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UNU-LRT

Land Restoration Training Programme
Keldnaholt, 112 Reykjavik, Iceland

Final project 2018

LAND RESTORATION PLANNING FOR MINES IN MALAWI

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ABSTRACT

This project was carried out to assess the current land restoration planning in mines in Malawi. This was done in consideration of the growing mining sector in Malawi amidst perceptions that it is causing a lot of destruction. The research included a desktop study of Malawi's and other countries' laws as well as field visits and interviews in Malawi and Iceland. Laws and guidelines from the Society for Ecological Restoration, Iceland, Australia and Canada were used as a comparison to identify weaknesses in Malawi's laws and guidelines. The findings show that both government and mining companies are aware of the importance of land restoration. However, weaknesses were found in the land restoration planning process such as inadequate stakeholder consultation, failure of companies to follow Environmental and Social Impact Assessment recommendations, and lack of detailed laws and codes of practice. Access to the Environmental and Social Impact Assessment reports was also difficult. The findings were used to come up with recommendations on the most important points that should be reviewed to improve the land protection and restoration in Malawi mines.

This paper should be cited as:

Kapokosa MC (2018) Land restoration planning for mines in Malawi. United Nations University Land Restoration Training Programme [final project]

<http://www.unulrt.is/static/fellows/document/kapokosa2018.pdf>

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1. INTRODUCTION

Mining is an important source of raw materials (Jain et al. 2016). The legal definition of “mine as a verb” in Malawi is given in section 3 of the Mines and Minerals Act as “intentionally to win minerals and includes any operations directly or indirectly necessary for or incidental to mining operations” (Government of the Republic of Malawi 1981). Mining provides materials for ornaments, construction (such as gravel for road, stone blocks for buildings) and manufacturing (such as metals for electrical equipment and jewellery) (Ciullo 1996; European Commission & Ad-hoc Working Group 2014). It plays an indispensable role in provision of essential materials for sustaining human wellbeing, especially in modern times with much higher dependency on technology such as cars and electronic devices. Despite this, the negative impacts of mining are considered significant (Jain et al. 2016). These negative impacts are very broad, but this report will focus mainly on those related to land.

The impacts of mining on land include contamination by pollutants, removal of soil during extraction, removal of vegetation, destabilisation of soil through movement of heavy equipment, and alteration of landscape such as subsidence in underground mines. Similar impacts can occur from other sectors but those from mining can usually be more significant. For example, loss of soil due to soil erosion is usually a slow process but in mining, large quantities of soil are required to be removed in a short period of time just to access the minerals (Jain et al. 2016). In terms of socio-economics, mining causes negative effects such as resettlement of people in and near the mining site and reduced access to land resources and other ecosystem services due to land being taken up (Kapyepye 2012; Vanclay et al. 2015; Government of Greenland 2016).

In the case of Malawi, mining is considered an emerging and important sector but the potential negative effects have been noted (Ministry of Natural Resources & Energy and Mining 2013). The mining sector in Malawi was formally established in 1981 through the passing of the Mines and Minerals Act, 1981. The Act also established that there should be a Commissioner of Mines and Minerals and this also established the Department of Mines to assist the Commissioner in implementing the laws (Government of the Republic of Malawi 1981). The sector contributes around one percent to the economy of Malawi but in recent years there has been more effort to grow the sector (Government of the Republic of Malawi - Ministry of Finance Economic Planning & Development 2017). Some of the government’s biggest moves to grow the sector have been the inclusion of the sector in the Malawi Growth and Development Strategy II (MDGS II) (Government of the Republic of Malawi 2010) and the country-wide airborne geophysical survey which was done to establish potential areas for development of mines (World Bank 2015).

As the mineral sector grows, there is more recognition of the importance of protecting the environment as well as communities around mines (Land Use Consultants 2014). There have already been some cases of tension between miners and communities which threaten to derail the development of the sector. One case happened in the Northern region of Malawi where a mining company abandoned their coal operations without following procedures and without informing the Department of Mines as required by law. The company simply moved out their equipment and left the area in a disturbed state. This included pits that were not filled or at least fenced off, piles of coal dust that were left open and got washed onto people’s farmlands, thereby polluting it, and many other issues. The community in the area was left with very bad impressions of mining due

to the reckless nature of the abandonment. The government is still trying to trace the owners of the mine who were foreign nationals (Chimwala 2016; Human Rights Watch 2016; Thokozani Chenjezi 2018). Another example is the Kanyika Niobium mine which has faced issues with communities regarding loss of land and compensation even though operations have not started. The controversy in this area is threatening to derail the project as people are becoming more frustrated with the upcoming project's handling of the compensation for the lost land (Singini 2017). These examples and others in the country are indicating increased hostilities by communities towards mining projects (Thokozani Chenjezi 2018). It is thus important to assess the situation in more detail so that people are given maximum benefits and minimum negative impacts.

In consideration of improving the sector in regard to environmental protection, it is important to have a good regulatory framework and guidance for the sector (World Bank 2004; Prno & Scott Slocombe 2012). Currently, the mineral sector is governed primarily by the Mines and Mineral Act, 1981 (MMA) which mainly covers issues of licencing but also has considerations for safety and the environment (Government of the Republic of Malawi 1981). The sector is also covered in the Environmental Management Act, 2017 (EMA), which regulates all sectors in Malawi in regard to the environment. The EMA requires developers of certain projects to conduct an Environmental and Social Impact Assessment (ESIA) which is defined in the Act as the systematic process of evaluating the protection of the environment. Guidelines are also used for the mining sector that were written in 2002 to cover the sector more specifically and comprehensively (Government of the Republic of Malawi 2002).

The restoration of mines in Malawi is a part of the Environmental and Social Impact Assessment (ESIA) (Government of the Republic of Malawi 2002; Land Use Consultants 2014). This project thus focuses on assessing the land restoration planning in Malawi, especially during the ESIA process.

1.1 Goal

The goal of the project was to assess current land restoration planning practices in Malawi mines, compare these practices to examples in other countries and recommend methods for better planning.

1.2 Objectives

1. Assess current land planning practices in Malawi.
2. Assess the current monitoring of mines in terms of land during operations in Malawi in comparison to Canada, Australia, Iceland and international standards.
3. Make recommendations on improving systems and practices based on international best practices.

2. METHODS

The assessment relied on literature review and field visits in Malawi and Iceland. The literature review included laws, regulation and guidelines from Malawi, Iceland, Australia, Canada and some international organisations. Some selected Environmental Impact Assessments reports were also studied from both Iceland and Malawi. The field trip in Malawi was conducted from 4 to 6 July 2018 using short structured interviews with personnel at mines as well as visits and assessments at sites that had been restored by the companies. One interview, however, was conducted via telephone.

2.1 Desktop Study

The desktop study focused primarily on studying the ESIA systems as well as ESIA documents of companies in Iceland and Malawi. The focus was mainly on the land restoration planning related aspects of these documents.

