

The development of a mine closure framework: a case study for Namibia

H Musiyarira *Namibia University of Science and Technology, Namibia*

I Chirchir *Ministry of Mines and Energy, Namibia*

M Bliss *Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development, Canada*

Abstract

Namibia is heavily dependent on the extraction and processing of minerals for export and this is a central pillar of Namibia's economy. However, while mining presents a significant opportunity for growth and development, the government, civil society and the private sector must work together to ensure that meeting the needs of today's stakeholders does not compromise the needs of future generations. In 2018, a Mining Policy Framework Assessment revealed that there was a lack of legislation that provided details for progressive rehabilitation, mine closure planning, site relinquishment and associated transfer of residual environmental and financial liabilities from the licence holder back to the government. Based on the assessment and capacity training carried out by the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF), there arose a need to develop a mine closure framework from a regulator's view point since there is already one that was developed by the Namibian Chamber of Mines (CoM). The framework represents a desire from industry to support the implementation of the government's Minerals Policy, which stipulates that the government will develop guidelines on closure and it will monitor compliance using set performance guidelines. However, the CoM mine closure framework does not prescribe how financial provisions for closure should be implemented and as such, this leaves the determination of the allocation of mine closure funds at the discretion of each mine operator.

The present paper therefore, outlines the steps that were undertaken to develop the regulator's framework and also provides preliminary outcomes from the process. The study was carried out using independent but complementary methodologies. These included a baseline study and data analysis, mining policy framework analysis and report writing. Relevant reports and data from government ministries, public institutions, private sector organisations and agencies were analysed. A benchmarking exercise with leading mining countries such as Australia, Canada and South Africa was undertaken. This was aimed at searching for new ideas and exchanging views and opinions on the developmental outcomes of the mine closure framework. The purposes for the development of the framework were to ensure that mines operating within Namibia align with the requirements of national rehabilitation and closure-related legislation; standardise the approach to rehabilitation and mine closure planning by developing a standard that all operators can use for consistency reporting.

The major elements of the proposed framework are that it sets an internationally accepted best practice framework for the Namibian mining industry to achieve the required regulatory rehabilitation and closure compliance. This includes dedicated stakeholder engagement on key closure planning aspects and also identifying the importance of aligning mine rehabilitation and closure planning throughout the mining life-cycle. It also provides the main planning aspects to be considered when developing, refining and implementing rehabilitation and closure plans and specifies the key considerations to determine closure cost estimates and the process to make financial assurance provisions for rehabilitation activities. It also identifies the importance of implementing progressive rehabilitation, frequently refining mine closure plans and continuing ongoing monitoring throughout the mining life-cycle towards the achievement of eventual site relinquishment.

Keywords: *mine closure, financial assurance, planning, stakeholder engagement*

1 Introduction

Historically, mining has been a significant contributor to the economic development of nations and it is also foundational to several industries including energy, construction, chemical, pharmaceutical, automotive, electronics, aerospace, ceramics, cosmetics, detergents, glass, metals, paints, paper, plastics, and fertilisers (Vedanta, 2019). Mining is one of the largest sectors contributing to Namibia's economy. At a broader level, the mining industry's positive impacts on the nation's economy are substantial because of the mining industry's expenditure on wages, infrastructure and operating costs, and maintaining regional employment and population growth. Hence, the closure of mines has a ripple effect on the country's economy and communities. In contrast with other industries, mining projects have finite life spans and they pass through distinct life-cycle phases from exploration and feasibility through operations to closure and rehabilitation (Limpitlaw & Mitchell, 2013). Best international industry practice requires closure planning for each life-cycle phase (IFC, 2002; Peck et al., 2005; ICMM, 2019) with a growing focus on planning from the earliest stages of project development. Currently, when mines close, not only are the direct socio-economic benefits lost but also the associated mines supported services and infrastructure (Anglo-American, 2017). This can leave the government and affected communities with significant challenges once mining companies have withdrawn e.g., maintenance continuation of road, water treatment, sewer networks and electrical utilities. However, Hattingh et al., 2019 reveal that industry's knowledge of the significance of the post-mining land use goal driving land rehabilitation objectives have reached an acceptable level of appreciation. The approach to mine closure has mainly focused on physical reclamation activities whilst taking a shallow concern to the socioeconomic impacts on the remaining communities after the mine closure. Typically, the social aspects of mine closure have, due to their complexity, received less attention than the physical aspects of closure. Nevertheless, the aspect of the social license to operate has gained momentum over the past decade. As such, it is against this background that the Ministry of Mines and Energy sought to develop the mine closure framework for Namibia. Therefore, the principal objective of this study was to highlight the path that was taken by the Namibian government in developing a mine closure framework.

