

Current Status of the Regulatory Infrastructure for Uranium Mining and Milling Activities in Malawi

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1. Introduction

Uranium mining and milling activities lead to increasing exposure by radionuclides when uranium ore, tailings and waste rocks are produced. The workers and the public living around uranium mining and milling facilities may be exposed to radiation doses through the mining and milling activities including the transportation of radioactive materials, and also through the radioactive dust, contaminated water and foodstuffs [1]. In this case, uranium mining and milling activities pose negative impacts on the health of workers and the public due to exposure to the increasing concentrations of radionuclides in the uranium ore, tailings and waste rocks.

Malawi is one of the countries where uranium mining and milling has been taking place. Uranium mining and milling is carried out as open pit mining situated at Kayerekera Uranium Mine (Fig. 1) in the Northern Region of Malawi (Fig. 2). In addition, uranium is expected to be produced as a by-product at a niobium mining project under development. There has been exploration for additional uranium ore resources around Kayerekera Uranium Mine and other parts of the country [2].



Fig. 1. Kayerekera uranium mining site layout [2].



Fig. 2. Map of Malawi, Africa and location of Kayerekera Uranium Mine [2].

Kayerekera Uranium Mine was commissioned in 2009 and it is currently on care and maintenance. The mine has been producing uranium oxide (yellow cake) and generating radioactive tailings and waste rocks. The mine has over 300 workers when it is in full operation [3]. The mine is close to communities with a population of about 1150 people [4]. It has been reported that there has been inadequate regulation of the uranium mining and milling activities at the mine and therefore, the workers and the public are at risk of being exposed to higher radiation doses [5].

Therefore, the objective of this study is to review the current status of regulation for the uranium mining and milling activities in Malawi, and to provide recommendations to develop and improve the effectiveness of the regulatory infrastructure. This paper covers the current status of the legislative framework as well as the regulatory authority for uranium mining and milling activities and the development and improvement of regulatory infrastructure for uranium mining and milling activities in Malawi.

2. Legislative framework for Uranium Mining and Milling Activities in Malawi

Legislative framework for radiation safety and protection in Malawi was developed after Malawi became a Member State of IAEA in 2006. Before Malawi joined the IAEA, no comprehensive legislative framework for radiation safety and protection was present. Implementation of radiation safety and protection programmes was only provided for by provisions in the pieces of legislation from different sectors which include among others environment, mining, energy, labour and water. These pieces of legislation were inadequate to effectively ensure implementation of radiation safety and protection including regulation of uranium mining and milling activities.

The current legislative framework which was developed through the IAEA Technical Cooperation programmes include the Atomic Energy Act Number 16 of 2011 and the Atomic Energy Regulations of 2012. The objectives of the Atomic Energy Act Number 16 of 2011 are [6]:

- i) To provide for adequate protection of the people and the environment in present and future generations against the harmful effects of ionizing radiation by controlling and regulating the importation, exportation, production, processing, handling, use, holding, storage, transportation and disposal of radiation sources, nuclear materials, and any other radioactive materials;
- ii) To provide for the establishment of the Atomic Energy Regulatory Authority and provide for its governance and management, and;
- iii) To provide for matters connected therewith and incidental thereto.

The objective of the Atomic Energy Regulations of 2012 is to specify the basic requirements for the following [7]:

- i) Protection of people against exposure to ionizing radiation;
- ii) Safety of radiation sources;
- iii) Safety of radioactive waste management;
- iv) Protection and safety of the environment, and;
- v) Prevention of unlicensed access or damage to, and loss, theft or unlicensed transfer of radioactive sources, so as to reduce the likelihood of accidental harmful exposure to such sources.

The Atomic Energy Act Number 16 of 2011 and the Atomic Energy Regulations of 2012 provide the general legislative framework for regulation of uranium mining and milling activities in Malawi. The Act and the Regulations ensure that uranium mining and milling

activities are licensed and inspected to ensure safety and protection of workers, the public and the environment from any hazards associated with uranium mining and milling. The Act and the Regulations also ensure that the operators of the uranium mining and milling facilities bear the responsibility for safety up to completion of closure of the facilities. However, the Act and the Regulations are not adequate. Therefore, the drafts for the regulation both for uranium mining and naturally occurring radioactive materials (NORM) have been developed. The drafts deal with specific requirements for regulation of uranium mining and milling activities. The drafts are expected to be approved in the near future.

