

## **Developing Regulation Draft for Radiation Safety in Lesotho**

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### **1. Introduction**

Radiological sources are used in various fields such as medicine, development, construction, industry, and agriculture. These applications pose a risk of harmful effects on workers, the public, and the environment due to ionizing radiation (IAEA, 2006). Radiological safety is critical in protecting people and their environment from hazardous radiation exposure. In Lesotho, radiation use has expanded over recent years, with the medical field accounting for a large proportion. Over 70 diagnostic X-rays and five CT scanners have been installed and used. Linear accelerators (LINACs) will be installed at the Queen Mamohato Memorial Hospital by 2028, and limited nuclear medical isotopes such as technetium-99 and iodine-131 will be used according to the plan (WHO, 2025). Cs-137 are used for non-destructive testing at construction sites, and americium-241 is used for fire detection. X-ray scanners are used at immigration checkpoints located at the border.

Despite the diverse use of radiation sources, effective regulatory frameworks for radiation monitoring and safety are lacking in Lesotho. The only legal basis for radiation safety is the Radiation Protection Act, which was published in 2018. However, no regulatory body has been established to implement the Protection Act, and no protection law enforcement regulations have been enacted, making the Protection Act ineffective. Previous studies have shown that safety implementation regulations strengthen regulatory oversight by providing consistent and reliable tools to encourage protection and safety from ionizing radiation (Berris et al., 2017). Without clear regulations and enforcement procedures, tracking of radiation sources is incomplete, inspections are rare and ineffective, and compliance with international standards such as the IAEA Safety Standards (IAEA, 2015) and the Nuclear Nonproliferation Treaty (NPT) will be challenging.

This study aims to install Lesotho's

regulatory infrastructure by proposing implementation regulations for radiation safety, including clear provisions on licensing, regulatory inspection, personnel requirements, modification reviews, etc. for radiation users.

## **2. Methods and Approach**

### *2.1 Data Collection*

The data for this study include the following:

- ) A review of Lesotho's Radiation Protection Act (2018) and related legal documents.
- ) List of radiation sources and facilities based on government departments, customs records and field inspections in Lesotho
- ) Gap Analysis comparing Lesotho's framework with the IAEA Safety Standards Series No. GSR Part 1 (IAEA, 2015), GSR Part 3 (IAEA, 2014), and Korea Institute of Nuclear Safety (KINS) regulatory system in Korea.
- ) Consulting major ministries and operators in healthcare and industrial sectors, including the Department of Environment, Department of Health and Energy in Lesotho.

### *2.2 Infrastructure Overview*

Lesotho's existing radiation safety system is lax and very limited. The current licensing is managed by the two ministries, the Ministry of Health and the Ministry of Environment, but a

centralized national registry has not yet been established. The tracking of radiation sources is reported based on customs records and the results of frequent inspections by ministry officials. There are no national laboratories for radiation monitoring and or dose measurement services, and there is insufficient emergency preparedness for radiation accidents (IAEA, 2015).

### *2.3 Gap Identified*

The following main gaps were observed:

- ) Absence of detailed technical regulations to enforce Radiation Protection Act (2018)
- ) Lack of a functional and regularly updated National Radiological Source Inventory Register.
- ) Lack of regulatory personnel and technical expertise.
- ) Lack of safety inspection and enforcement mechanisms by insufficient government agencies.
- ) Lack of integration with the Southern African Development Cooperation SADC regional framework (Kamen, 2021).

## **3. Proposed Radiation Safety Regulatory Framework**

### *3.1 Licensing*

The framework proposes regulations for radiation sources, including a systematic licensing system that requires a safety analysis report and safety management regulations as key documents for specific permits listed below.

- ) Production Permits: Safety analysis, quality assurance, and qualified operators' requirements.
- ) Use Permit: Holding facility layout, sales tracking, transport safety, and proof of a permitted producer.

All permitted and notified licensees shall appoint an RSO responsible for ensuring compliance, conducting inspections, and managing dose monitoring. Qualifications differ depending on the scale of operation and risk level of both permitted and notified facilities.

### *3.3 Regular Inspections*

There are four types of regulatory inspections proposed:

- ) Facility Inspection: after completion of the radiation facility, verify that it is installed as specified in the radiation safety report.
- ) Periodic Inspection: inspect that the licensed facility is maintained and that radiation activities are being carried out in accordance with the permitted requirement. Annual inspection for high-risk facilities, every 3 years for medium-risk, every 4 years for low-risk.
- ) Sudden Inspections: Unannounced, triggered by non-compliance reports, incidents, or accidents.
- ) Documents Review: substitution of on-site inspection by documents inspection for facilities with a track record of compliance and no incidents or accidents.

### *3.4 Change Permits and Notifications*

- ) Mobile Use Permit: Operation and emergency plans for portable devices.
- ) Small Source Notification: simplified procedures for low-risk devices.

### *3.2 Appointment of Radiation Safety Officer*

Major operational or physical changes affecting safety require approval; and minor changes, such as equipment replacement, require notification to the regulatory body

### *3.5 Recommendations*

#### Short-Term (0-2 years)

- ) Enact and enforce the Radiation Protection Act (2018).
- ) Establish a centralized National Radiological Agency Registration System.
- ) Provide staff training Programs.

#### Medium-Term (2-5 years):

- ) Establish a complete operational regulator with appropriate staff, inspection tools, and enforcement authority.
- ) Conduct public awareness campaigns and conduct national emergency training.

#### Long-Term (5+ years)

- ) Align regulations with SADC regional standards.
- ) Signing a global cooperation agreements under the AFRA and IAEA programs.
- ) Develop sustainable infrastructure and local technical capacity.

#### **4. Conclusion**

The increasing use of radiation technology requires a well-established and effective regulatory framework. The proposed regulations in this article align with IAEA Safety Standards and the best international standards of KINS, thereby addressing critical gaps in permit issuing, inspection, and operational safety. Implementing these regulations will enhance public health and environmental safety, strengthen compliance with international obligations, and support the safe expansion of radiation applications in medicine, industry, and security.

## References

- Berris, T., Dejan, Z. & Rehani, M., 2017. Survey on impact of regulations on radiation safety and development of radiation safety culture in 25 countries. *Journal of Medical Imaging*, 4(3).
- IAEA, 2006. *IAEA Safety Standards- Fundamental Safety Principles SF-1*, Vienna: IAEA.
- IAEA, 2014. *IAEA Safety Standards No. GSR Part 3* , Vienna: IAEA.
- IAEA, 2015. *Capacity Building for Nuclear Safety*, Vienna: IAEA.
- IAEA, 2015. *IAEA Safety Standards No. GSR Part 1 (Rev 1)*, Vienna: IAEA.
- IAEA, 2015. *Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards-GSR Part 3*, Vienna: IAEA.
- Kamen, V., 2021. *Synchronizing Nuclear Governance in SADC Member States Through Regional Cooperation*, Johannesburg: SAIIA.
- WHO, 2025. *Bridging the Cancer prevention, diagnosis, and care gaps in Lesotho*, S.L.: WHO: Regional Office for Africa.