1.1 Mining Risks

According to an International Council on Mining and Metals (ICMM) 2019 report, there are six types of risks that need to be considered when it comes to mine closure, namely; health and safety risk, natural environment risk, social risk, reputational risk, legal risk and financial risk. For the mining sector to make a strong and positive contribution to Namibia's sustainable development, there must be a robust risk management system put in place. Moreover, it is important that a strong legal and policy framework is available that maximises the benefits accrued to the nation and to surrounding communities. Additionally, a strong framework is needed that promotes the developmental benefits of mining while upholding strong environmental and social standards. Mining activities can have both positive and negative environmental, economic and social impacts on communities. Moreover, the mining sector is a major catalyst of a nation's long-term social and economic development. It provides revenues for the government and also supports local content programmes through the job creation, local skills development and business opportunities for local communities. Through corporate and social investment, the mining sector also supports investments in education, health, clean technology and infrastructure (IGF, 2018). However, improperly managed activities can adversely impact the environment, affect the local population, and, in the worst cases, result in severe or catastrophic social and/or environmental impacts as evidenced by many legacy sites still awaiting remediation (IAEA, 2010). Moreover, if not managed well, mining activities can result in extensive water and soil degradation, disrupted nutrient cycles and may lead to severe impacts on ecological processes and communities.

1.2 Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development

The Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF) is a member-driven organisation which provides national governments the opportunity to work collectively to achieve their sustainable mining goals. It is devoted to optimising the benefits of mining to achieve poverty reduction, inclusive growth, social development and environmental stewardship. The IGF serves as a unique global venue for dialogue between its 75-member country governments, mining companies, industry associations and civil society (IGF, 2018). In order to manage the risks associated with mining, the government of Namibia requested the IGF to assist with assessing the mining laws in Namibia. The assessment focused on the MPF's six themes of the Legal and Policy Environment, Financial Benefit Optimisation, Socio-economic Benefit Optimisation, Environmental Management, the Post-Mining Transition, and Artisanal and Small-scale Mining (ASM). A key finding around Post-Mining Transition was the current lack of legislation that provides details for progressive rehabilitation, mine closure planning, site relinquishment and associated transfer of residual environmental and financial liabilities from the licence holder back to the State (IGF, 2018). Based on the assessment and capacity training carried out by IGF, there arose a need to develop a mine closure framework from a regulator's view point since there is already one that was developed by the local mining industry through the Chamber of Mines (CoM) Namibia. The mine closure framework developed by the Chamber of Mines represents a desire from industry to support the implementation of the government's Minerals Policy (2003) which stipulates that the government will develop guidelines on closure and will also monitor compliance with the set guidelines. The CoM mine closure framework does not prescribe how financial provisions for closure should be implemented but leaves the determining of the allocation of closure funds at the discretion of each mine operator. This paper thus outlines the steps taken to develop the framework and also provides preliminary outcomes from the process.

2 Namibia National Context

In 1990, Namibia gained her independence from South Africa. Namibia neighbour's are Angola, Zambia, Botswana, South Africa. Namibia is one of the world's most sparsely populated countries, second only to Mongolia, as Namibia has approximately 2.5 million people that are spread across an area of 825,615 km² (UNDP, 2019). Nearly half of all Namibians live in cities and towns, with Windhoek, Swakopmund and Walvis Bay being the largest urban centres in the country. Namibia has made tremendous progress in terms of human development and the country's Human Development Index (HDI) value for 2018 stood at 0.645 - which put the country in the medium human development category, positioning it at 130 out of 189 countries and territories (UNDP, 2019). Namibia's constitution is one of the first in the world to enshrine the protection of the environment (IGF, 2018).

