

1. Background and goal of the present work

International trade of commodities containing radioactive materials takes various forms, and regulatory agencies in each country are monitoring imports and exports of these to ensure radiological safety [1]. Disputes may arise if the radiological safety standards are significantly different between the exporting and importing countries. In particular, with regard to commodities containing NORM such as raw materials, NORM residues, consumer products, which are justified and have a relatively low risk, it is recommended that safety standards are consistently applied to the importing and exporting countries in order to unnecessarily hinder the trade.

In ROK, regulations on consumer products containing NORM have been strengthened due to the Monazite-added radon-emitting mattress incident in 2018. Therefore, at this point of time, it is necessary to review the domestic regulations in comparison to the relevant international safety standards. **In this study, the potential cases for disputes in international trade related to regulatory differences among countries by product types are analyzed. Based on the analysis, referential implications for improving domestic regulation have been derived.**

2. Current status of IAEA safety standards

IAEA safety standards mainly related to the radiation safety in trade of consumer products containing NORM are the **GSR Part 3 requirements** (2014) and the **RS-G-1.7 guides** (Application of the Concepts of Exclusion, Exemption and Clearance, 2004).

2.1. IAEA GSR Part 3 Requirements

According to the paragraph 3.4 of GSR Part 3 requirements, in case of exposure from NORM exceeding the activity concentration standards (K-40 10Bq/g, 1Bq/g for U and Th series), the requirements for the **planned exposure situation** are applied. Otherwise, the requirements for the **existing exposure situation** are applied.

The **major planned exposure situation requirements** applied to consumer products containing NORM are Requirement 7 (Notification and authorization), 8 (Exemption and clearance), 10 (Justification of practices), 12 (Dose limits) and 33 (Consumer products) which contains requirements of justification for public use.

The **GSR Part 3 requirements for consumer products containing NORM to which existing exposure situation** applies are the establishment of strategic goals and appropriate reference levels for the management of existing exposure in accordance with paragraph 5.4. According to Requirement 51, it is presented to establish an annual effective dose of about 1mSv as a reference level for the management of exposure to radionuclides in commodities.

2.2. IAEA RS-G-1.7 Guides (2004) and Revision Status

The **RS-G-1.7 (2004) guides are being revised in accordance with the revision of the requirements to maintain hierarchical consistency. Currently, 12th out of 14th revision steps are in progress.** The review by the IAEA safety standards committee has been completed, hence details will be confirmed soon without major changes.

Paragraphs 7.6 to 7.14 of the 11th revision step version of the guides (DS499) [2], which are currently available online, contain information on radiological safety management in international trade of commodities containing radioactive materials. These contents can be summarized as the procedure diagram in Figure 1.

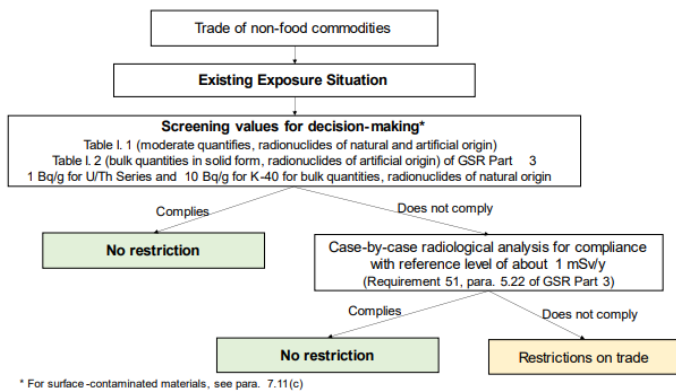


Fig. 1. Flowchart illustrating the use of screening values for decision-making in trade of commodities [2]

3. Domestic Regulatory Status

Domestic regulatory requirements for international trade of NORM-containing consumer products are based on the **'Act on Protective Action Guidelines against Radiation in the Natural Environment'**, and its supplementary guidelines are **safety guidelines** [3] based on Article 8 of the Act.

The main requirements are the definition of NORM-containing consumer products and quantitative standards for these (Article 2), standards for registering the product manufacturers (Article 9), reporting obligations of registered manufacturers when importing and exporting products (Article 11), obligations and standards on the record, storage and reporting of distribution of products by registered manufacturers (Article 12), safety and justification standards for the products (Article 15), and radiation monitoring standards for the products imported through airport or port to confirm and control whether this substance is suspicious one (Article 19).

In the safety guidelines [3], the safety confirmation procedure for domestic import of consumer products containing NORM is presented as shown in Figure 2.

