Industries With NORM:
In Ghana, there are several industries included in the extraction of gold, oil and gas, bauxite, manganese and quarries that may contain NORM. Among these, gold mining and oil and gas are the most prominent NORM related industries. However, when these raw materials are processed can lead to enhanced level of NORM into the environment.

Regulations:
The effective radiation protection programme for control of NORM started with the promulgation of legislative instrument (LI) 1559 in 1993. The Radiation Protection Institute (RPI) was established as technical support for Radiation Protection Board (RPB) for the implementation of LI 1559, and, with the assistance of the International Atomic Energy Agency (IAEA), commenced NORM radioactivity monitoring in workplaces. In 2015, Nuclear Regulatory Act (NRA) Act 895, 2015 was established. This act makes a provision for safe transport and management of NORM residues and monitoring of occupational exposed workers in the NORM industries. Currently, Ghana does not have national guidelines specifying the acceptable levels for NORM in workplaces, however, the international action levels and limits outlined in the IAEA GSR Part 3 and other international occupational and environmental safety guidelines are used.

**Examples of Industries with NORM:**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Type of Industries</th>
<th>Problem Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining and processing</td>
<td>Gold</td>
<td>Radon, dust inhalation, tailings</td>
</tr>
<tr>
<td>Exploration and production</td>
<td>Oil and gas</td>
<td>Radium-226 containing scales and sludges (waste), Radon-222</td>
</tr>
<tr>
<td>Other extractive industries</td>
<td>Quarry etc</td>
<td>Dust inhalation, radon</td>
</tr>
</tbody>
</table>

**NORM Monitoring and Analysis:**
Ghana has a well-established environmental and occupational monitoring laboratories to deal with NORM management issues:
- Secondary Standards Dosimetry Personal Dosimetry,
- Gamma-spectrometry,
- Alpha and Radon laboratories.

**NORM Transport Safety and Waste Storage Facilities**

**CHALLENGES**

- The regulatory framework established but regulation and guidelines yet to be promulgated for disposal, storage and transport of NORM,
- Lack of appropriate radiation protection programmes for specific NORM practices,
- Lack of adequate training among workers, stakeholders and general public on specifying the acceptable radioactivity levels and radiological effects on exposure to NORM waste and radon in workplaces,
- Insufficient resources for regulatory bodies to carry out enforcement and inspection
- Inadequate infrastructures for the management of NORM issues and radon in workplaces.

**REFERENCES:**

**POSIVES**

Ghana has adopted GSR Part 3 and other international occupational safety documents to protection of workers, public and environment against any enhanced level of NORM due to activities of industries. Radiation protection infrastructure for industries with NORM has been established. It includes a new independent regulatory act, environmental radioactivity monitoring equipment, and two storage NORM waste facilities. Even though the regulations and guides are yet to be approved by the appropriate government authority, Ghana is proactively working in important area.

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Lead Author’s Email: kwameoo@yahoo.com