2.1 Mining in Namibia

Namibia country is among the world's top 10 gem-quality diamond producers, mined both on land and offshore, and it is the fourth-largest producer of uranium in the world (World Nuclear Association, 2017). Namibia also produces high-grade zinc, graphite, gold bullion, blister and refined copper, lead concentrate, salt and dimension stone (Ralston et al., 2015). The mineral industry has been an integral part of the Namibian economy and it remains a foundational sector. Namibia's mining sector makes significant contributions to the economy, accounting for approximately 9 - 12% of the country's Gross Domestic Product (GDP) and it accounted for at least 50% of the foreign exchange over the past decade (Chamber of Mines Namibia, 2019). Namibia has significant uranium mines capable of providing 10% of world mining output and it is the fourth largest exporter of uranium in the world (World Nuclear Association, 2017). In addition, Namibia is the source of the richest alluvial diamond deposits in the world and it has become one of the world's leading gem-quality diamond producers. Moreover, Namibia is the fourth largest exporter of non-fuel minerals in Africa (KPMG report, 2014). There are about 27 actives mines which are mainly multi-international companies mining in Namibia (some of which seem to be making an exit) and may have very different perspectives on closure. There are about ten mining companies that are in a care and maintenance state and may seemingly be

leading towards and unplanned closure. Namibia also produces a wide variety of industrial minerals including graphite, wollastonite, bentonite, salt and others; apart from graphite and salt, and these minerals are mined on a small scale (MME, 2018). Namibia produces a wide variety of dimension stone, consisting mainly of marbles, granites, diorites and sodalite. Namibia has a variety of quality semi-precious stones, which are mostly mined in the Karas, Erongo and Kunene regions. These include rose and smoky quartz tourmaline, topaz, varieties of beryl, garnet, diopside, chrysocolla and pyrophyllite and amethyst (Musiyarira et al., 2016).

3 Legal context

The maintenance and protection of ecosystems, ecological processes, and biodiversity is enshrined in the constitution (Article 95), and the natural resources found below and above the land, territorial waters and continental shelf belong to the state if they are not otherwise lawfully owned (Article 100). The Mining Policy framework assessment for Namibia carried by IGF (2018) reveals that the Minerals (Prospecting and Mining) Act, No. 33 of 1992 (The Minerals Act), Environmental Management Act, No. 7 of 2007 (EMA) and Minerals Policy of Namibia (2003) all reference to mine rehabilitation and closure (the 'polluter pays' principle). The Minerals Act of 1992 [section 54 (2)] requires/obliges licence holders, on announcement of abandonment to demolish accessory works, remove all debris and other objects brought onto the land, and to take the necessary steps to remediate "to the reasonable satisfaction" of the Minister of Mines any damage to the environment. The Environmental Management Act, No. 7 of 2007 and the Environmental Impact Assessment Regulations govern the environmental aspects of the mining life cycle.. In accordance with the Act and its regulations, numerous listed activities relevant to exploration, mining and quarrying cannot be undertaken without an Environmental Clearance Certificate (ECC).

The Government of the Republic of Namibia has made provisions in the Minerals Policy (2003), under section 2.2.5 for mine closure to be included in the integrated land use strategy and the communities should be involved at all levels. Unfortunately, the Mineral Policy was developed after the Minerals (Prospecting and Mining) Act was implemented, which means that the mine closure provision is not yet included in the law. The Minerals Policy provides the 'vision for the responsible development of Namibia's mining sector to ensure that the sector makes a sustainable contribution to the country's socio-economic development' (IGF, 2018). Relevant to rehabilitation and closure, the Minerals Policy (2003) stipulates the following:

- The government will develop guidance on closure and will monitor compliance with this guidance;
- mine closure is planned for and should form part of the integrated land-use strategy involving communities', and 'before a Mineral Licence is granted, there should be a final mine closure plan and funding mechanism that describes how the company will deal with matters affecting the environment;
- the government will investigate the establishment of mandatory mechanisms for the funding of Final Mine Closure Plans; and
- the government will monitor mine closures to ensure that the mining industry has mechanisms to rehabilitate closed mines for the purpose of sustained land use.