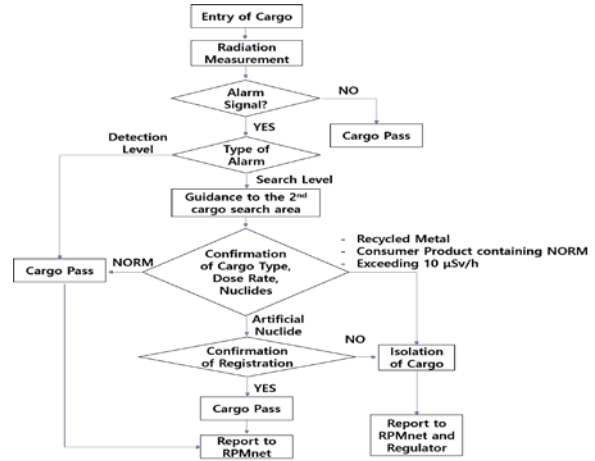


Fig. 2. Domestic airport and port radiation monitoring system safety management procedures [3]

4. Comparative Analysis

For the analysis, the **types of products** were classified based on their **activity concentration, dose, and justification. 18 product types** were established by **combining 3 types** for each radioactive concentration range, 2 types for each dose range, and 3 types for each justification **so that all products can be covered.**

For naming of each type, product type containing less than **0.1Bq/g of U, Th series radionuclide (domestic standards related to the requirement of 'justification')** is denoted as **AC1**. Product type containing more than 0.1Bq/g and less than **1Bq/g (exemption levels presented in IAEA safety standards)** is denoted as **AC2**, and a product type containing more than 1Bq/g was denoted as **AC3**.

The dose symbol is **D1** for products with less than **1mSv/y (IAEA and domestic dose standard)** and **D2** for products with more than 1mSv/y. The justification symbol is **J1** when the **practice is not justified, J2** when the practice is justified but not **justified for general use of public**, and all justified products are labeled as **J3**.

By type, the expected import/export control of countries to which IAEA safety standards apply and ROK are analyzed. Based on the analysis, **possible types of trade** (assuming there is no illegal trade) **and the possibility of trade disputes** are analyzed as shown in Table 1.

Table 1. Analysis results of expected controls on products in IAEA and ROK, and possible disputes

Type	IAEA	ROK	Possible Trade	Possible Dispute
AC1-D1-J1	Exempted	Exempted	Interactive	N/A
AC1-D1-J2	Exempted	Exempted	Interactive	N/A
AC1-D1-J3	Exempted	Exempted	Interactive	N/A
AC1-D2-J1	Exempted	Exempted	Interactive	N/A
AC1-D2-J2	Exempted	Exempted	Interactive	N/A
AC1-D2-J3	Exempted	Exempted	Interactive	N/A
AC2-D1-J1	Unauthorized	Unauthorized	impossible	N/A
AC2-D1-J2	Exempted	Unauthorized	IAEA→ROK	Complaints from IAEA
AC2-D1-J3	Exempted	Unauthorized	IAEA→ROK	Complaints from IAEA
AC2-D2-J1	Unauthorized	Unauthorized	Impossible	N/A
AC2-D2-J2	Exempted	Unauthorized	IAEA→ROK	Complaints from IAEA
AC2-D2-J3	Exempted	Unauthorized	IAEA→ROK	Complaints from IAEA
AC3-D1-J1	Unauthorized	Unauthorized	Impossible	N/A
AC3-D1-J2	Unauthorized	Unauthorized	Impossible	N/A
AC3-D1-J3	Conditionally Authorized	Unauthorized	IAEA→ROK	Complaints from IAEA
AC3-D2-J1	Unauthorized	Unauthorized	Impossible	N/A
AC3-D2-J2	Unauthorized	Unauthorized	Impossible	N/A
AC3-D2-J3	Unauthorized	Unauthorized	impossible	N/A

5. Implications and Conclusions

In this study, a comparative analysis was performed between the IAEA safety standards and domestic regulatory standards in relation to the confirmation of radiation safety in international trade of NORM-containing consumer products.

As a result, it has shown that **some export products satisfying IAEA safety standards may cause disputes due to difficulties in importing them into ROK. The reasons are analysed that domestic justification rule is so inclusive that it is likely to ban most products without sufficient justification assessment for public use, and that dose standard is applied as dose limit regardless of registration.**

This research is expected to contribute to the continuous improvement of domestic safety management on radiation in living areas in harmony with IAEA safety standards.

6. References

- [1] G. Han, et al., Development of Improve Plan for Domestic Radiation Monitoring Standards to Prevent Disputes in International Trade of Consumer Products containing NORM, Nuclear Safety Technology Analysis Report (NSTAR-21RS32-343), 2021.
- [2] IAEA, Application of the Concept of Exemption, Draft Safety Standards No. DS499 (Step 11, Revision of part of safety guide RS-G-1.7), 2022.
- [3] NSSC, Safety Guidelines for Radiation Safety in Living Areas, 2021.