RADIOLOGICAL IMPACT ASSESSMENT OF RADON IN AN EARTHQUAKE PRONE AREA: A CASE STUDY Of WEIJA-McCARTHY HILL IN GHANA.

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BACKGROUND AND OBJECTIVE

Radiation is an integral part of our surroundings, originating from both natural and anthropogenic sources. Among the natural sources, radon gas (222Rn) stands out due to its radioactivity and potential health risks. Radon is an inert, colorless, and odorless noble gas produced through the radioactive decay of uranium in soil, rock, and water. Once emitted into the atmosphere, radon can infiltrate indoor environments, posing a potential threat to human health. This study focuses on the Weija-McCarthy Hill region in Ghana, characterized by its earthquake-prone nature, to assess the radiological impact of radon gas.

Fig 1: The radon element (Source: https://www.livescience.com/39546-radon.html)

RADON AND HEALTH IMPLICATIONS

Radon exposure stands as a noteworthy contributor to the development of lung cancer, trailing closely behind smoking. This radioactive gas undergoes decay, resulting in the formation of radioactive progeny that cling to tiny airborne particles such as aerosols and dust. Upon inhalation, these radioactive particles settle within the respiratory tract. As they decay, they emit alpha particles that have the potential to harm lung tissue and set in motion the process of carcinogenesis – the formation of cancer.

According to data from the Environmental Protection Agency (EPA), the impact of radon exposure is stark, leading to an estimated 21,000 deaths annually in the United States due to lung cancer.(USEPA, 2000). This statistic highlights the severity of the threat posed by radon, making it imperative to address and mitigate its potential risks.

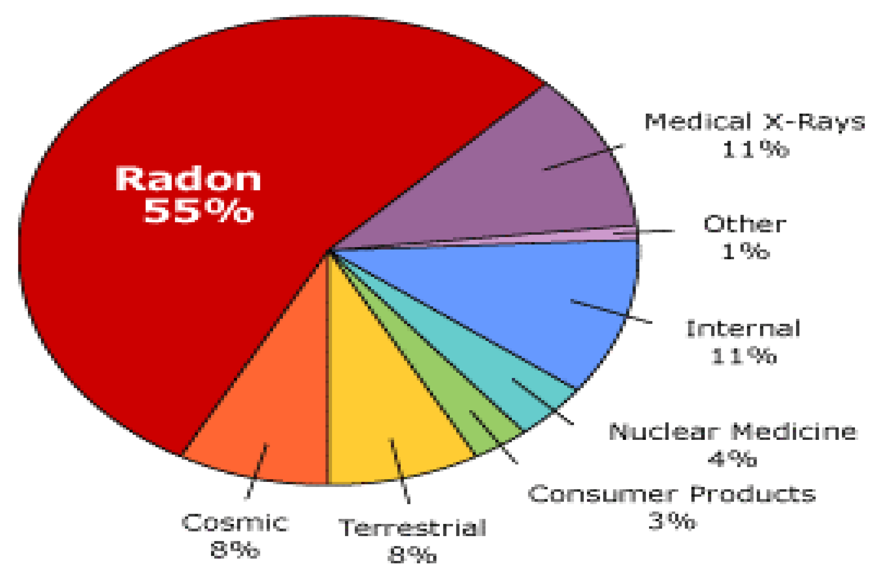

Fig 2: Risk of radon exposure (https://mrnatural.ca/services/air-testing/radon-testing-monitoring/)

GEOLOGICAL INFLUENCE ON RADON CONCENTRATIONS

Geological factors play a crucial role in radon concentration levels. The type of geological formations, presence of fractures, and fault lines affect the movement of radon from the ground into the atmosphere and subsequently into indoor spaces. Rocks containing higher levels of uranium are more likely to emit elevated radon concentrations. The Weija-McCarthy Hill area's geology may have a significant impact on radon levels due to its earthquake-prone nature and geological characteristics.