The Chamber of Mines of Namibia (CoM) - Mine Closure Framework (2010), provides sound industry guidance, but its implementation is not legislatively binding, and it is only applicable to member companies. Hence, the Mine Closure Framework (MCF) that was developed from a regulator's viewpoint is required to underpin existing legislation, and is aligned to current international best practice mine closure planning and implementation approaches.

4 The Process

A study was undertaken by the Ministry of Mines and Energy in collaboration with IGF to assess the mining policy framework for Namibia and provide recommendations for the development of a modern mine closure framework (steps outlined in Figure 1). After the mining policy framework assessment was completed, a capacity development training workshop facilitated by IGF was held to empower government officials from the Ministry of Mines and Energy and the Ministry of Environment, Forestry and Tourism (MEFT). Key topics such as environmental management, post mining transition and small-scale mining were discussed and this then led to the realisation of the need to first develop the mine closure framework from a government perspective. After the workshop, a working team was established that consisted of members from the Ministry of Mines and Energy and the Chamber of Environment and Environmental Compliance to prepare a concept note on the mine closure situation in Namibia.

The concept note considered current provisions on Mine Closure in the Minerals Act (Act 33 of 1992) and Environment Management Act, no. 7 of 2007; the Ministry’s position in addressing abrupt mine closures; challenges faced by the Ministry with respect to Mine Closure and Rehabilitation and the different roles that the MME and the MEFT can play in relation to mine closure. The concept note was presented to the Minister and approval was granted to start the process of developing the Mine Closure Governance Framework for Namibia. The Ministry of Mines and Energy approached IGF for assistance with identifying possible financial assurance and finalising of the mine closure framework. Companies and institutions like Anglo-American and the International Council on Mining and Metals have developed a number of excellent tools for use in dealing with mine closure aspects across the mine life cycle (Harvey, 2016; ICMM, 2019). These and other literature sources were used in formulating a strategic roadmap on developing the mine closure framework.

