Analysis of Uganda's Radiological Emergency Preparedness and Response Arrangements in Comparison with IAEA Requirements

Joshua Birungi [a, b*], Inyoung Jeon[c]
[a] *Nuclear and Quantum Engineering Dept., KAIST, 291 Daehak-ro, Yuseong-gu, Daejeon, Republic of Korea 34141*
[b] *Atomic Energy Council, Plot 40 Bukoto Street, Kisementi, Kampala, Republic of Uganda*
[c] *Korea Institute of Nuclear Safety, 62 Gwahak-ro, Yuseong-gu, Daejeon, Republic of Korea, 34142*
**Corresponding author: joshbirungi@kaist.ac.kr*

1. Introduction

The Republic of Uganda is a developing country that is quickly adopting modern technologies in its socio-economic activities. In particular, nuclear technology has gained widespread adoption in medicine, industry, research, and academia over the last few years. However, the proliferation of activities that use radiation sources also indicates an increased possibility for radiological accidents and emergencies in the country.

Although rare, radiological accidents can become disastrous if there are no adequate measures to manage them. Therefore, adopting nuclear technologies requires commensurate safety measures, including radiological accident prevention, emergency preparedness, and response arrangements to prevent disaster situations. In this research, we analyzed the comprehensiveness and effectiveness of Uganda's radiological emergency preparedness arrangements in light of IAEA international standards.

2. Methodology

In 2011, the International Atomic Energy Agency (IAEA) issued safety requirements for preparedness and response for a nuclear or radiological emergency in the Safety Standards Series as General Safety Requirements Part 7 (GSR-7) [1]. The Requirements provide a helpful instrument for contracting parties to assess their performance on nuclear and radiological emergency preparedness and response (EPR). The document highlights and describes twenty-six requirements. As a member of the IAEA, Uganda uses IAEA standards to develop its laws, regulations, and guides. Concerning EPR, the Atomic Energy Act no. 24 of 2008 [2] and the Atomic Energy Regulations of 2012 contain relevant legal provisions and requirements [3].

In this analysis, we compare and contrast Uganda's current legal and regulatory infrastructure provisions with the requirements in GSR-7. We applied the descriptive-analytic approach to assessing the comprehensiveness of the existing national arrangements for EPR against the IAEA requirements specified in GSR-7. The requirements were tabulated, matched against the existing national EPR framework in Uganda, and evaluated to determine whether each provision was fully or partially met or not met at all.

The gaps, challenges, and areas of improvement in the national radiological emergency management arrangements were also identified. Recommendations and best practices are derived from a review of the radiological emergency preparedness and management practices in countries with advanced nuclear technology, such as the Republic of Korea [4].

3. Results and discussions

National regulatory requirements vary according to the nuclear applications in the country. Thus, the IAEA recommends that each member state use the provisions in the GSR-7 to determine and establish a level of radiological emergency preparedness consistent with the country's hazards [1]. For example, although it is a potential nuclear embarking country, Uganda does not have any activities that use nuclear materials. Therefore, the adoption of the requirements is customized to suit prevailing conditions.

3.1. National radiological Emergency Management System (EMS)

The EMS for Uganda is generally described in the Atomic Energy Act no. 24 of 2008 (AEA), the Atomic Energy Regulations, 2012 (AER) and the National Radiological Emergency Response Plan (NRERP) [5]. However, Uganda's NRERP is still pending approval by the responsible Ministry.

The AEA provides for establishing the Atomic Energy Council (AEC) as the national regulatory body for nuclear and radiation safety. Consequently, the government created AEC in 2009. AEC developed and issued the AER to specify the minimum requirements for protecting individuals and the environment from the dangers of ionizing radiation and providing for the safety and security of radiation sources. The regulations specifically stipulate that the primary responsibility for the safety of radiation sources lies with the licensed user.

Regarding emergency preparedness and response (EPR), the regulations stipulate the responsibilities of a licensed user in an emergency, emergency response planning requirements and interventions, and the protection of workers undertaking an intervention. In particular, where a licensed source is involved in an incident, the licensee is responsible for taking all required protective actions.

Additionally, Section 9 (1)(k) – (l) of AEA specifies that the functions of AEC are to assist in emergency response to radiological incidents and accidents; and to initiate, recommend, and provide appropriate support on interventions relating to radiological emergencies.

3.2. Compliance of Uganda's EMS with GSR-7 requirements

GSR-7 stipulates twenty-six requirements under three chapters: general, functional, and infrastructure. The explicit details of each requirement are explained within the standards. This subsection summarizes the findings of the analysis of the extent to which the EMS in Uganda meets the different requirements in GRS-7. In Tables I to III, the requirements and the country status are matched and rated. Symbols are used to show fully met (●), partially met (◑), or not met (○).

3.2.1. General requirements.

General requirements (1 to 5) are essential for adequate emergency arrangements for hazards assessed based on a graded approach. Table I shows Uganda's status concerning the general requirements.