Australia's and Canada's mining laws and practices were also studied for comparison in terms of land restoration and ESIA's. The countries were selected for several reasons:

1. They are ranked among top mining countries in terms of both resource reserves and production (Finances Online n.d.; United States Geological Survey 2014, 2017; Anthony 2016).
2. They are ranked in the top 30 in Environmental Performance Index developed by Yale University and Columbia University in collaboration with the World Economic Forum and the Joint Research Centre of the European Commission (Yale University & Columbia University 2018).
3. The two countries have been important to the Malawi mining sector with the largest ever mine investment to come to production being from Australia (Kayelekera Mine by Paladin Energy). Several large exploration projects by Australian (Globe Metals & Mining) and Canadian (Mkango Resources) companies (Globe Metals & Mining n.d.; Ministry of Natural Resources, Energy and Mining, n.d.; Mkango Resources n.d.; Paladin Energy n.d.; Hubert 2016).

As for international standards, the Society for Ecological Restoration's standards for restoration were used as a reference for best practices (McDonald et al. 2016).

2.2 Mine site observations and interviews

An assessment tool was specifically designed for this study to assess the practices of mines in land restoration. The field assessment in Malawi started with a short and structured interview to get basic details about the mine such as name, location, type of operation and land restoration planning. The second segment was a physical assessment of the mine by four assessors. For the one mine where restoration work had been done, this was the focus of the assessment while for the other sites it was a general assessment of the mine and the surrounding areas. The final segment was for the assessors to give their views on the mine site, its planning process and the plan itself. The full assessment tool is in the Appendix.

In Iceland, two interviews were conducted with one employee from the National Roads Authority and the other from a geothermal energy company. The person from the National Roads Authority is a geologist who has been involved in a programme by the Authority in collaboration with other organisations to restore all old mining sites that were left unrestored and to keep track of the restoration status of all mine sites in Iceland (G Bjarnason, 2 July 2018, Icelandic Road and Coastal Administration, Reykjavik, Iceland, personal communication). The interview was done as an open-end discussion of the status and procedures for land restoration. The interview at the geothermal energy company was done with the restoration manager of the company. It was done similarly to the assessment used in Malawi. Even though the company is not a mining company in the traditional sense, there are many similarities of this activity with the mining sector because it requires drilling and alteration of the surface to build drilling platforms, removal of vegetation and earth material and the use of heavy equipment. A site visit was then made to one of the company's power plants, Hellisheidi Geothermal Project, to make observations of the planning and practices of restoration.

2.2.1 Project Assessments

The assessed sites are given in Table 1. The table gives name and location and description of the operation such as mechanisation level, type of operation and minerals being mined. The table also shows whether the ESIA document was available for the study, how the assessment was done and whether any restoration has been done at the mine. All mining licences in Malawi have ESIA reports and cannot receive their licence without one. However, there were difficulties accessing the documents from the Environmental Affairs Department (EAD) which is responsible for keeping a database of all ESIA's. It took repeated visits to EAD to get EIA documents and in the end, some could not be obtained at all.

Table 1. Sites where assessments were carried out and description of the operation and the assessment.

| Mine and location | Operation description | Was an EIA available for the study? | Visited (Y/N) | Restoration begun (Y/N) |
|---|--|--|---|---|
| Kautsi Hill Quarry, Mining License 134 (ML0134), Malawi | Mechanized rock aggregate quarry | Yes | No. ESIA document and satellite pictures used. | No. |
| Kaziwiziwi Coal Mine ML0118, Malawi | Semi-mechanized underground coal mine | No. Document could not be obtained from EAD even after repeated visits. | No. Only environmental audit available and used. | No |
| Mchenga Coal Mine, ML0164, Malawi | Semi-mechanized underground coal mine | Yes | Yes, on 4 July 2018. ESIA document also used | Yes, mined out areas only. |
| Strabag, ML0202B, Malawi | Mechanized rock aggregate quarry | No. Document could not be obtained from EAD even after repeated visits. | Yes, on 5 July 2018. Environmental Audit also studied. | No |
| Zunguziwa in Malawi | Mechanized rock aggregate quarry | No. Document could not be obtained from EAD even after repeated visits. | Yes, on 6 July 2018. ESIA document not available. | No |
| Nkhachira, ML0143 in Malawi | Mechanized surface coal mine (currently suspended operations). | No. Document could not be obtained from EAD even after repeated visits. | No. Only telephone interview. | Yes. |
| Hellisheidi Geothermal Project in Iceland | Geothermal plant for electricity and hot water | Yes. | Yes. On 3 August 2018. Interview, EIA and a company assessment report were also done. | Yes. Progressive restoration used. |
| Vegagerðin in Iceland | Various mine sites in the country, mostly gravel. | EIAs were not sought for the individual sites due to this being a meta study. An interview and website containing an overview of all mines being restored in Iceland was used. | No. Interview, website and booklet. | Yes, have restored most of the old mines. |

2.2.2 Assessors for Malawi mine observations

The team of assessors was made up of four people. Their role was to conduct the interview at the mine and then make their assessment which relied on their expertise. As such, the team had a variety of academic and professional backgrounds. The team consisted of an expert in geology and mining engineering, environmental science and mining engineering, soil science, and forest ecology.

2.3 Analysis

The analysis was done by comparing the findings in Malawi to best practices. Best practices were decided based on internationally recognised standards and standards and practices in countries that are considered exemplary in the mining sector, including Australia and Canada. The field assessments and interviews were used to establish exactly what is happening on the ground compared to what is written in documents and see if the practices and standards are effective. Finally, recommendations were made based on the evidence found during this assessment.

3. FINDINGS

3.1 Desktop study on legal frameworks

3.1.1 Malawi

The Environmental and Social Impact Assessment is a requirement for some projects as per Part VI of the Environment Management Act, 2017 (Government of the Republic of Malawi 2017). The Act gives power to the Minister to set criteria for determining whether a project requires an ESIA or can be exempted. Another requirement in the EMA 2017 under section 32 is the Environmental Audit which is meant to check project conformance to the ESIA (Government of the Republic of Malawi 2017).

Further to the EMA, guidelines were prepared for the mining sector in 2002 and these give more specifics of requirements for ESIA's and how the ESIA should be carried out. The guidelines present a summarisation of the process to be followed by project proponents. The guidelines are meant to assist developers to know exactly what is required from just one document and it indicates other relevant documents as well for further details. The guidelines have some examples of impacts and suggested mitigation measures. The guidelines also assist those drafting and assessing the ESIA's (Government of the Republic of Malawi 2002).

The aim of the ESIA as both a process and a tool is to ensure that negative effects of projects are predicted and avoided or at least mitigated from the early stage and that positive impacts are enhanced (Government of the Republic of Malawi 2002).

All mining activities have mandatory requirements for ESIA including prospecting, quarrying and mining at both large scale and small scale. In practice, however, this is not being applied as

prospecting operations and small-scale operations are being allowed to operate without an ESIA in contravention of the regulations (Government of the Republic of Malawi 2002).

Steps in ESIA as per guidelines are described below.