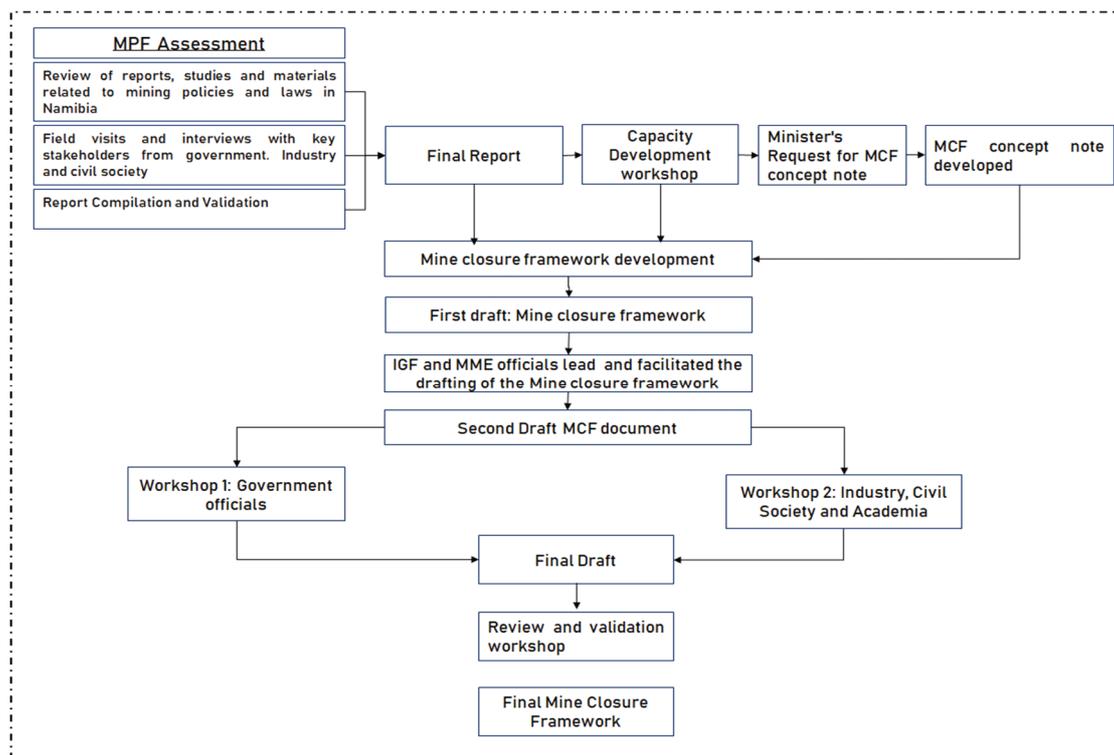


Figure 1 Development Process

After the second draft mine closure framework was finalised, two separate workshops were held with internal stakeholders (staff members in the two Ministries) and one with external stakeholders (mining industry, civil society and tertiary institutions). The concerns and recommendations that came out of the workshops were taken on board. After the final draft was produced, another stakeholder consultation

exercise was held with the Environmental Committee of the Namibian Chamber of Mines and Environment and the framework was presented to them for validation and also to solicit for final comments and ideas. The meeting was attended by all Environmental Officers from most of the large-scale mining companies. The final draft was adopted after incorporating comments from all the stakeholders where possible.

4.1 Draft Mine Closure Framework

The framework document examined the main components related to mine closure and post-closure site management, and it considers long-term care monitoring and maintenance. Essential elements of the mine closure framework document include closure objectives, closure plans, financial assurance, post-closure care, and the return of mining lands back to the government as shown in Table 1.

Table 1 Namibian Mine Closure Framework (Modified: Source, MME, 2020)

