatory requirements and achieve best practice and community-acceptable mine rehabilitation standards, the public sector regulators analysed in this report have compiled a significant number of guidance documents dealing with both general and more often specific MC issues.

Asides from regulators, international institutions have compiled comprehensive guidance documents and suites of ancillary documents aimed primarily at assisting government in improving mine closure policy, but also at achieving best practice mine closure and rehabilitation by industry.

Despite their different intended readers, Table 18 reveals many obvious similarities in the generalised degree to which the three groups of organisations provide comprehensive 'how to…' guidance. There are also, however, differences that are not attributable to the different and more specific purpose of the reviewed regulatory guidance documents.

Table 17: Generalised degree to which different guidance types provide comprehensive 'how to…' guidance.

Activity Slice (summarised)	***Generalised degree to which comprehensive 'how to…' guidance is provided (3: high, 2: moderate, 1: low)***			***Comments***
	Analysed regulatory guidance (Vic, Qld, WA)	***International institution policy guidance for governments*** (World Bank, IFC, APEC)	***International institution guidance for industry*** (ICMM, ISO)	
Interpreting regulatory guidance framework	3	2	1	
Ongoing recording of baseline data	2	3	3	3 indicates social and socio-economic parameters recorded
Identifying stakeholders and ongoing engagement	2	3	3	
Setting closure objectives	2*	3	3	*It would be 3 if WABSI (2019) more widely adopted

Risk assessment/ opportunities	3	3	3	
Identifying post-mining alternative land uses and repurposing	1	3	3	Recognised as a gap in analysed regulatory guidance
Estimating financial assurance and closure costs	3	2	1	
Reviewing mine closure plan	3	3	3	
Enabling post-mining social transition	1	2	3	Recognised as a gap in analysed regulatory guidance
Rehabilitation post-mining	2	2	3	
Rehabilitating abandoned/orphaned mine sites	3	3	1	

Table 17 highlights the need in the analysed regulatory guidance documents to increase the amount of guidance on obtaining community input into objective setting including post-mine land use options and formulating social transition plans during the life of the mine. Given the amount of detailed 'how to' guidance provided by the ICMM guidance suite, there is probably less need for regulators to include more than the essential 'how to' guidance on some of the topics by making relevant reference to the ICMM's documents.

Impacts of many mines within a region are receiving increasing attention from regulators and the public. Individual mines have a range of impacts that extend beyond their immediate mine-related tenement package in terms of vehicular roads, haul roads, railway lines, water and power lines etc, usually located on a mining tenure easement. Depending on the climate regime, dust and riverine impacts may also occur.

These regional impacts are not usually the subject of regulatory guidance and have not been recognised as specific gaps in Section 10 of this report. They are essentially an issue for whole-of-government consideration (mining, environment, water, state and regional planning, and infrastructure agencies, local governments etc) to resolve with one area of possible overlap into regulatory MC guidance being a reminder to new mine proponents that their mine closure plan may be assessed within a regional framework of mining-related impact minimisation.

11.2 Conclusions

As different MC guidance documents are very different in style, length, emphasis, and the extent they dwell on various MC activities/processes, a fair, like-for-like comparison in their entirety proved virtually impossible. This challenge was overcome by disaggregating and separately comparing the various chapters/sections of each guidance document in terms of their quality/fitness-for-purpose of

in relation to 11 key 'MC activities' and 13 different 'Useability Attributes' and generating a weighted assessment and score for each document, thus enabling comparison. To the extent that this methodology is transferable to other research fields involving comparison of diverse written documents, it is considered that it represents an original and useful contribution to knowledge.

As already discussed in detail in Chapter 9 and summarised in Table 18, ICMM's 2019 Integrated Mine Closure - Good Practice Guide was placed at rank 1 followed by WA's, Victoria's, Queensland's, and the World Bank's documents. While the Western Australian MC guidance would represent the best initial basis on which to draw when improving future MC guidance in Australia, it should be complemented with the best aspects of MC guidance from other jurisdictions as for instance the Victorian Government's 2020 "Rehabilitation bonds – mineral exploration, mines and quarries" and related cost estimation calculator, as well as from the ICMM's Good Practice Guide.

Given the different timing and types of disturbances it would also be practical to separate guidance relating to the exploration stage up to and including a pre-feasibility study from that relating to mine development/construction and operations. These in turn should be separate from documentation of policies and practices relating to rehabilitation of legacy mine sites that are primarily used by government rather than industry.

It would also be desirable to draft future guidance in a manner that, as far as possible, would make it useable by the large range of regulatory bodies and institutions involved in the MC process (e.g. mining, environmental, water, planning, and community regulators) thus reducing its complexity and related compliance costs for both industry and government.

The analysis also revealed the presence of a few gaps where recent policy trends and emerging societal priorities have not yet been fully captured in current guidance. For example, further attention may need to be devoted to areas such as setting social/socio-economic objectives and transition strategies, formulating clear pathways to relinquishment, addressing inconsistencies relating to mines under care and maintenance and, more comprehensive coverage of alternative land uses, re-purposing and re-use of mining assets. Greater emphasis should also be placed on post-closure impacts as well as opportunities in the regional planning context beyond the boundary of individual mining leases.

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