- i. Project Brief: A project brief is required for most projects including mining. It gives information about what the project is and how it will be done. It also gives some preliminary information on potential impacts (Government of the Republic of Malawi 2002).
- ii. Scoping: Involves defining the scope of the ESIA study. It includes identifying major issues, stakeholders, engagement planning for stakeholders and some mitigation measures. The scoping is used to develop terms of reference (TORs) for the ESIA. The TORs are used to guide the ESIA process and they must be approved by Environmental Affairs Department (EAD) before further steps are taken. (Government of the Republic of Malawi 2002).
- iii. ESIA study: The ESIA study itself includes a detailed determination of potential impacts and monitoring and mitigation measures, consultations and ESIA reporting. The report of the ESIA study has to be approved by EAD in order for the project to proceed (Government of the Republic of Malawi 2002).
- iv. Environmental Management Plan (EMP): The Environmental Management Plan (EMP) is meant to provide to give practical solutions to the impacts that have been determined. It also provides for monitoring procedures and standards. It is considered the most important part of the ESIA report (Government of the Republic of Malawi 2002).

3.1.2 Iceland

There is a categorisation in place to decide which mines need a mandatory ESIA and which ones do not. This primarily focuses on the size of the area disturbed and the volume of material extracted. There are also some extra considerations that are made even if a project does not fall into any of the categories above such as sensitivity of the land (for example, protected area or area with endangered species), waste generation and pollution possibilities (Government of Iceland, 106/2000 2015).

There are requirements for advertising in the media and publishing drafts and decisions related to EIA to allow the public to comment freely (some clauses from Icelandic law explicitly requiring publication are given below). In Iceland, the general public and not just local communities is given a chance to look at the information and give comments. This makes the process more transparent to the people and gives them adequate opportunity to comment (Government of Iceland 2015). All EIA documents in Iceland can be found on one website (Environmental Agency of Iceland n.d.).

Several useful guidelines and aiding tools also exist in Iceland. Of note is the website www.namur.is, which was created by the Icelandic Road and Coastal Administration (IRCA) (Vegagerðin) in collaboration with the National Power Company of Iceland (Landsvirkjun) and the Environment Agency of Iceland (Umhverfisstofnun), to give guidance to mine developers on both licencing and environmental requirements (G Bjarnason, 2 July 2018, Icelandic Road and

Coastal Administration, Reykjavik, Iceland, personal communication). It provides a summary for procedures needed by mine developers. Below is a summarisation of information on the website:

1. The site advises that the protection status of the area be considered when selecting the site. Also, the geology of the area and significance of the area in terms of ecosystem services should be kept in mind. The considerations when selecting the area for mining include characteristics, rarity, diversity, previous disruption, educational value, biodiversity geological formations, types and delights symbolic and historical value (Icelandic Road and Coastal Administration et al. n.d.).
2. The mine owners and operators should be mindful of the operation's whole lifespan, from how they extract minerals all the way to the closing of the mine and rehabilitation of the area. The developer is required to produce plans for the area before mining and after rehabilitation. The developer must carry out an EIA if the project meets certain criteria. The website recommends that the plan be made in such a way that the material is mined in a way that will more easily blend in with the surrounding areas (Icelandic Road and Coastal Administration et al. n.d.).
3. The website recommends that developers ensure minimising the area disturbed by their operations. It also recommends vegetating the area with vegetation that is the same as that before as soon as possible (Icelandic Road and Coastal Administration et al. n.d.).
4. During restoration, the vegetation should be returned to its natural form as much as possible. The landscape must also be made in such a way that it blends in with the surrounding areas. The guidelines also give some examples of methods that can be used for reclamation and the situations where those methods are appropriate. Some of the techniques are fertilisation, seeding, use of plant cuttings and hay transfer. The guideline then gives some conditions that must be considered when restoring land, such as assessing the soil condition, elevation and the intended use of the area (Icelandic Road and Coastal Administration et al. n.d.).

The website also has an accompanying webpage (<http://namur.vegagerdin.is>) that shows locations of gravels pits and quarries in Iceland. According to Mr Gunnar Bjarnason, the site was developed as part of an effort by government to restore all areas disturbed by mining activities. They had over 900 sites in 2008 when they started but currently have about 150 sites remaining (G Bjarnason, 2 July 2018, Icelandic Road and Coastal Administration, Reykjavik, Iceland, personal communication).

3.1.3 Canada

Canada has had legacy issues with abandoned mines, with Ontario alone having over 6000 inactive and historic mines. The government in Ontario started a project to assess all these sites. However, the assessment could not be completed as they discovered that some mines had hazards so great they had to be addressed right away and hence money for the study was diverted to fixing the riskiest hazards. Aside from physical hazards, the abandoned sites also have poor aesthetics and have resulted in a negative attitude by citizens towards mining, which in turn makes acceptability of future projects difficult (Cowan & Robertson 1999).

Legislation of mines in Canada is based on the acts and regulations of the different provincial and territorial governments (Kabir et al. 2015). However, some codes of practice have been developed at the national level to give guidance to companies (Environment Canada 2009).

Mines are required to submit closure plans and get them approved before starting operations. Upon commencement of operations, the plans must be updated every three to five years depending on the jurisdiction (Environment Canada 2009; Kabir et al. 2015).

All jurisdictions also require some form of financial assurance for the mine reclamation in the form of either cash, bonds, insurance or other means (Government of British Columbia 2008; Kabir et al. 2015). The amount of the assurance varies depending on type and size of the project and how the company is performing in environmental management especially with regard to progressive reclamation. The provincial government has guidelines for calculating the bonds. The financial assurance can also be used by the government to rehabilitate the mine in case of abandonment, bankruptcy of the project or other unforeseen circumstances (Cowan & Robertson 1999).

The laws in Ontario have made progressive rehabilitation mandatory. This means that companies do not have the option of leaving everything related to reclamation until the end of the operations. The companies thus have to continually assess their operations to see where rehabilitation can take place right away and government then reduces their financial assurance (Cowan & Robertson 1999).

Another major component of the laws is public participation requirements. The project proponent is required to give notice of the plans and the plans must then be discussed with the communities and other stakeholders. The government also produced a public participation manual which companies can use (Cowan & Robertson 1999).

Several codes of practice and guidelines have also been produced at either the provincial/territorial or federal level to give detailed guidance to project proponents (Environment Canada 2009; Kabir et al. 2015). The main code studied for this report were those from British Columbia (Ministry of Energy and Mines 2017) and one national code of practice (Environmental Code of Practice for Metal Mines) with the latter being the main focus. Even though the Environmental Code of Practice for Metal Mines was produced more specifically for metal mines, it can be applied to any mine (Environment Canada 2009). Highlights from the codes of practice related to mine reclamation are listed below.

1. Closure plans should be made before operations commence and the design and operations of all structures should make consideration for mine reclamation (Environment Canada 2009).
2. Closure plans should identify objectives for the reclamation and the intended use of the area (Environment Canada 2009).
3. Closure plans should be detailed, and the detail level should increase as operation progresses and the plans are updated. The closure plans should be updated regularly, taking into consideration lessons learned from progressive reclamation, community and stakeholder response and any changes to operations or advances in available technology or knowledge (Environment Canada 2009).

4. The standards further detail aspects that must be considered during closure. A monitoring plan during reclamation is required and it should cover the closure operations as well as post closure monitoring (Government of British Columbia 2008; Environment Canada 2009).
5. Public participation should be done at all stages of the mining cycle including reclamation planning and implementation. Each mine should have its site-specific plan for public engagement. The plan should include contacts of key community members and other stakeholders, description of approaches for engaging the public and giving them relevant information, and also a mechanism for communities to communicate with the mine operators (Environment Canada 2009).