MINING LIFE CYCLE		STAKEHOLDER ENGAGEMENT		PLANNING		FINANCIAL ASSURANCE		IMPLEMENTATION	
FEASIBILITY AND PLANNING	Stakeholder identification: possible external and internal stakeholders	Identify	Identify stakeholders	Conceptual Rehabilitation Plan (RCP): Submitted as part of mining licence application	Conceptual Rehabilitation Closure	Conceptual Financial Assurance (FA)	Upfront modelling: (Mine plan, post mining landform design, cover etc.) Used to inform Conceptual RCP	Conceptual FA amount	Used to inform Conceptual RCP
CONSTRUCTION	Stakeholder Engagement: dedicated consultations	Initiate	Initiate	Conceptual RCP: Approved for implementation	Approved for implementation	Proposed FA mechanism amount +/- 50 % accuracy	Site preparation for progressive rehabilitation: includes site mapping, soil removal and temporary stockpiling	Conceptual FA to be given to the regulator in the form of preapproved surety mechanism	Used to inform Conceptual RCP
OPERATIONS	Ongoing Stakeholder Engagement: dedicated consultations	Initiate	Initiate	Operational RCP: Implementation of approved rehabilitation and closure activities	Implementation of approved rehabilitation and closure activities	Operational FA: Based on approved FA amount and surety mechanism	Progressive Rehabilitation: ongoing site rehabilitation linked to operational RCP activities	Operational FA: Based on approved FA amount and surety mechanism	Used to inform Conceptual RCP
	INVOLVE/ COLLABORATE: Ongoing > 5 years from decommissioning	Ongoing	> 5 years from decommissioning	Update Operational RCP: Update knowledge base, qualitative risk assessment, closure objectives, closure criteria based on outcomes of site investigations and operational monitoring in consultation with stakeholders	Update Operational RCP: Update knowledge base, qualitative risk assessment, closure objectives, closure criteria based on outcomes of site investigations and operational monitoring in consultation with stakeholders	Update Operational FA: Refine annually based on updates to operational RCP	Operational Monitoring: Ongoing operation monitoring of protocols to identify suitability of implemented rehabilitation or need for corrective action	Update Operational FA: Refine annually based on updates to operational RCP	Used to inform Conceptual RCP
DECOMMISSIONING AND POST MINING	COLLABORATE/ EMPOWER < 5 years from decommissioning	Define and agree on content of facilities and land (site) agreements	Define and agree on content of facilities and land (site) agreements	Final RCP: refined rehabilitation activities (final voids, shafts, covers, footprint clean-up, etc.)	Refined rehabilitation activities (final voids, shafts, covers, footprint clean-up, etc.)	Final FA: Update FA value provided for final facilities and land site disturbances, ongoing monitoring and management of residual risks	Final Rehabilitation: Ongoing operation monitoring of protocols to identify suitability of implemented rehabilitation or need for corrective action	Update Final FA: Update or renew FA value based on rehabilitation performance	Used to inform Conceptual RCP
	Ongoing Stakeholder Engagement	Key decision makers and identified landowner(s) or communities	Key decision makers and identified landowner(s) or communities	Update Final RCP; (Monitoring) Performance Assessment Report (PAR)	Update Final RCP; (Monitoring) Performance Assessment Report (PAR)	Update Final FA: Update or renew FA value based on rehabilitation performance	Final Rehabilitation: Ongoing operation monitoring of protocols to identify suitability of implemented rehabilitation or need for corrective action	Update Final FA: Update or renew FA value based on rehabilitation performance	Used to inform Conceptual RCP
CLOSURE	Rehabilitated landscape transferred to next landowner	Finalise and implement land (site) transfer agreements: 18-24 months from closure	Finalise and implement land (site) transfer agreements: 18-24 months from closure	Closure RCP and PAR: On submission for mine closure certificate	Closure RCP and PAR: On submission for mine closure certificate	Partial Return of FA: for any progressively rehabilitated areas already demonstrating achievement of closure criteria	Ongoing monitoring and maintenance: until achievement of closure criteria can be demonstrated	Partial Return of FA: for any progressively rehabilitated areas already demonstrating achievement of closure criteria	Used to inform Conceptual RCP
				Closure RCP and PAR: documents achievement of closure criteria and transfer of rehabilitated site	Closure RCP and PAR: documents achievement of closure criteria and transfer of rehabilitated site	Closure FA: Final once off monetary provision for management of remaining or residual or potential latent risks	Site Relinquishment: on issuance of mine closure certificate	Closure FA: Final once off monetary provision for management of remaining or residual or potential latent risks	Used to inform Conceptual RCP
				Receipt of Mine Closure Certificate	Receipt of Mine Closure Certificate				Used to inform Conceptual RCP

The Mine Closure Framework (MCF) has been developed from the Regulator’s point of view, specifically to underpin appropriate enactments of the refined Namibian legislation. It considered the Chamber of Mines of Namibia’s (CoM’s) 2010 Mine Closure Framework, incorporated valuable review inputs from the Namibian industry and is aligned to current international best practice mine closure planning and implementation approaches.

4.2 Rehabilitation and Closure Plan Content

Figure 2 highlights the description of the expected minimum content of all versions of the Rehabilitation Closure Plan (RCP), aligned to the context of the MCF.



Figure 2 Rehabilitation and Closure Plan Content (MME, 2020)

An overarching content outline as well as a supporting checklist guiding will be developed and the Rehabilitation and Closure Evaluation Committee will use guideline sand checklist in assessing the suitability of a mine’s closure planning. Since all rehabilitation closure plans will be site-specific, additional information from the guidelines and the checklist should be provided if site conditions warrant that. Closure of an operation is also not a point in time, or a discrete event – it is a process that should be followed throughout

the life cycle of the mine from project feasibility and permitting, construction, operation, decommissioning, post-mining and, eventual site relinquishment at mine closure.

The MCF states that all new and existing mining operations should develop a Rehabilitation Closure Plan (RCP) to the required level of detail relevant to their current mining life cycle. For new mines, the RCP should accompany the mining license application and for existing mines, the RCP should be developed or updated within a given timeframe (still to be agreed upon) after the MCF is implemented. All RCP and associated FA reports should be updated every two years or at any time if there is major changes to the operation. Mining companies on care and maintenance are also obliged to have an updated RCP in place.

