An Analysis of Challenges in the Land Transportation of Tin Slag 2

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Abstract

A by-product of tin processing and smelting industries, tin slag 2, is naturally radioactive as it originates from uranium and thorium decay chains. Currently, tin slag 2 is stored only in temporary facilities, creating opportunities and increasing the potential for transportation from one location to another, whether for further processing, temporary storage, or disposal. This paper aims to identify the challenges of transporting tin slag 2 by land, viewed from the aspects of regulation, infrastructure, radiation safety, and human resources. The methodology employed is a literature study of national regulations and international recommendations. Regulations relevant to the transport of radioactive material include Government Regulation No. 58 of 2015 and BAPETEN Regulation No. 7 of 2020. Tin slag 2 is categorized as a Low Specific Activity-I (LSA-I) radioactive material. The transport of LSA-I can be conducted without special packaging if three conditions are fulfilled: the material does not leave the vehicle during transport, it is transported under exclusive use, and it does not contaminate the vehicle. The key challenge is ensuring an effective monitoring system from upstream to downstream so that these conditions are consistently met. Infrastructure limitations, particularly poor road conditions and difficult terrain, can increase travel time and the risk of accidents. Longer travel times directly correlate with potential external and internal radiation doses received by transport personnel. Compliance with personal protective equipment, radiation monitoring devices, and dosimeters adds another layer of complexity. Moreover, drivers and transport personnel must be adequately trained and supported by clear operational procedures. While the challenges seemed primarily domestic in nature, the issue can also highlight the importance of international cooperation. Regional initiatives such ASEANTOM, and global platforms like the IAEA, can foster knowledge sharing, joint training, and improved monitoring and information exchange, thereby strengthening the safety and security of radioactive material transport.

Keywords: challenges, tin slag 2, radioactive material, transportation,