3.1.4 Australia

Regulation of mines, including mine reclamation, in Australia is done at the federal government level. All states have laws related to mine reclamation. Most of the states also have detailed guidelines on the process of mine reclamation (Kabir et al. 2015).

All mining licence applications must be submitted together with a preliminary mine closure plan. The plan includes baseline studies, identification of all issues during closure and monitoring plans after closure (Kabir et al. 2015). Community engagement is a requirement at all stages of this process. Some states also have requirements to have a community consultative committee (NSW Department of Planning 2007; Kabir et al. 2015). The mine reclamation plan is included as part of the Environmental Management Plan. All states also require some form of financial bond that acts as an assurance that the company will fulfil its obligations. In most Australian states, however, progressive rehabilitation is not mandatory although most companies opt to do it to reduce their burden at the end of the project. After closure, the land is returned to its owner after it has been inspected and approved to be satisfactorily rehabilitated (Kabir et al. 2015).

3.1.5 Society for Ecological Restoration

The Society for Ecological Restoration is a membership-based global association that has existed for over 20 years and is aimed at promoting ecological restoration. Its members are restoration professionals including researchers, practitioners, decision-makers, and community leaders from all over the world. The society uses the diverse expertise and influence of its members to work with international, regional, and national partners such as government agencies, intergovernmental organizations, NGOs and the private sector to advance the science and practice of ecological restoration for the benefit of biodiversity, ecosystems, and humans. SER collaborates with the International Union for the Conservation of Nature (IUCN), the Convention on Biological Diversity (CBD) and the Global Partnership on Forest Landscape Restoration (GPFLR) (Society for Ecological Restoration n.d.; Clewell et al. 2004; McDonald et al. 2016). Malawi can be linked to SER since it is a party to many of these international unions (Convention on Biological Diversity n.d.; International Union for Conservation of Nature n.d., 2012). In 2016, it published the International Standards for the Practice of Ecological Restoration. The standards are meant to provide guidance during planning and implementation of restoration on degraded lands (McDonald et al. 2016).

The standards are based on principles of an effective, efficient and engaging restoration. The standards mainly advocate the idea of ecological restoration, which they define as assisting the ecosystem to reach a point where it can fully recover and stabilise itself rather than designing a new direction for the restoration. Level of intervention should be determined based on level of disturbance. Ideally, spontaneous recovery should be the means but some assistance is needed with extremely degraded areas needing more physical interventions before the ecosystem can recover by itself (McDonald et al. 2016).

The standards provide for the use of a reference ecosystem, is used to inform the target and is developed by looking at undisturbed sites near the degraded area or using similar types of land elsewhere as examples. The aim in this case is not necessarily to duplicate the system exactly but to optimise the potential for ecosystem recovery subject to the possibility of irreversible physical disturbances. The standards also advocate for the identification of key ecosystem attributes. The attributes are given broadly and include absence of threats, physical conditions, species composition, structural diversity, ecosystem functionality and external exchanges. These attributes should be considered prior to developing goals and objectives (McDonald et al. 2016). The restoration planning and execution should draw on all relevant knowledge available. This includes other examples from elsewhere, expertise of the professionals and specific knowledge gained through experimentation. The standards also encourage the use of local knowledge to enhance the restoration. The standards also highlight the importance of early, genuine and active engagement of stakeholders. The stakeholder engagement leads to mutual acceptance of the project and consequently prosperity (McDonald et al. 2016).

The standards give a detailed process for planning, implementing and maintaining restoration. The main highlights of the planning recommended are stakeholder engagement, assessment, setting goals and preparing plans and resources. During implementation, the standards encourages monitoring and adaptive management which includes documentation, assessment and stakeholder engagement (McDonald et al. 2016).

3.2 Assessment of Practices at Mines

3.2.1 Kautsi Hill Quarry

An ESIA document for the Kautsi Hill Quarry in Malawi was obtained in order to assess the land restoration plan. A satellite image was used to assess the compliance of the company with some of the ESIA recommendations. The ESIA for Kautsi Hill Quarry was written in 2010 as part of the condition of obtaining the licence for the proposed rock aggregate quarry at Kautsi Hill in Nathenje Area, Lilongwe District in Malawi (Phiri et al. 2010).

The report gives general statements as to impacts and recommended measures for mitigation. However, these statements are mostly generic and were written more as suggestions from the consultant to the developer rather than commitments by the developer, as indicated in the Act and guidelines (Phiri et al. 2010).

In terms of public consultations, the description of the methodology includes encouraging participatory discussions, proper timing, using focus groups and capturing gender issues. However,

in the summary of discussions with the stakeholders there is nothing related to land restoration or even any environmental issues. The summary mainly highlights infrastructure and other socio-economic needs of the community such as school buildings and provision of medication at a nearby health clinic (Phiri et al. 2010).

Decommissioning activities are explained as:

- Removal of all plant and ancillary equipment.
- Demolition of all mine structures.
- Contour of landscape dumps to blend into landscape.
- Removal of all contaminated soils and hazardous waste and dispose appropriately.
- Rehabilitation of land to return it to its original state. Activities will include rehabilitation of access road, planting of indigenous trees in open areas and allow grass to grow.
- Fencing off of mine to restrict entry by humans and animals (Phiri et al. 2010, p. 12).

In the EMP, land restoration issues are not mentioned as part of the decommissioning process. As such, the only negative impacts mentioned are loss of jobs, loss of informal business and loss of government revenue (Phiri et al. 2010).

One of the notable recommendations in the ESIA is for the mine to plant trees around the mine in order to trap dust (Phiri et al. 2010). However, this has not been done, as seen from the satellite image taken in 2017 (seven years after the EIA was published) in Figure 1 and as such, dust is spreading around the mine.



Figure 1. Satellite image of Kautsi Quarry showing the lack of trees around the mine which had been recommended in the ESIA (Background image retrieved from Google Maps 2017 at Latitude:-14.1093934, Longitude:33.8709666)

3.2.2 Kaziwiziwi Coal Mine

The Kaziwiziwi Mining Company carried out an Environmental Audit in 2014 as a requirement for their licence area expansion. The aim of the audit was to review activities that affect or have the potential to affect the environment either positively or negatively. The Audit Report for Kaziwiziwi was assessed but there was no visit to the mine site (Maneya et al. 2014).

The audit involved stakeholder consultations, site visits and literature review. The audit looked at the operational phases of the mine from the current operations until the anticipated decommissioning at the end of the licence period if the licence is not renewed (Maneya et al. 2014). Public consultations were done to establish perceptions about the project and hence help the audit team to “come up with propositions that would build mutual understanding of and appreciation of the project by the stakeholder and hence promote its acceptability”. The approach used was key informant interviews and observations (Maneya et al. 2014).

The findings from the public consultation were summarised by the audit team. However, they do not show any discussion related to mine reclamation and very little on environment related issues. Discussions mainly focused on socio-economic contributions of the company to the community, such as building or repairing infrastructure. For example, “extension of electricity grid from the mine to local communities”, “whenever there is a funeral in the nearby village, the management at the mine should nominate a person from among their ranks to represent them at the event” and “participation in the village afforestation and reforestation campaigns including woodlot management” (Maneya et al. 2014, p.9).