There is still a contentious and ongoing debate on the issue if the legacy sites and whether they should be covered under this closure framework or a separate regulatory framework be created to deal with them. Since the Closure Framework is still in draft form, the government is still getting comments on this. The final stakeholder engagement will discuss and endorse the road map on dealing with legacy sites.

Spatial and temporal planning and implementation of rehabilitation and closure-related activities will always change continually throughout the mining life-cycle. The RCP will be a multi-faceted document that requires ongoing coordination with internal and external stakeholders, and ongoing revision throughout a mine's life-cycle. It remains the responsibility of the Mining Licence or Mining Claims holder to ensure that all aspects of the RCP are coordinated with the mine plan and that criteria for successful achievement of closure objectives have been identified and agreed upon by the stakeholders.

5 Next Steps

Recommendations from the local mines, coupled with the major outcomes from the validations workshop will be used by the MME and the IGF committee to improve the current draft for the mine closure framework. The MME will obtain stakeholders' perspectives on the issuance of a release, and addressing issues of when and under what conditions such a return of land would be appropriate. This will ensure that all stakeholders' views are taken into consideration. Table 2 shows the plans for the next stages in developing and implementing the mine closure framework.

Table 2 Plans for the Next Steps

Activity	Timelines
Appointment of the Namibia Rehabilitation and Closure Evaluation Committee	2 nd Quarter 2021
Training and capacity building workshop for the Namibia Rehabilitation and Closure Evaluation Committee	2 nd Quarter 2021
Publication of the MCF on the IGF website	3 rd Quarter 2021
Workshops on financial assurance mechanisms for industry and facilitated by the MME	3 rd Quarter 2021
Provisions to be made in the revised Act for mining companies to submit mine closure plans with financial assurance	3 rd Quarter 2021
Review and refinement of the Minerals Act	Final Quarter 2021
Review and refinement of the EMA	Final Quarter 2021
The framework will be adopted and launched	Final Quarter 2021

6 Conclusions

Emanating from the understanding that mine closure planning can have positive benefits for both the mine and remaining post-mining stakeholders, this should provide the principal rationale for implementing well thought-through, upfront, and reiterative closure planning. This should be undertaken within the context of evolving frameworks of legislation and good practice policies (such as this MCF), that require companies to take responsibility for cleaning up their environmental impacts and managing socio-economic challenges, from the feasibility phase through operations to the post-closure landscape. The compilation of a suitable RCP in the upfront mine planning stages of an operation, and incorporating defined post-mining land uses is imperative in the identification of appropriate biophysical and socio-economic post-mining goals that could be agreed upon with the Namibian regulators. This would greatly assist towards mitigating mining-related environmental impacts in a timely manner, as well as reinstating practical and defensible post-mining land uses, developing local skills, creating job opportunities and enhancing long-term post-mining sustainable livelihoods. This would also serve to counteract the effects of possible future political and/or environmental debates that could result in temporary or premature closures of an operation. The RCP will help in bringing understanding of the opportunities and constraints of the possible post-mining landscapes, whether they are environmentally and/or socially driven. This empowers an operation to identify the most practical and cost-effective solutions for the post-mining landscape; most of which can be implemented during the operational phase, whilst creating opportunities for communities remaining after final site relinquishment. Positive outcomes from this closure framework should mean that engagement with stakeholders will be more consistent and transparent, thereby leading to buy in by stakeholders. As such, the accuracy of closure cost estimates will be improved, the risk of regulatory non-compliance will be minimised, and there is more likelihood for adequate funding for closure, and opportunities for lasting benefits will be recognised and adequately planned for.

Acknowledgement

The authors wish to acknowledge and thank IGF management for availing their staff to offer their expertise in the development of the mine closure framework. Thanks to the Government of Namibia and the Namibia University of Science and Technology for their unwavering support and commitment to ensuring that Namibia's resources are well taken care of.

