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IDENTIFICATION OF THE REQUIREMENT OF NORM REGULATIONS IN COMPLIANCE WITH GSR PART 3 FOR MINERAL ASSOCIATED INDUSTRIES IN SRI LANKA

Even though Sri Lanka is a very small oceanic country, it inherits a considerable geological diversity. About 90% of the land is made up from metamorphic rocks where mineral resources are abundant. This also suggests that, an occurrence of primordial radionuclide deposits and high concentration areas can be expected. Several industries have been established to exploit these resources. Namely, Pulmuddai Mineral Sand Extraction Facility (extracting Ilmenite, Rutile, Zircon, Garnet, Silica and Monazite as a residue), Eppawala Phosphate Mine and distributed Gem mining operations in Rathnapura and Elahera regions.

The Pulmuddai factory is the largest mineral processing facility in the country. A detailed radiation survey has been conducted in 2015 based on a request from the company (Lanka Mineral Sands Ltd.). This paper presents the results of this survey with a discussion on the requirement of regulations for Naturally Occurring Radioactive Material (NORM) in these industries. Comprehensive studies have not been conducted in other mineral processing industries due to the absence of regulations. As the lead technical organization for radiological analysis, Sri Lanka Atomic Energy Board (SLAEB) has to surrender this constraint as it is not authorized to perform workplace surveys in industrial facilities.

However, the detailed survey conducted in Pulmuddai and some other independent research work carried out in other mineral associated industries have raised the concerns regarding the safety of the workers. A considerably high ambient gamma dose rates have been observed in certain areas of the Pulmuddai facility. 1 m above the surface dose rates; $1.778 \pm 0.2\% \mu\text{Sv/h}$ in heavy mineral heap, $3.028 \pm 0.1\% \mu\text{Sv/h}$ in high-grade crude Zircon heaps and $52.64 \pm 0.1\% \mu\text{Sv/h}$ in crude Monazite go down region have been recorded. In the Monazite go down, a Th-228 concentration of $28.77 \pm 1.13 \text{ kBq/kg}$ was estimated by in-situ gamma spectroscopy measurements. This suggests that the area shall be operated as a controlled area considering the occupational exposure threshold levels mentioned in present radiation protection regulations in Sri Lanka ($10 \mu\text{Sv/h}$).

Apart from the basic personal protective equipment (PPE) such as dust masks and boots, no additional radiation protection gears are worn by the operators/workers. The enforcement of such practices has also been problematic due to the lack of regulations for NORM. These gaps have also identified by the reviewers during the Occupational Radiation Protection Appraisal Service (ORPAS) mission in 2019. The recommendations have been issued to rectify the gaps and establish the safety culture in compliance with the General Safety Requirements (GSR) Part 3 and General Safety Guidelines (GSG) No. 7 for NORM associated industrial facilities. Unlike the open-air facilities like Pulmuddai and Eppawala, the enclosed, underground environments of the Gem mining operations have a considerable health risk from the exposure to Radon-222 and Thoron (Rn-220). The surveys and radiological studies have undeniably identified the requirement of NORM regulations in occupational radiation protection regime in Sri Lanka. In these situations, it is extremely difficult to overcome the administrative challenges to enforce the radiation protection culture of the country. The establishment of NORM regulations with profound basis such as GSR Part 3 and GSG 7 is instrumental to enhance the safety culture, ensuring the protection of workers in the mineral associated facilities.

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