3. Regulatory Authority for Uranium Mining and Milling Activities in Malawi

According to the IAEA Safety Standards, uranium mining and milling requires an administrative, legal and regulatory framework for its management to ensure the achievement of fundamental safety objective of protecting the public and the environment from harmful effects of ionizing radiation. In this case, it is necessary for an independent regulatory authority to be in place to ensure effective implementation of the following functions:

- i) Legislative framework;
- ii) Authorization process;
- iii) Compliance assurance;
- iv) Enforcement;
- v) Regulation of exploration activities;
- vi) Regulatory involvement prior to construction of a mining or processing facility;
- vii) Regulation of activities related to construction;
- viii) Regulation of activities relating to mining of uranium;
- ix) Regulation of activities relating to the processing of uranium ore;
- x) Regulation of decommissioning & closure of mining and processing facilities;
- xi) Regulation of control post-closure (institutional control), and;
- xii) Regulation of activities related to transportation.

In general, the effective regulatory control programme which is implemented by the regulatory authority covers all activities including exploration, construction, mining, milling, decommissioning and closure as well as transportation.

In Malawi, there is no independent regulatory authority. Environmental Affairs Department (EAD) under the Ministry of Natural Resources, Energy and Mining (MoNREM) was designated as the regulatory authority to ensure coordination of and implementation of regulatory functions to ensure radiation safety and

protection in Malawi. To ensure more focus on the initiation and implementation of the radiation safety and protection programmes, the EAD put in place an internal organizational unit called Atomic Energy Unit. The Unit specifically handles regulatory functions for radiation safety and protection. The Unit performs the regulatory functions of authorization, review and assessment as well as conducting inspections of practices and facilities including uranium mining and milling activities. In addition, the Department of Mining (DoM) due to its jurisdiction, it also regulates the uranium mining and milling activities in coordination with the Atomic Energy Unit.

4. Development and improvement of Regulatory Infrastructure for Uranium Mining and Milling Activities in Malawi

In general, the current status of regulatory infrastructure for uranium mining and milling activities in Malawi is not adequate. The following are the main ways to develop and improve regulation of uranium mining and milling activities:

- i) Operationalizing of the Atomic Energy Regulatory Authority which is established by the provision of the Atomic Energy Act Number 16 of 2011. The authority will ensure that the Act and the Regulations are implemented so that uranium mining and milling activities are effectively regulated. The Government should ensure adequate budgetary allocation to the authority;
- ii) Developing adequate human resources;
- iii) Approving of the specific regulations: Uranium Mining Regulations and NORM Regulations which are in draft form;
- iv) Harmonization and coordination of the regulation of uranium mining and milling activities among the regulatory authority, DoM, EAD and other relevant competent authorities, and;
- v) Increasing stakeholder consultation and engagement including the local communities.

5. Conclusion

Adequate regulatory infrastructure for uranium mining and milling activities is very important to ensure safety and protection of the workers, the general public and environment from the effects of ionizing radiation. Malawi has managed to establish its regulatory infrastructure within a short period from the time it became a Member State of IAEA in 2006. However, the current regulatory infrastructure for uranium mining and milling activities is not adequate. There is need for the Government to expedite the operationalization of the Atomic Energy Regulatory Authority so that it should

start the full implementation of its regulatory functions. Most importantly, the Government should provide adequate financial resources to the regulatory authority so that it fully implements its regulatory functions effectively. In addition, there is need for specific regulations to be approved (draft Uranium Mining and NORM Regulations). There is also need for proper coordination among the regulatory authority, EAD, DoM and other relevant competent authorities involved. Stakeholder consultation and engagement including the local communities need to be improved.

It is expected that as the mining industry in Malawi is developing, uranium mining and milling activities will also increase, therefore the current regulatory infrastructure for uranium mining and milling activities needs to be improved as soon as possible. Finally, it is expected that the study will be used by Government and other relevant stakeholders to develop and improve regulation of uranium mining and milling activities.

REFERENCES

- [1] IAEA. Environmental Contamination from Uranium Production Facilities and their Remediation. Proceedings of an International Workshop Lisbon, 11–13 February 2004. Vienna. pp. 6. 2005.
- [2] Department of Mines. Available from <<http://www.mines.gov.mw>>. [16 August 2016].
- [3] Department of Mines. An overview of Uranium Mining Development in Malawi. Lilongwe. 2008.
- [4] Paladin (Africa) Limited. Kayelekera Uranium Project Environmental Impact Assessment Report. Report 5032/40. pp. 6-223. 2006.
- [5] Chareyron, B. Impact of the Kayelekera uranium mine, Malawi. Environmental Justice Organisation, Liabilities and Trade (EJOLT) Report No. 21. 2015.
- [6] Government of Malawi. Atomic Energy Act Number 16 of 2011. Government Print. Lilongwe. pp. 4. 2011.
- [7] Government of Malawi. Atomic Energy Regulations of 2012. Government Print. Lilongwe. pp. 315-316. 2012.