Decommissioning activities were explained as below by Maneya et al. 2014, p.17.

- Finishing of resources and allowing the roof to collapse as support pillars of coal are mined.
- Removal of all plant and ancillary equipment.
- Demolition of all mine structures.
- Contour of landscape dumps to blend into landscape.
- Removal of all contaminated soils and hazardous waste and appropriate disposal.
- Rehabilitation of land to return it to its original state. Activities will include rehabilitation of access road, planting of indigenous trees in open areas and allow grass to grow.
- Fencing off of mine to restrict entry by humans and animals.

There is no detailed explanation on how the land restoration will be done (Maneya et al. 2014). In the EMP which was part of the Audit, land restoration is not mentioned as part of the decommissioning process. As such only negative impacts mentioned that are dealt with are loss of jobs, loss of informal business and loss of government revenue (Maneya et al. 2014).

One major thing that was noted was that recommendations for negative impacts were made as suggestions by the consultant to the management of the company and not commitments by the company. For example, it says “the following management measures are recommended”; “For dust generated in various mine activities, it is recommended that work areas should be sprinkled with water to suppress dust at source” (Maneya et al. 2014, p.49).

The audit also noted that the company had not followed the recommendations from the ESIA report that was written previously (Maneya et al. 2014).

3.2.3 Malawi mine assessments at Mchenga, Strabag, Zunguziwa and Nkhachira

The findings from the site visits in Malawian mines were collected and grouped into themes and then discussed together. The findings were combined because they were long, and most findings were similar.

3.2.3.1 Plans for restoration by the mines

When asked about their plans for restoration, the companies mainly talked about removing equipment, backfilling (mainly with overburden), levelling and revegetation as means of restoration. One company even has a tree nursery which it uses for revegetation.

One of the companies visited had done restoration on its surface mining operation. When asked about challenges faced, they indicated that they faced the challenge of equipment and manpower. They also had difficulty restoring indigenous species and as such resorted to exotic species (eucalyptus). While this exotic tree is doing okay, it was noted by the assessors that the reason native species weren't able to thrive was the fact that subsoil was used instead of topsoil. The company indicated that they did not use either organic or inorganic fertilizer.

Most of the companies also stated that they are waiting for the end of operations to start looking at closure. A notable example of this in practice was that one of the visited mines had moved an explosives magazine (a special building used for storing explosives) but did not do any restoration of the area as part of progressive restoration.

3.2.3.2 Process of planning

On the issue of the process of restoration planning, the company representatives indicated that they relied on the ESIA process. They also indicated that stakeholders engaged through meetings during the making of the ESIA. During the interviews, the companies mostly listed stakeholders as communities, chiefs, government official and their own people.



Figure 2. Mined out and restored Kaliati site at Mchenga Coal Mine where the restoration assessment was conducted (Background image retrieved from Google Maps 2016 at -10.7111414, 34.1622709)

3.2.3.3 Views from companies and assessors

When asked about their views on the importance of planning, the representatives of the companies indicated that they consider it important. One company representative stated that “Government needs to develop the best way of restoration and enforce all the requirements on the industry.” They indicated that the planning works as a guide for them. However, when asked to show their plans in the EIA documents, they did not have the documents on site.

The representatives of the companies also mentioned that they consider training staff to be important although they indicated that no such training is available. They also indicated that they consider consulting with experts either private consultants, NGOs or government institutions to be important. Two of the company representatives said they would like to have an opportunity to formally train their employees on how to do effective and efficient land restoration.

The assessors were also asked for their views on the plans and planning process at the companies visited, and the general view was that the process needs improvement, with one assessor remarking on one company’s planning as follows;

“I think it is highly deficient and in need of major improvement. I can also say it is not available at all. The company seem to have done the EIA process just to fulfil the law but does not know its usefulness or how to implement requirements of the EMP.”

This highlights the general consensus of the deficiency of the current system and its implementation.

3.2.4 Hellisheiði Geothermal Project

ON is a power company in Iceland that provides electricity and hot water from geothermal and hydropower plants (ON Power n.d.). The company owns and operates three power plants: the Nesjavellir and Hellisheiði geothermal plants and the Andakílsárvirkiun hydroelectric station (ON Power n.d.). The company also has a small mining operation which it used and a mine that was used by another company but which they intend to restore, should the land holder give permission (M Magnúsdóttir, 3 July 2018, ON Power, Reykjavík, Iceland, personal communication).