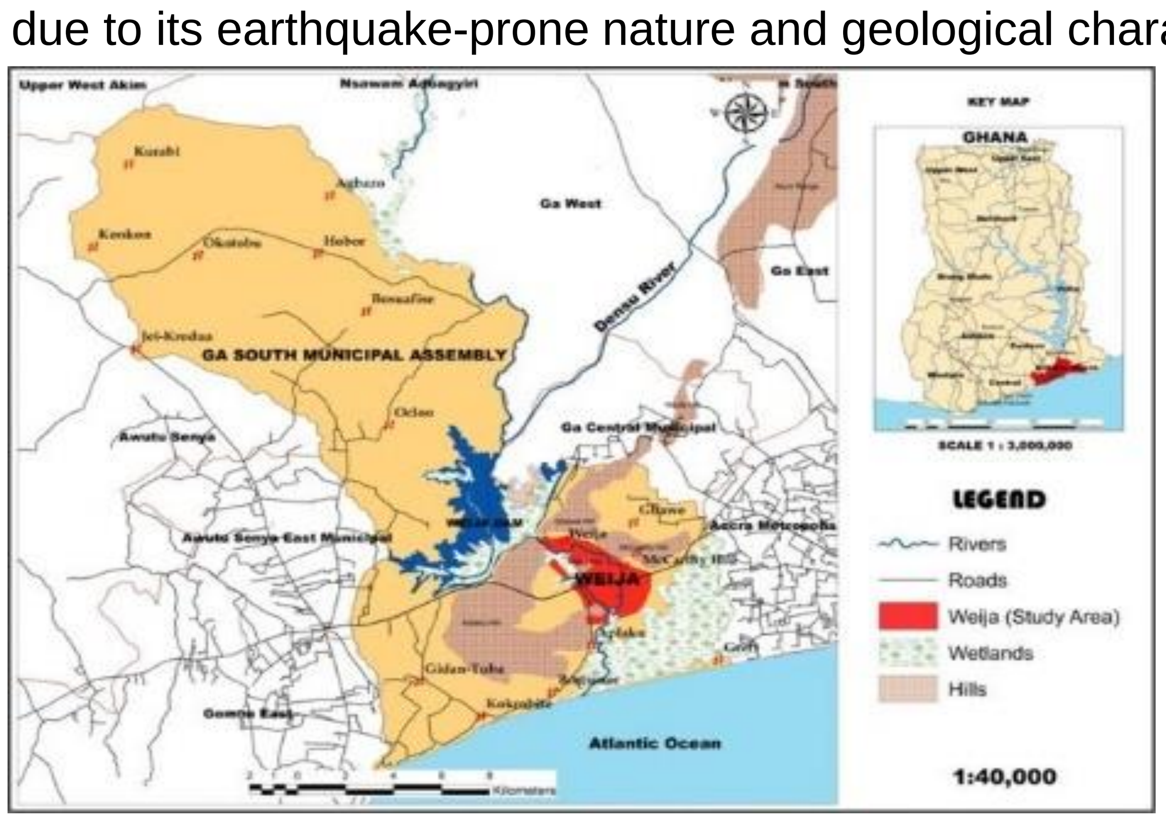

Fig 3: Map showing study Area, Source: (Owusu-Ansah et al, 2019)

METHODOLOGY

Indoor radon concentrations were measured using LR-115 Type II strippable detectors. These detectors are commonly used for passive radon measurements. The detectors were placed in various homes across the Weija-McCarthy Hill area for 6months. The detectors were then collected, and the alpha particles emitted from the decay of radon and its progeny were recorded, allowing for the calculation of radon activity concentrations.

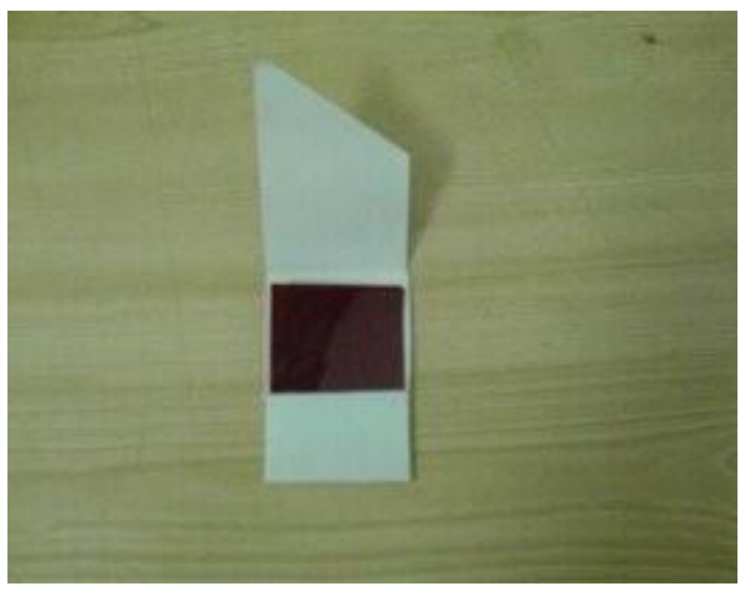

Fig 4: How detectors are fixed in the rooms

RESULTS AND DISCUSSION

The study's results revealed a wide range of indoor radon activity concentrations, spanning from 50.89 Bqm-3 to 365.65 Bqm-3, with an average concentration of 186.51 Bqm-3. These findings indicate that a significant proportion of homes in the area have radon levels exceeding the World Health Organization's recommended limit of 100 Bqm-3. This suggests a potential health risk for the residents, emphasizing the importance of assessing and mitigating radon exposure.

