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TENORM management from the fertilizer industry for reclamation in Indonesia

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As the fourth largest country in Asia, Indonesia is an agrarian country. Area of agricultural land and plantation in Indonesia reached 64,8 million ha. Therefore, the need for fertilizer in this country is very high. One type of fertilizers needed is NPK (nitrogen-phosphor-kalium). NPK fertilizer is made of basic materials of phosphate rocks, yet it has by product. Phosphate rocks are one of the TENORM types that concern to the content of several radionuclides, mainly uranium-238. Indonesia has the regulation related to TENORM management such as BAPETEN Chairman Regulation (BCR) No. 9/2009 about The Intervention on Exposure Derived from TENORM and BCR No. 16/2013 about Radiation Safety in TENORM Storage.

The paper is aimed at the investigating the management of NORM residue especially in fertilizer industry in Indonesia which is used for reclamation. The huge amount of NORM residue in fertilizer is a problem, but also an opportunity to use for reclamation. Therefore, BAPETEN have to make sure that the use of this material is safe for workers, public and environment. BAPETEN did monitoring, verification, licensing and inspection of TENORM.

Based on BAPETEN supervision, TENORM residue which was produced by fertilizer industry consist of potassium-40 (K-40), Uranium-238 (U-238), Lead-210 (Pb-210), Radium-226 (Ra-226), Radium-228 (Ra-228), Thorium-228 (Th-228), Thorium-230 (Th-230) and Thorium-234 (Th-234). The radionuclides range concentrations were <0,10 - 7,07 Bq/kg K-40, 175. - 938 Bq/kg U-238, 112 -391 Bq/kg Pb-210, 533 - 988 Bq/kg Ra-226, 51 - 102 Bq/kg Ra-228, <0,03 Bq/kg Th-228, 118 -321 Bq/kg and 29,26 - 428 Bq/kg Th-234; and the radionuclides average concentrations were 8,32 Bq/kg K-40, 399,00 Bq/kg U-238, 258,29 Bq/kg Pb-210, 778,80 Bq/kg Ra-226, 4,08 Bq/kg Ra-228, <0,03 Bq/kg Th-228, 171,43 Bq/kg and 160,42 Bq/kg Th-234. The surface radiation exposure was 0,10 - 0,29 μ Sv/h and the one meter radiation exposure was 0,09 - 0,27 μ Sv/h. So that, the regulatory body could gave permit for reuse of TENORM residue as material for reclamation. BAPETEN should conduct monitoring and verification after the reclamation.

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