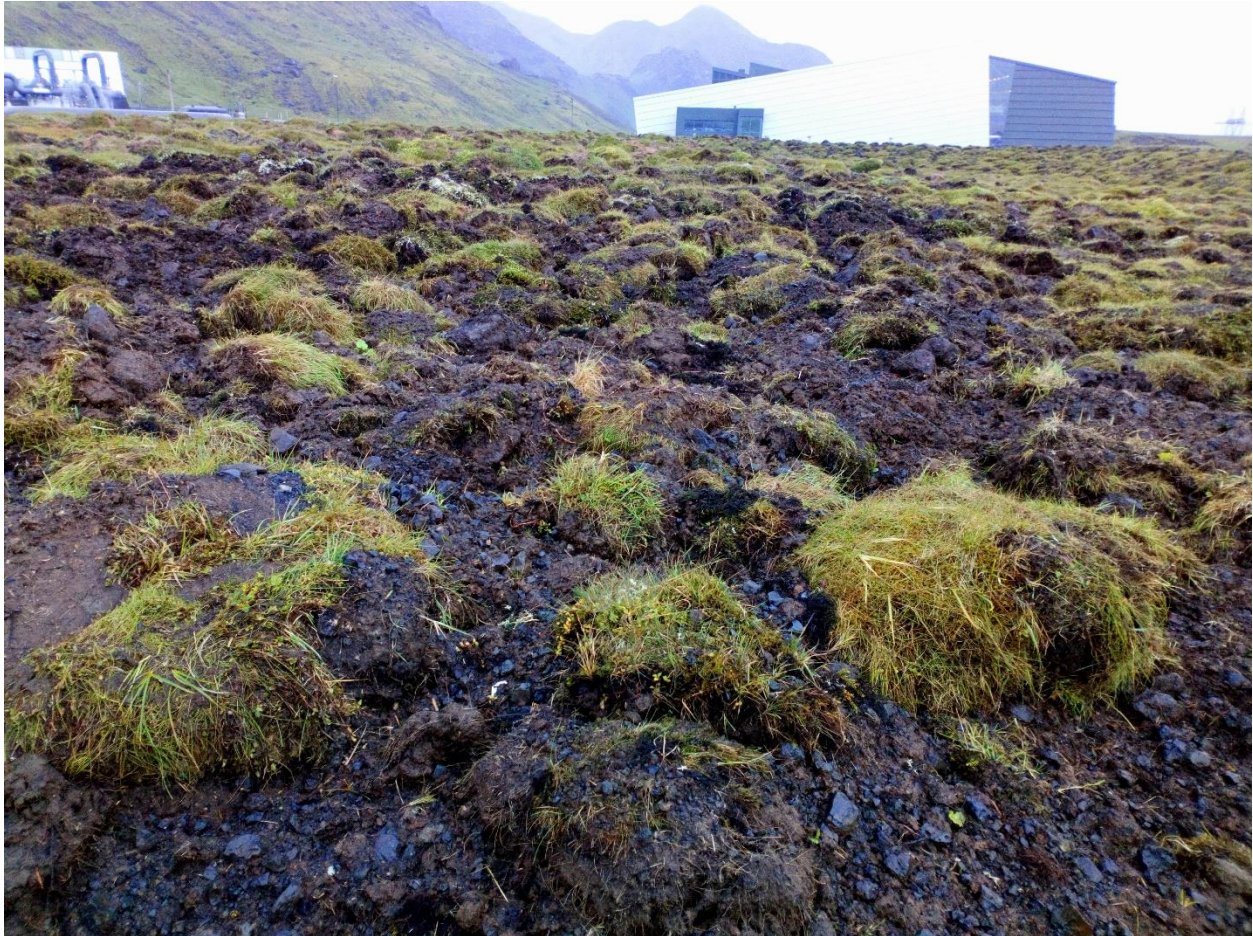


Figure 3. Drilling platform restored using turf transplants at ON Power.

The company has an EIA, but it is outdated, and better methods are being used now. In the past, the company, like many others, were more concerned about developing sites first, and then restoration came as an afterthought. This changed due to increasing awareness of the importance of valuing the land (M Magnúsdóttir, 3 July 2018, ON Power, Reykjavík, Iceland, personal communication).

The company uses mainly three methods to restore land and vegetation. These are turf transfer, hay seed transfer and use of cuttings (M Magnúsdóttir, 3 July 2018, ON Power, Reykjavík, Iceland, personal communication).

The company's restoration manager is involved in the planning for new geothermal wells. When developing bidding documents, the restoration manager makes requirements for the contractor to follow. The importance of this is that the contractor is required to work in a way that will make restoration easier. For example, turf transfer, it is necessary to remove the vegetation and a small layer of top soil carefully and store it to be used later for restoration. This requires that the contractor carry out this work before they start operations. The restoration then conducts training of the contractor's employees. Then the manager assesses and leads the restoration. This way of planning and implementing has led to significant success in achieving restoration results (M Magnúsdóttir, 3 July 2018, ON Power, Reykjavik, Iceland, personal communication).



Figure 4. Sides of drill platform used to restore vegetation.

The company is also restoring old sites that were not restored previously. This has included sites which the company itself did not degrade. This led to the restoration manager being recognised by the local council with an award. Other companies in Iceland have also recognised this success and have visited the company to learn. The restoration manager also participated in the development of guidelines for mines which are published on namur.is, which shows that the company's successes are being recognised.



Figure 5. Channel recently rehabilitated using turf transplant at ON Power's site where a pipe was laid out as indicated in the red rectangle.

The company, ON, also underwent an assessment of its operation from 2006 to 2018 with the objective of gaining insights into the performance on the specific project, identifying opportunities for improvement of this and other geothermal projects in Iceland (Hartmann & Rydgren 2018). The company was found to meet high standards in all criteria including land rehabilitation (Hartmann & Rydgren 2018).

It was found that there had been no consideration of negative effects on the land during the time the plant was being built. However, the company has started on rectifying these issues. The restoration uses only native species and they have achieved great results in not only restoring new disturbances but also past disturbances by the company and even areas outside the company's jurisdiction such as old mining sites. This has resulted in better community relations (Hartmann & Rydgren 2018).

However, it was pointed out in the report that their EIA was old and had missed some critical issues. Following to reviewing and updating their practices, they have managed to exceed the goals of the EIA (Hartmann & Rydgren 2018).

4. DISCUSSION

The first thing to consider for this report is whether land restoration planning is an important factor in the success of land restoration. Based on the findings from SER, Australia and Canada, proper planning is considered to be critical to success. The interviews in both Malawi and Iceland also showed that people working in land restoration also consider it important and as such, it is worthy studying it and finding ways of improving the planning. A study was conducted in Australia on the views of people about the mining industry. Part of the analysis involved looking at factors that affect acceptability of a project and environment and mine rehabilitation were considered to be the biggest issues (Moffat et al. 2014).

The current setup in Malawi restoration planning relies on the ESIA process. This is similar to the other countries whereby the planning is done as part of the ESIA or as a separate but still connected process. The ESIA guidelines in Malawi are in most part comparable to those in Iceland and they cover land issues quite well. They only give basic statements on what should be considered and possible mitigation measures. However, details on how the mitigation measures should be applied and when it is appropriate to apply them are not addressed. In Australia and Canada, they have detailed codes of practices and guidelines on the process of restoration. In Iceland, the guidelines on the website namur.is also gives directions and examples of techniques that can be used to restore native vegetation, as well as the assessments that must be made to determine which method to use and when. However, the guidelines also encourage the companies to experiment and consult so that site-specific issues are determined and addressed.

In Malawi land restoration plans are made before the project starts as part of the ESIA. However, the plans were found to lack detail. There is also no requirement to regularly review and revise the plans or even the ESIA report. As much as some companies have done environmental audits which are also used to update the EMPs; this was found to only be done when companies are renewing their licences or expanding their licence area. In Canada and Australia, the plans are required to be detailed and there are regular mandatory revisions that must be made. During the review in Canada, the company is also required to report on what it has done following the recommendations and how they have used progressive reclamation.

During the process of ESIA, consultations are carried out in Malawi as found from the guidelines, interviews and ESIA reports. There is an understanding of the need to do the consultation in a way that is inclusive. The discussions during consultations did not include anything on land restoration. This is in contrast with the guidelines from SER and the other countries where land restoration and other environmental issues are discussed in detail with the community. There was also no explanation of the stakeholder analysis or engagement plan which are tools that are currently being used to maximise the stakeholder consultation process internationally.

Another issue with the public participation as reported in the ESIA's was the lack of broad non-selective participation. Only some of the surrounding communities and their leaders ("surrounding" is determined by the consultants doing the ESIA) as well as some government personnel (also selected by the consultants) are consulted. This contrasts with what can be considered current best practice which requires the whole process to be completely opened using mediums such as radio, newspapers and websites. In Iceland, for example, the ESIA at different

levels from terms of reference to scoping all the way to the final report are required to place a copy at the local council office for anyone to access and it is required to be circulated in both local and national newspapers and on radio as well as websites. Only selectively consulting means that some important things can be missed out. For example, non-governmental organisations and civil society organisations play an important role in advocating and representing for both people and the environment.

Another point is that ESIA usually have issues that can be considered of national importance and publishing them means comments can be received widely from concerned citizens and other concerned experts.