The observed variations in radon concentrations can be attributed to the geogenic radon potential of the area. Geological features such as fault lines and fractures can serve as pathways for radon migration, allowing it to escape from the ground and enter indoor spaces. The Weija-McCarthy Hill area's geological setting likely contributes to the observed radon levels. Understanding these geological factors is essential for predicting radon concentrations in similar earthquake-prone regions.

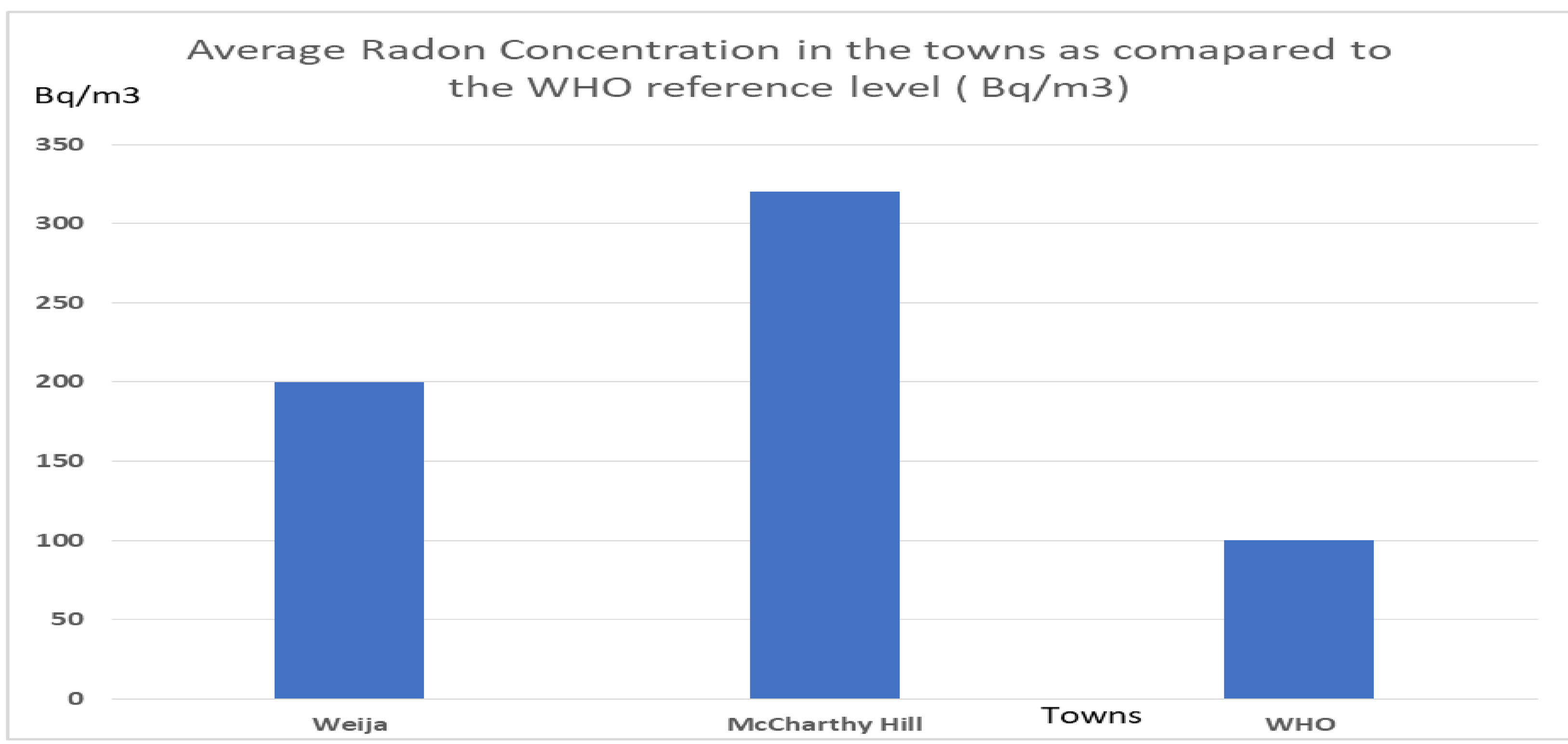

Fig 4: A graph showing the average radon concentrations in the selected towns

IMPLICATIONS AND RISK MITIGATION

Geological Given the elevated radon concentrations found in many homes, immediate action is necessary to reduce potential health risks. Public awareness campaigns on radon and its health effects should be implemented to educate residents about the importance of radon testing and mitigation. Additionally, building codes and construction practices could be adapted to minimize radon infiltration and accumulation in indoor spaces.

CONCLUSION

Geological This study highlights the radiological impact of radon gas in an earthquake-prone area, using the Weija-McCarthy Hill region in Ghana as a case study. The results underscore the influence of geological characteristics on radon potential and indoor concentrations. With many homes exceeding recommended radon levels, a comprehensive risk communication strategy and effective mitigation measures are imperative to safeguard public health.

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