

SUGGESTIONS

1. INTRODUCTION

1. Line 5: The sentence '.....and thus a significant radiation dose to the workers [2]'
should read
'.....and thus **acts as** a significant **source of** radiation dose to the workers [2]'.
2. Line 8: The sentence 'Oil equipment where NORM (Naturally Occuring Radioactive Materials) accumulates in oil production unit includes; seperators, oil shipment system, produced water dump, dehydrators, etc'
should read
'**Units in an** oil equipment where NORM (Naturally Occuring Radioactive Materials) accumulates **during** oil production includes; **separators**, oil shipment system, produced water dump, dehydrators, etc'.
3. Line 12: The sentence '.....oil disposal and gas flaring hence, personnels working.....' should read
'.....oil disposal and gas flaring, hence, **personnel** working.....'.
4. Line 15: The sentence 'Researchers in the areas of Radiation and Medical Physics have been working hard to understudy the health impact of exposure to ionisation radiation- both nuclear radiations and continuous, but low level non-nuclear radiations' is not clear enough. The author(s) reconstruct it again.
5. Line 17: The sentence 'A detailed evaluation of excessive lifetime cancer risk due to natural radioactivity in the rivers sediments of Northern Pakistan was carried out and it was observed that the river sediments created a huge radiological threat when used as a building material because of the high value of their hazard indices [4]
should read
'A detailed evaluation of excessive lifetime cancer risk due to natural radioactivity in sediments **harvested from rivers in** Northern Pakistan **revealed** that **they** created a huge radiological threat when used as a building material **due to** the high value of their hazard indices [4]'.
6. Line 26: The sentence 'One of the primary components of the environment whose background level of radiation could be affected by external sources is the river'
should read
'**For an environment**, one of the primary **external sources that can affect the level** of background radiation is **a** river'.

2. MATERIALS AND METHODS

2.1 Study Area

7. Line 1: These modifications are suggested.
Radiological studies were conducted **in 2009** on water samples collected from three rivers (**Names of the rivers should be listed here; xxx river, OWR; yyy river, IMR and zzz river, UMR**) around three selected oil mineral producing fields in Abia state, Nigeria. The surveyed oil communities are **aaa, bbb and ccc; all** located in **the** Ukwa West Local Government Area of Abia State. These oil wells belong to the Eastern division of Shell Petroleum Development Company and **contribute** about five percent of the total barrels of oil per day produced in the division [6]. **A map** showing the study area is shown in Figure 1.
8. **OWR, IMR and UMR were introduced in from Table 1 and Figure 2 without any prior introduction to them to clearly explain what they mean. Listing of the names of the rivers and explaining what they mean will therefore be necessary here.**
9. **The map shown in Figure 1 is not clear enough and should be replaced with a much clearer one. It is obvious that the map (Figure 1) has been stretched/enlarged. When doing so, the aspect ratio has to be locked so that it is stretched/enlarged by equal amounts in both the major and minor axis. This will ensure that it is not distorted in the end.**

2.2 Sample Collection and Analyses

10. Line 1 can be modified as follows:
Twenty one water samples (seven from each river) were collected
11. The last line can be modified as:
The mean activity concentrations of the samples in Bq/l for the Identified Radionuclides (K-40, Ra-226 and Th-232) were calculated using the formula given in equation 1;
..... (1)
This should be repeated for all the other equations.
The equation number should be specifically stated before it is written.

As an example, for equation 2:
The annual effective dose of radiation due to ingested water by an individual (in mSv/yr) was calculated using the expression in equation 2 [8],

2.3 Methods of Computation of Radiological Risk Parameters

12. Line 1:
The gamma radiological risk parameters computed in this work and the formulae used for the computations are given in equations 2, 3, 4 and 5.
13. Equation 2, just like all the other equations, should stand on its own. It should therefore be dropped down to the next line.

3. RESULTS AND DISCUSSION

14. Line 1:
The results of the specific activity of the identified gamma radionuclides (K-40, Ra-226 and Th-232) and their associated Radiological Risk Parameters from the three surveyed rivers (list the names of the rivers here) are presented
15. From Table 1, UM. River, E.D.I.W. recorded a higher value of 3.18 mSv/yr at UMR 3. Its range should therefore be modified.
Thus:
'The results of annual effective dose of radiation due to ingested water (E.D.I.W.) show that for OW. River, E.D.I.W. ranged from 2.21 to 3.52 mSv/yr; for IM. River, E.D.I.W. ranged from 1.89 to 3.13 mSv/yr and for UM. River, E.D.I.W. ranged from 1.94 to 3.03 mSv/yr'.

should read

'The results of annual effective dose of radiation due to ingested water (E.D.I.W.) show that for OW. River, E.D.I.W. ranged from 2.21 to 3.52 mSv/yr; for IM. River, E.D.I.W. ranged from 1.89 to 3.13 mSv/yr and for UM. River, E.D.I.W. ranged from 1.94 to 3.18 mSv/yr'.
16. These levels of deviation are so high and indicate that water collected from these sources for ingestion and other economic uses may have been negatively affected radiologically due to oil production activities going on around these areas.

should read

These levels of deviation are so high and indicate that water collected from these sources and ingested, or used for other economic uses may have been negatively affected radiologically due to oil production activities going on around these areas.
17. This correction has to be made:
From Table 1, with respect to the results of the Annual Gonadal Dose Equivalent (AGDE) due to gamma radiation, the range for IM River is NOT 0.041 to 0.06 mSv/yr, but rather 0.040 to 0.066 mSv/yr.

18. From Table 1, the Excess Lifetime Cancer Risk (ELCR) for gamma radiation for UM river is **NOT** 5.433×10^{-3} to 8.49×10^{-3} , but 5.43×10^{-3} to 8.91×10^{-3} .

4. CONCLUSION

The Conclusion may be modified to specifically stating the ranges obtained. This is demonstrated as follows:

Radiological risk parameters due to gamma radiation have been computed for water samples collected from three rivers (mention the name of these rivers and the names of the communities where the study was conducted) around the surveyed oil producing areas. The results of annual effective dose of radiation due to ingested water (EDIW) show very high deviation from the standard limit of 0.1 mSv/yr.

Suggestion: Here the specific values obtained at the various measuring sites that led to the above conclusion being drawn need to be stated.

Results obtained for the Annual Gonadal Dose Equivalent (AGDE) were below the World average value of 0.3 mSv/yr as measured values were within the range

Suggestion: Values obtained that were below the World recommended average need to be stated.

With the Excess Lifetime Cancer Risk (ELCR), the measured values were within the range, which exceeded the world average value of 0.29×10^{-3} .

Suggestion: The specific obtained values need to be stated.

Despite the fact that the measured values of the Annual Gonadal Dose Equivalent (AGDE) were below the World average value, the continuous usage of water from these rivers both for consumption and other economic activities may still likely have adverse impacts on the inhabitants of the surveyed environments who frequently make use of the water. This is because measured values of the annual effective dose of radiation due to ingested water (EDIW) and Excess Lifetime Cancer Risk (ELCR) exceeded the recommended world average values. The observed elevation of some of the radiological risk parameters, compared to World recommended values, obtained in this work may be attributed to oil production activities within these environments.