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Evaluation of radiation parameters on Naturally Occuring Radioactive Materials and levels of metal elements in some matrices from Phosphate Fertilizer Company

The levels, risks/hazards associated with the use of phosphate rock in the production of super phosphate fertilizer by a company in densely populated area in northwestern Nigeria was evaluated. Ten samples of diverse matrices; sludge, sediments, phosphate rock, phosphogypsum and dust particulates were obtained for analysis within and around the company. Instrumental Neutron Activation Analysis (INAA) was used in the elemental analysis to determine NORM, Rear Earth Element (REE), toxic and heavy metals in the samples. Results obtained indicate the enrichment of radioelement and some heavy and toxic metals in the materials sampled, with samples of sludge, sediment, dust and phosphate rocks having levels below world average. In terms of matrix, dust samples had the lowest levels. The range, and mean value of Annual Effective Dose Equivalent (⊠Sv/y), External Hazard Index, Internal Hazard Indices, Annual Gonad Dose Equivalent (⊠Sv/y), Radium Equivalent Activity (Bq/kg), Absorbed Gamma Ray Dose rate (nGy/h), Potential Toxic Elements, Activity Utilization, and Gamma Representation Indices were respectively: 5.88 - 333.95 and 87.0, 0.028 - 1.36 and 0.4, 0.048 - 1.37 and 0.5, 31.86 - 2044.63 and 517.7, 10.49 - 505.06 and 137.3, 4.8 - 272.3 and 70.9, 2529.33 - 51765.83 and 20101.3, 0.11 - 81631.22 and 9388.9, and 0.071 - 4.35 and 1.1. The evaluation showed higher level of some elements in soil sample (SED 1) which confirmed the deposition of phosphate rock, phosphogypsum dust and sludge onto the soil around the phosphate company. In conclusion the large population within and around the company were exposed to some potential risks and hazards through hydraulic means, use of sludge for soil fertility enrichment and inhalation of dust particulates.

Keywords: Environment; Risks; Nigeria; NORM; Phosphate rock, INAA; Hazards

Primary author: Mr ALHASSAN, Attahiru Jaoji (CERT ABU Zaria)

Presenter: Mr ALHASSAN, Attahiru Jaoji (CERT ABU Zaria)

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