The EMA 2017 has clauses in section 5 which are aimed at ensuring public access to information and participation of the public:

- “5. — (1) For purposes of ensuring effective public participation, enforcement of rights and duties created under this Act, the Authority shall promote the right of every person to—
- (a) access environmental information and lead agencies, private sector and non-governmental organizations shall have a duty to provide such information in a timely manner;
 - (b) participate in environmental decision-making processes directly or through representative bodies and mechanisms for effective, direct and indirect public participation shall be created by lead agencies; and”

However, there was a lot of difficulty faced when trying to obtain ESIA reports for the study. This was due to lack of an easily accessible database. In Iceland, the ESIA reports were easy to access and this was the same in Australia and Canada. The law in Iceland is very detailed in the requirements of public participation at all stages of the EIA process. Transparency has been identified as one of the key pillars of effective ESIA with integrity in a comprehensive study called “International Study of the Effectiveness of Environmental Assessment” (Sadler 1996). It has also been identified as one of the key principles of an ESIA by the International Association for Impact Assessment (Senécal et al. 1999). To achieve this transparency documents such as ESIA must be made as easy to access as possible. One example of usefulness of making these documents easily accessible is studies like this one which was done to assess the ESIA and make recommendations for improvement. In Iceland, Canada and Australia which were studied these documents were very easily found on the web.

In all the three mine sites visited in Malawi, neither the ESIA report nor EMP were found available at the site. It also seemed that the ESIA reports were not being used during operations. As one of the assessors noted at one of the mines, the companies simply conduct the ESIA to get their mining licence and do not apply it after that. There was also evidence found of companies not fulfilling the mitigation measures in the ESIA reports. This was noted in both the assessments and the audit reports. There was also a lack of practical training available to mine personnel on how to do proper land restoration. The companies were also not using experts who can be hired as consultants or even government experts who can provide some advice for free, such as ecologists and soil experts.

Most of the companies in Malawi and even in other countries rely on using consultants to conduct the ESIA and produce a report. While this is reasonable considering that the process requires experts in different fields, the company should have ownership and still bear responsibility for the report and process. This seems not to be the case in Malawi mines as evidenced by the fact that the companies do not keep a copy of the ESIA on site during operations. The ESIA reports are also written as suggestive statements from the consultants to the company rather than commitments by the company. This contrasts with ESIA reports that were assessed from Iceland, Australia and Canada where there is a clear commitment made in addressing negative impacts and enhancing positive ones.

Most of the companies also stated that they are waiting for end of operations to start looking at closure. This leaves only a small window of preparation and is not considered good practice in many countries such as Australia (Government of Western Australia - Department of Mines and Petroleum & Environmental Protection Agency 2015). The lack of preparation for the eventual closure means the company may not be fully ready during closure, as experienced by Mchenga coal mine when they closed their surface operations. Preparation can include training or hiring personnel, making detailed plans, making an assessment to determine what will be needed, planning equipment and resources and preparing a fund, which all requires adequate time.

It should also be considered that if a mine is doing full closure, it may mean limited finances since the mine will likely be concluding operations and not making much money. The company also must fulfil other obligations such as severance packages for employees, moving equipment out and other things. This is one of the reasons to promote progressive rehabilitation and ensure that proper planning is done ahead of the final period of operation with adequate resources prepared for this phase. The practice that has been applied successfully for over a few decades in many countries including Canada and Australia is to require a financial bond in either cash or other forms that is held either directly by the government or on behalf of the government by private institution. This financial bond is only given back to the company if it fulfils its obligations properly at the end of the operations. It can also be used by the government to conduct the restoration if the company either abandons the mine unprocedurally or goes bankrupt. The bond is also used to encourage progressive rehabilitation and other environmental compliance by setting higher bond amounts for companies that are not doing well and reducing it for companies that are doing well.

In both Iceland and Canada, they have many old mines that were abandoned in unrestored states leaving the burden of fixing the situation to the government. This is the kind of situation Malawi must learn from and avoid as allowing companies to leave sites disturbed leaves the government with the burden of correcting the problems. Some companies in Malawi have already abandoned mines or gone bankrupt, leaving sites in a bad state. It is necessary to put in measures to prevent this happening as soon as possible.

The interviews with mine personnel showed that there is an understanding of the importance of restoring land after closure. Some of the companies are making good initiatives such as their own tree nursery and seedling collection for revegetation, which is a great initiative. However, the companies have had some challenges in implementing the restoration. In contrast, ON in Iceland has shown that with innovation and having the right expertise, it is possible to restore the land using native species, even in the difficult climate Iceland (Hartmann & Rydgren 2018). The

Icelandic Road and Coastal Administration has also showed great success by restoring in 14 years over 700 abandoned sites, which demonstrates that land restoration is possible in mining with most of the restored sites regaining their native species and not being distinguishable from surrounding sites.

5. RECOMMENDATIONS

Based on the findings and in consideration of achieving best practices in land restoration in Malawi's mineral sector, some recommendations are given below.

1. The government should come up with more detailed requirements and guidelines on land restoration based on internationally recognised principles and guidelines as well as other countries' laws.
2. The government should come up with more detailed requirements and guidelines on stakeholder consultation and public involvement during ESIA based on internationally recognised principles and guidelines as well as other countries' laws.
3. There should be a financial bond requirement for all mines to ensure that they fulfil the rehabilitation requirements upon mine closure. The calculation of the bond amount should be done using clear and adequately detailed guidelines. Companies that are performing well such as compliance with environmental requirements and progressive rehabilitation should have their rates lowered and those who do not perform in this aspect should have rates increased accordingly.
4. Restoration plans should be more detailed and should be practical. The plans should be regularly reviewed and revised and there should be minimum mandatory periods between revisions.
5. ESIA's and restoration reports should be fully the responsibility of the project proponents. They should be encouraged to hire or train personnel in implementing the requirements,
6. The mitigation measures identified in the ESIA should be mandatory and deviations should only be acceptable where the company shows that its measures are better than those in the ESIA.
7. It should be made mandatory for companies to keep a copy of its ESIA and restoration plans on site.
8. Companies should be required to train or hire someone to oversee managing environmental issues and the person must be certified by government or show that they have obtained the necessary qualifications.
9. During operations, companies should minimise their impacts as much as possible and ensure that things such as dust are not going off site and causing problems to a wider area than their licence area.
10. Progressive rehabilitation should be made mandatory and companies must make reports on how much they are rehabilitating instead of leaving everything to the end.
11. Government should ensure that enforcement is done on mitigation measures that are written in the ESIA's.
12. On the issue of training in land restoration, government can conduct training workshops or use other means of providing training to mine personnel. Another way would be for government to get private training institutions to set up a relevant curriculum.

13. The requirement for mining claims to conduct ESIA or at least an EMP should be enforced.

6. CONCLUSIONS

The assessment of the planning showed that in Malawi, there is an understanding of the importance of conducting land restoration at the end of the mining project. The importance of planning is also appreciated but little is done to make detailed plans and document them. This land restoration for mines requires good planning from the time before operations start until the mine closes. The ESIA process which is relied upon to account for these plans is not adequate in its current form. The ESIA process has become a routine process used just to obtain the licence and this is reflected in the lack of commitment in writing as well as the absence of the EIA report at most sites. Land restoration planning must be taken as a big part of the ESIA enforced by comprehensive regulations and guided by detailed guidelines.

