Radiological risk classification of NORM industries in Brazil

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Objectives and Methodology

This work is a Postgraduate Course Monograph based on a literature review with the objective of identification and recognition of Natural Occurrence of Radioactive Materials -NORM Industries in Brazil.

The handling of radioactive material and disposal of waste from these NORM industries follows the Regulatory Authority Regulations (CNEN) and IAEA recommendations, which establish safety requirements and radiation protection in mining and NORM industrial facilities.

In this literature review, the identification does not address nuclear power production plants and even oil production, thereby restricting them to mining industries and fertilizers industries production.

A simple mapping of some selected NORM industries over the Brazilian Regions is done and a general radiological risk classification based on the activity concentration of radionuclide is presented.

Summary of Results

Table 1: Mapping and radiological risk classification of NORM industries in Northern Region of Brazil.

State / Company	Product	Specific Activity (Bq/g)	Classification
AM - Pitinga	Cassiterite/Iron and Niobium	$10^1<$ activity/gram$<10^2$	High Risk
PA - CVRD– Serra do Sossego	Copper Concentrate	$10^{-1}<$ activity/gram $<10^0$	Low Risk
PA – CVRD Projeto 118	Copper Concentrate	$10^0<$ activity/gram$<10^1$	Medium Risk

Table 2: Mapping and radiological risk classification of NORM industries in Northeast Region of Brazil.

State / Company	Product	Specific Activity (Bq/g)	Classification
RN - Borborema	Uranium and Thorium	$10^{-1}<$ activity/gram$<10^0$	Low Risk
PB – Borborema	Uranium and Thorium	$10^{-1}<$ activity/gram$<10^0$	Low Risk
PB – Mataraca	Titanium	$10^{-1}<$ activity/gram$<10^0$	Low Risk
BA – Camaçari	Titanium	$10^{-1}<$ activity/gram $<10^0$	Low Risk

Table 3: Mapping and radiological risk classification of NORM industries in Central West Region of Brazil.

State / Company	Product	Specific Activity (Bq/g)	Classification
GO - Catalão	Iron / Niobium	$10^1<$ activity/gram $<10^2$	High Risk

Table 5: Mapping and radiological risk classification of NORM industries in South Region of Brazil.

State / Company	Product	Specific Activity (Bq/g)	Classification
PR – Figueira - Cambuí	Mineral coal	$10^{-1}<$ activity/gram $<10^0$	Low Risk

Table 4: Mapping and radiological risk classification of NORM industries in Southeaster Region of Brazil.

State / Company	Product	Specific Activity (Bq/g)	Classification
MG – Araçuaí	Niobium	$10^{-1}<$ activity/gram $<10^0$	Low Risk
MG – Araxá	Niobium	$10^1<$ activity/gram $<10^2$	High Risk
MG – Nazareno	Tantalum and Niobium	$10^1<$ activity/gram$<10^2$	High Risk
MG – São Tiago	Tantalum and Niobium	$10^1<$ activity/gram $<10^2$	High Risk
MG – Araxá	Concentrated rock phosphate	$10^0<$ activity/gram $<10^1$	Medium Risk
MG – São João Del Rey	Tantalum and Niobium	$10^1<$ activity/gram $<10^2$	High Risk
MG – São João Del Rey	Manganese	$10^{-1}<$ activity/gram$<10^0$	Low Risk
MG – Tapira	Concentrated rock phosphate	$10^0<$ activity/gram $<10^1$	Medium Risk
SP – Pirapora do Bom Jesus	Tin	$10^{-1}<$ activity/gram $<10^0$	Low Risk
SP - Cubatão	Nitrogenous phosphate fertilizers	$10^0<$ activity/gram $<10^1$	Medium Risk