References

- Anglo-American 2017, Socio-Economic Assessment Toolbox Version 3. Seat Toolbox developed by Anglo-American.
- Chamber of Mines Namibia 2019, Chamber of Mines Namibia 2019 Annual Report. Retrieved 13 January 2021, from <http://www.chamberofmines.org.na/index.php/annual-reports>
- Harvey, BE 2016, 'The eye of the beholder — utility and beauty in mine closure', in AB Fourie & M Tibbett (eds), *Proceedings of the 11th International Conference on Mine Closure*, Australian Centre for Geomechanics, Perth, pp. 17-23
- Hattingh, R, Williams, DJ & Corder, G 2019, 'Applying a regional land use approach to mine closure: opportunities for restoring and regenerating mine-disturbed regional landscapes', in AB Fourie & M Tibbett (eds), *Proceedings of the 13th International Conference on Mine Closure*, Australian Centre for Geomechanics, Perth, pp. 951-968
- IAEA 2010, International Atomic Energy Agency Annual Report 2010. Best Practice in Environmental Management of Uranium Mining. IAEA Nuclear Energy Series No. NF-T-1.2.
- Intergovernmental Forum of Mining, Minerals, Metals and Sustainable Development (IGF) 2018, IGF Mining Policy Framework Assessment: Namibia. Winnipeg: IISD. Retrieved 4 February 2021, from <https://www.iisd.org/sites/default/files/publications/namibia-mining-policy-framework-assessment-en.pdf>
- International Council on Mining and Metals 2019, Integrated Mine Closure – Good Practice Guide, 2nd edn.
- International Council on Mining and Metals 2019. Integrated Mine Closure – Good Practice Guide, 2nd edn. Retrieved 6 February 2021, from <https://www.icmm.com/en-gb/guidance/environmental-stewardship/integrated-mine-closure-2019>
- KPMG Report 2014, KPMG Global Mining Institute, Namibia Country Mining Guide
- Limpitlaw, D & Mitchell, P 2013, 'Mine closure – misplaced planning priorities', in M Tibbett, AB Fourie & C Digby (eds), *Proceedings of the Eighth International Seminar on Mine Closure*, Australian Centre for Geomechanics, Cornwall, pp. 3-13
- Ministry of Mines and Energy 2018, Mineral Beneficiation Report. Ministry of Mines and Energy/Windhoek.
- Ministry of Mines and Energy 2020, Draft Namibia Mine Closure Framework Report. Ministry of Mines and Energy/Windhoek.

- Musiyarira, H, Tesh, D, Pillalamarry, M, Namate, N 2016, 'Formulating strategic interventions for the coloured gemstone industry in Namibia by utilising the logical framework approach'. *International Journal of the Extractive Industries and Society*. vol. 6, no. 4, pp. 1017-1029 <https://doi.org/10.1016/j.exis.2019.05.004>
- Peck, P, Blakau, F, Bogdanovic, J, Sevaldsen, P, Skaalvik, JF, Simonett, O, Thorsen, TA, Kadyrzhanova, I, Svedberg, P and Dausa, R 2005, *Mining for Closure: Policies and Guidelines for Sustainable Mining Practice and Closure of Mines*, UNEP, UNDP, OSCE and NATO, 97 p.
- Ralston, J, Musiyarira, H, Tesh, D, Cabo, VD, & Donegan, S 2015, 'Mineral processing in Namibia: scientific, engineering and environmental challenges. Bridging the technology divide through collaboration'. In *Proceedings of the 1st Africa Australia Technical Mining Conference 2015*, pp. 99–102.
- United Nations Development Program (UNDP) 2019, *Human development report 2019: Human development for everyone*. UNDP: New York. Retrieved 3 January 2021, from http://hdr.undp.org/sites/default/files/2019_human_development_report.pdf
- Vedanta Sustainability Report, 2019, Retrieved 18 February 2021, from <http://sd.vedantaresources.com/SustainableDevelopment2018-19/>
- World Nuclear Association, 2017, *World uranium mining production*. Retrieved 2 February 2021, from <http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/mining-of-uranium/world-uranium-mining-production.aspx>