Monitoring of the commitments of ESIA's should also be done and adherence should be enforced. Companies in collaboration with government institutions should also be encouraged to innovate and adapt their environmental management plans as operations go. The operations should also be done in a way that minimises degradation and promotes progressive rehabilitation so that the final restoration after closure is easier and cheaper. The restoration plans should also be reviewed and updated regularly as mining plans change or new technologies are discovered.

It is important for companies and regulators to note that all the approaches or methods are ultimately about people (current and future), other creatures and the environment that need to be protected and not just following legal requirements to get licences. It is hoped that this review of the current system will initiate a constructive discussion between the stakeholders and lead to a situation where mining is no longer viewed as a temporary benefit with permanent destruction. This can in turn lead to more acceptance of mining and maximisation of its benefits for the adjacent communities, the environment and the whole nation.

To have substantiality and acceptability in the mining sector, land must be repaired as much as possible and as soon as possible with the goal of returning it to the original and stable state. The mine should try to minimise its impacts and try to ensure that the effects are only within the licence area and not beyond its boundaries.

6.1 Recommendations for future studies

- Comprehensive study on stakeholder engagement. Find out community views on restoration including their expectations, their suggestions and how they prefer to be engaged. Also, find out from environmental NGOs their views on restoration and how they can interact with other aspects of the environment.
- One of the objectives of this study was to come up with a code of practice for land restoration in Malawi. However, due to the scale of the work in assessing and then producing the report, there was inadequate time to come up with the documents. However, key points were identified and exemplary documents from international organisations and

other countries were identified that can be used to come up with these detailed guidelines and codes of practice.

- This study only covered large scale licences but not mining claims. The number of small-scale licences is increasing, and they are not monitored as much as the large-scale licences. Therefore, a study specifically targeting them can cover this gap.

ACKNOWLEDGEMENTS

I am grateful to all those who have been of great assistance to me in this project. There were times when it felt that I could not produce anything useful but Dr Sigrun Maria Kristinsdottir, my supervisor, always guided and encouraged me to keep going. I also had a lot of help from Gunnar Bjarnason of ICARDA who gave me a lot of material to start from and Magnea Magnusdottir of ON Power who shared with me a lot of information and took me around to her company to show me all her wonderful work. In Malawi, the project assessment was facilitated by Chimwemwe Bandazi who did a great job collecting documents and organising everything more than I expected.

The UNU-LRT have created an excellent course and the research component has been invaluable even though it seemed daunting. Starting with Halldóra Traustadóttir who interviewed me two times before I was selected for the course, Hafdís Hanna Ægisdóttir, Berglind Orradóttir, Isabel C Barrio and Muhammad Azfar Karim who have all helped us and taught us for the 6 months. One of the biggest things I have learnt from this course is that when we are learning, we should not just take the information and use it elsewhere but rather research and adapt the methods to the appropriate conditions and that this process never stops.

“what is the best way of restoring a mine site?”

“Here are different methods ... but to as to which to use, **IT DEPENDS ...**”

I have also appreciated the company of most of the fellows and have learned a lot from others. It has been a lot of fun, especially with my special friend Daginnas Bastukh as well as Bayarma and others.

Finally, I would like to express my gratitude to the people of Iceland who are the source of the funds for this course via the Government of Iceland. My stay in Iceland has been educational but also a lot of fun and Icelandic people, though reserved in most cases, have always been nice and helpful when we interacted.

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APPENDIX

Assessment tool for restoration

Each assessor filled their tool separately so that they could input their own view based on academic background and work experience

This tool is meant to be a guiding document and not necessarily a checklist. The assessment will rely on the person completing to observe things above and beyond this tool.

(If they are available, try to include mine manager, environmental officer, community engagement representative, restoration manager or any person knowledgeable of the restoration at the mine – if none of the participants from above is female, request that any female employee participate if possible.)

Name of assessor:

Gender:

Expertise

Academic background

Organisation

Position

A. Mine site

(Upon arrival at the mine site, this will be an interview with some key personnel)

People interviewed

| Name | Position and Responsibility | Years of experience | Gender |
|------|-----------------------------|---------------------|--------|
| | | | |

1. Name of Mine (Licence number as well if available)

2. District

3. Locality (village/TA/any general description)

4. Minerals being mined

5. Type of mining

Surface

Underground

Both

Mechanised

Semi-mechanised

Artisanal

Describe below:

6. When did mining start

7. Describe the type of land that was there before mining started (e.g. wetland, arable land, forest)

8. What services did the area provide before mining started (for example, catchment area or fuel or agriculture or residences or water source, medicinal etc)

9. What is the plan for restoring the land

10. How is the mine preparing for the restoration?

11. How was the plan developed?

12. Who were the stakeholders?

13. How were the stakeholders engaged in the restoration planning?

14. Do you believe planning is critical to achieving restoration targets?

15. What do you suggest is the best way of planning restoration and following up?

16. How is the Environmental impact assessment being used at the mine?

17. Who is responsible for managing obligations in Environmental impact assessment at the mine
 18. Is the Environmental Impact Assessment document available at the site for those responsible to use?
 19. Has any restoration been done at any part of the mine (describe briefly)?
Yes, No In progress
 20. When was site restored?
 21. What planning was there for the restoration?
 22. What considerations were made in trying to restore (what were the targets in terms of functionality of the place and stabilisation)?
 23. Were there any challenges in restoring the site?
 24. What do you think would have improved the planning and execution of the restoration?
- B. Assessment of sites

Note: This section will partially rely on comparing surrounding sites and the knowledge and expertise of the team assessing the site

25. Location - GPS coordinates of area assessed (if possible)
25b Coordinate system used for the coordinates
 26. Key ecosystem attributes (it is not expected that all the things can be observed and analysed. If it is not possible to make observations, please just explain that) - Describe and explain observations (adapted from McDonald et al. 2016)
 27. Absence of threats - Are there any threats such as pollutants, the continued use of the site for mining or other threats? (adapted from McDonald et al. 2016)
 28. Physical condition - How is the hydrology and nutrient availability? (adapted from McDonald et al. 2016)
 29. Was any nutrient addition done? - Was any organic or inorganic fertilizer added to any part of the site? (adapted from McDonald et al. 2016)
 30. Species composition - How are native species doing on the site? Are introduced or undesirable or invasive species dominating? (adapted from McDonald et al. 2016)
 31. Soil - Is the soil on the site in a stable state? (adapted from McDonald et al. 2016)
 32. System functionality - Is the system in a self-sustaining state? (adapted from McDonald et al. 2016)
 33. How is the landscape of the site? (adapted from McDonald et al. 2016)
 34. Is the site in a state that can provide services to the environment and people around? Is the site able to provide the services to the people around it that it did before, or if it can now be used in a different way or if it has lost all use to the locals? (e.g. water, fuel, animal habitat etc) (adapted from McDonald et al. 2016)
 35. Is the site in a state that can provide services to the environment? (e.g. animal habitat, maintenance of biodiversity etc) (adapted from McDonald et al. 2016)
- C. Assessors overall observations and impressions
36. State/Condition of the restored site (Also describe condition of the surrounding sites (undisturbed) and use as comparison with restored site)
 37. Give your general view of the company's restoration planning process
 38. Give your view of the company's plan
 39. Give your view of the restored parts of the mine
 40. What do you think about the land restoration planning
 41. Any other views or comments?