Table I: Compliance with the general requirements

Requirement	**Country Status**	
1. The emergency management system	The EMS is provided for in the AEA, AER and NRERP	●
2. Roles and responsibilities in emergency preparedness and response	The AEA, AER and NRERP specify roles and responsibilities	●
3. Responsibilities of international organizations in emergency preparedness and response	Not applicable	-
4. Hazard assessment	A hazard assessment is still under development	◑
5. Protection strategy for a nuclear or radiological emergency	A protection strategy was developed, but it does not meet all GSR-7 specifications	◑

Table I above demonstrates an effort by the country to establish an effective EMS. However, there is a need to fast-track the finalization of the documentation process.

3.2.2. Functional requirements.

Functional requirements (6 to 19) establish the provisions necessary for effectively carrying out actions critical for effective emergency response. Table II shows Uganda's status concerning the functional requirements.

Table II: Compliance with the functional requirements

Requirement	**Country Status**	
6. Managing operations in emergency response	The NRERP describes the mechanisms for managing response	●
7. Identifying and notifying a nuclear or radiological emergency and activating an emergency response	The mechanisms for identification and notification of an emergency are outlined in the NRERP	●
8. Taking mitigatory actions	Each operating organization is required to submit procedures for taking mitigatory actions before licensing	●
9. Taking urgent protective actions and other response actions	The NRERP briefly describes actions to be taken, but they are not comprehensive to GSR-7 specifications.	◑
10. Providing instructions, warnings, and relevant information to the public for emergency preparedness	There is no public communication strategy, although the NRERP designates the responsible organizations	◑
11. Protecting emergency workers and helpers in an emergency	The protection of emergency workers is described in the protection strategy document	●
12. Managing the medical response in a nuclear or radiological emergency	The NRERP designates the responsible organizations, but no efforts have been made to build capacity for medical response	◑
13. Communicating with the public throughout a nuclear or radiological emergency	There is no public communication strategy, although the NRERP designates the responsible organizations	○
14. Taking early protective actions and other response actions	The NRERP briefly describes actions to be taken, but they are not comprehensive with GSR-7 specifications.	◑
15. Managing radioactive waste in a nuclear or radiological emergency	There is a policy for radioactive waste management that includes waste from emergency incidents	●

16. Mitigating non-radiological consequences of a nuclear or radiological emergency and an emergency response	The guidelines and process for managing non-radiological effects are described in the NRERP	●
17. Requesting, providing, and receiving international assistance for emergency preparedness and response	The NRERP outlines the process for requesting assistance from the IAEA. However, Uganda is not a party to the 'Assistance Convention.'	◑
18. Terminating a nuclear or radiological emergency	The process for terminating a response is described in the NRERP	●
19. Analyzing the nuclear or radiological emergency and the emergency response	The NRERP provides for a review of the response process	●

Table II shows that most functional requirements are covered in the NRERP. However, some requirements are not comprehensive, and this will require a review of the NRERP or a separate additional document to cover them. Particularly, it is recommended that a communication strategy be developed.

3.2.3. Requirements for infrastructure.

The requirements for infrastructure (20 to 26) represent provisions for the facilities, personnel, logistics, and documentation necessary to develop and maintain appropriate arrangements for preparedness. Table III shows Uganda's status on the requirements for infrastructure.

Table III: Compliance with the requirements for infrastructure

Requirement	**Country Status**	
20. Authorities for emergency preparedness and response	The authorities are designated in the NRERP	●
21. Organization and staffing for emergency preparedness and response	No information is available on staffing requirements for NRERP	◑
22. Coordination of emergency preparedness and response	The coordination mechanisms are provided for in the NRERP and AEA	●
23. Plans and procedures for emergency response	There is a draft national plan (NRERP) and plans for operating organizations but no verified procedures for responding organizations	◑
24. Logistical support and facilities for emergency response	The NRERP designates the organization responsible for logistics. The organization has facilities but lacks some equipment	◑
25. Training, drills and exercises for emergency preparedness and response	Requirements for training and drills are provided in the AEA, AER, and NRERP	●
26. Quality management program for emergency preparedness and response	There is no provision for quality management	○

Table III shows a fair level of compliance with GSR-7 requirements for infrastructure. However, the provisions for staffing, quality management, procedures for the response, and logistical support should be addressed.

4. Conclusion

Adequate national arrangements and capabilities for radiological emergency preparedness and response are essential in minimizing the impacts of disastrous accidents involving radioactive materials and consequently building public trust in the safety of nuclear technology. In the case of Uganda, although considerable progress has been made to establish a radiological emergency management system, there are still several gaps in the framework that need improvement. Particularly, it is concerning that the National Radiological Emergency Response Plan (NRERP) is not approved and, therefore, cannot be implemented. The country should fully adopt, adapt, and implement the requirements specified in GSR-7 and ratify the relevant conventions to enhance its framework.

REFERENCES

[1] IAEA, 2015, Preparedness and Response for a Nuclear and Radiological Emergency, No. GSR Part 7 (IAEA, Vienna, 2015)
[2] The Republic of Uganda, Atomic Energy Act no. 24 of 2008 (Parliament of Uganda, Kampala, 2008)
[3] The Republic of Uganda, Atomic Energy Regulations, 2012 (Atomic Energy Council, Kampala, 2012)
[4] The Republic of Korea, Act on Physical Protection and Radiological Emergency, Act No.06873 (Korea Institute of Nuclear Safety, Daejeon, 2003)
[5] The Republic of Uganda, National Radiological Emergency Response Plan (draft), 2019 (Atomic Energy Council, Kampala, 2019)