



Radiological impact of oil and Gas Activities in selected oil fields in Production Land Area of Delta State, Nigeria

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ABSTRACT: A study of the radiological impact of oil and gas exploration activities in the production land area of Delta State has been carried out *in-situ* using two synchronized and calibrated radiation meters (Digilert 50 and 100) and a geographical positioning system (GPS). Ten oil field facilities were studied. At each facility, nine sampling locations and their host communities were evaluated making a total of 100 study points. Measured exposure rate in the oil field facilities ranged from $0.011 \pm 0.003 \text{mRh}^{-1}$ in Evwreni camp site to $0.031 \pm 0.01 \text{mRh}^{-1}$ at the Otorogu gas plant. Mean field exposure rates/equivalent dose rates ranged from $0.016 \pm 0.006 \text{mRh}^{-1}$ ($0.839 \pm 0.34 \text{mSvy}^{-1}$) to $0.0213 \pm 0.008 \text{mRh}^{-1}$ ($1.134 \pm 0.44 \text{mSvy}^{-1}$). In the host communities the values ranged from $0.0115 \pm 0.003 \text{mRh}^{-1}$ ($0.612 \pm 0.16 \text{mSvy}^{-1}$) in Evwreni community to $0.021 \pm 0.007 \text{mRh}^{-1}$ ($1.117 \pm 0.37 \text{mSvy}^{-1}$) in Otujeremi town, while for the control study area the value obtained was $0.009 \pm 0.002 \text{mRh}^{-1}$ ($0.479 \pm 0.11 \text{mSvy}^{-1}$). The results show that the radiation levels for the Ughelli East, Kokori, Eriemu, Evwreni, Eriemu, Oweh, Olomoro-Oleh oil and gas fields are within the 1mSvy^{-1} maximum permissible limit recommended for the public and non-nuclear industrial environment, while the levels for the fields at Otorogu, Ughelli West, Afiesere and Uzere West and East and the host communities of Olomoro, Uzere and Emeragha exceeded the maximum recommended value, an indication that the oil fields and host communities environment have been impacted radiologically. However, these results obtained may not have immediate health hazard, but will pose some long-term health side effects on the staff working in the facilities and residents of the host communities. Interim proactive measures are recommended @JASEM

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Radiation plays an important and sometimes vital role in our everyday lives. Everyday each of us is exposed to naturally occurring quantities of radiation through the air we breathe, the soil on which we walk the water we drink, the food we eat and even within our bodies (Ademola, 2008). Furthermore, certain industrial activities such as crude oil exploration result in enhanced ionizing radiation in the environment. Ionizing radiations such as α , β and γ radiations are often found in the petroleum matrix due to both contamination by radionuclides in the earth's crust and the materials used in the drilling process (Chad-Umoren, 2012; Laogun et al., 2006). Gamma rays are highly penetrating and are products of the radioactive materials containing radon. These substances may be ingested or inhaled thereby exposing both the hydrocarbon industry personnel and members of the host communities to increase in the risk of lung cancer, eye cataracts and mental imbalance (Laogun et al., 2006). Also, it has been reported that naturally occurring radioactive materials (NORMS) associated with oil and gas production

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contain radioactive uranium, thorium and their progenies Ra-226 and Ra-228 (Abison, 2001; Avwiri et al., 2007a; Chad-Umoren, 2012).

Radiation monitoring is of primary importance for environmental protection purposes (El-Bahi, 2004). A strong correlation has been found between oil and gas activities and elevated environmental ionizing radiation (Avwiri et al., 2007a; Avwiri et al., 2007b; Chad-Umoren, 2012; Chad-Umoren and Briggs-Kamara, 2010; Ononugbo et al., 2011) which are attributed to the industries' input raw materials and effluent discharge such as gas flaring and other output products.

Elena and Gracea (2004) conducted environmental monitoring of radioactivity in the environs of six oil fields in Bacau and Braila districts and reported that there was no immediate radiological challenge; however, the high radium-226 content of oil field formation waters could lead to environmental pollution. Laogun et al. (2006) studied the variation

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