BAYERO UNIVERSITY, KANO

RADON IN HOMES AND WORKPLACES:
UNDERSTANDING THE INVISIBLE THREAT BENEATH OUR FEET

Arabi Suleiman Abdullahi
B.Sc. (UNIMAID), M.Sc. (FUTY), PhD (ABU)
Department of Geology
Faculty of Earth and Environmental Sciences
Bayero University, Kano.

BAYERO UNIVERSITY, KANO
PROFESSORIAL INAUGURAL LECTURE

NO. 58

DATE: 26th March 2026

BAYERO
UNIVERSITY PRESS

Published 2026 by:
Bayero University Press,
Main Library Building,
Bayero University Kano,
New Site, Gwarzo Road,
P.M.B. 3011.
Kano.

Website: *www.buk.edu.ng*
E-mail: *info.bukpress@buk.edu.ng*

ISBN: 978 - 978 - 62384 - 3 - 2

SUMMARY OF PRESENTER'S BIODATA

Arabi Suleiman Abdullahi is a geoscientist whose scholarly career has been anchored on the intersections of geology, environmental health, and radioactivity studies. Trained as a geophysicist and hydrogeologist, his academic trajectory has focused on understanding how the Earth's sub-surface processes influence human exposure to natural radiation and variations in water quality. Over the years, he has made significant contributions to the advancement of environmental geosciences through teaching, research, and mentorship at Ahmadu Bello University, Zaria, and Bayero University, Kano. His publications appear in leading international journals, including the *Arabian Journal of Geosciences* and *Environmental Geochemistry and Health, Quaternary International, and Applied Clay Science*. His research programme has been characterized by rigorous fieldwork, laboratory analysis, and the integration of computational tools such as Monte Carlo simulation and geochemometric modeling. Through these studies, he has helped establish radon as a key indicator of geological and environmental risk in Nigeria's diverse terrains. This lecture represents the culmination of his efforts to translate scientific findings into public policy and environmental awareness.

Table of Contents

List of Figures

List of Table

Professor Arabi Suleiman Abdullahi *B.Sc. (UNIMAID), M.Sc. (FUTY), PhD (ABU)*
Department of Geology
Faculty of Earth and Environmental Sciences
Bayero University, Kano

Radon in Homes and Workplaces: Understanding the Invisible Threat Beneath Our Feet

"The air we breathe may be invisible, but it must never be unknown."

Introduction

The Vice-Chancellor, distinguished colleagues, esteemed guests, ladies and gentlemen: it is a profound honour to deliver this professorial inaugural lecture titled *Radon in Homes and Workplaces: Understanding the Invisible Threat Beneath Our Feet.* This moment marks both a personal academic milestone and a reflection of Bayero University, Kano's enduring commitment to knowledge that safeguards human welfare.

The lecture embodies a journey of over two decades of teaching, research, and field exploration—an intellectual pursuit shaped by curiosity about the unseen forces of the Earth that influence our daily lives. As a hydrogeologist and environmental geochemist, my inquiry into natural radioactivity began with a simple but powerful question: *How do Earth's materials quietly affect human health?*

Among naturally occurring invisible hazards, radon gas stands as one of the most intriguing and dangerous environmental phenomena. Despite being imperceptible to our senses, radon contributes significantly to background radiation exposure. According to the World Health Organization (WHO, 2009), radon is the second leading cause of lung cancer globally, responsible for an estimated 3–14% of all lung cancer cases, depending on average indoor radon concentrations in a given region.

This lecture, therefore, seeks to deepen understanding of radon as both a geoscientific and a public health issue. It examines its origin, pathways, and impacts, drawing from my empirical research and that of other scholars. Ultimately, it calls for stronger integration of scientific evidence into environmental policy, construction standards, and occupational health practices in Nigeria.

Radon (^{222}Rn) is a naturally-occurring radioactive gas produced from the decay of uranium and radium in rocks, soils, and groundwater. Invisible, odourless, and chemically inert; it is a silent but significant contributor to human radiation exposure. Globally, the World Health Organization and the United States Environmental Protection Agency recognize radon as the second leading cause of lung cancer after tobacco smoking (WHO, 2009; USEPA, 2018). This lecture explores the geological processes that govern radon generation and migration, its public health implications, and the policy gaps that expose communities to unrecognized risk. Drawing on more than a decade of research into natural radioactivity in Nigeria's rocks, soils, and aquifers, the discussion integrates empirical data from studies conducted in the Federal Capital Territory and the Maiganga Coal Mine. The results revealed radon concentrations far exceeding global safety limits and demonstrate how lithology, fracture networks, and hydrogeochemical conditions control radon behaviour. The lecture advocates for a National Radon Action Plan and the institutionalization of environmental monitoring in construction and mining sectors. By bridging geoscience, health policy, and public awareness, it positions radon research as a strategic component of sustainable development and occupational safety in Nigeria.

Context and Background

The study of natural radioactivity—particularly that associated with radon—has long been central to environmental geology and radiation health physics. Radon (^{222}Rn) is a naturally-occurring radioactive gas formed from the decay of uranium (^{238}U) and thorium (^{232}Th) series isotopes in rocks and soils (IAEA, 2020). Because of its gaseous state and half-life of 3.8 days, radon can migrate through pores, fractures, and groundwater, eventually accumulating in enclosed spaces such as homes, offices, and mines.

Globally, radon exposure has been studied extensively since the mid-20th century. Early epidemiological data from uranium miners in Europe and North America provided the first evidence of its carcinogenicity (UNSCEAR, 2020). Subsequent indoor studies in Sweden, the United Kingdom, and the United States confirmed its contribution to lung cancer risk among non-smokers (Darby *et al*., 2005).

In developing countries, however, systematic radon assessment remains limited. In Africa, only a few nations—South Africa, Egypt, and Kenya—have national radon monitoring frameworks. Nigeria, despite its complex crystalline basement geology rich in uranium-bearing minerals, lacks a coordinated National Radon Action Plan (NRAP).

This lecture situates radon research within this global-to-local context, focusing on Nigeria's unique geologic setting. It underscores the need to integrate geoscientific data into environmental management and public health systems.

Radon Characteristics and Behaviour

Radon is chemically inert, colourless, odourless, and tasteless. As a noble gas, it does not readily react with other substances, yet it exerts significant health impacts through its radioactive decay products known as radon progeny or daughters (^{218}Po, ^{214}Pb, ^{214}Bi, etc.). These progeny attach to aerosols and dust particles, which, when inhaled, deposit in lung tissues and irradiate cells, increasing the risk of cancer (USEPA, 2018).

Understanding Radon: The Silent Hazard

Radon (^{222}Rn) is a naturally occurring radioactive gas produced from the decay of uranium (^{238}U) and radium (^{226}Ra) in rocks and soils. Radon has two isotopes (^{222}Rn = Radon, ^{220}Rn = Thoron) (Fig. 1).

^{222}Rn ^{220}Rn

Figure 1: *Isotopes of Radon*

Isotopes

An isotope (Fig.1) is one of two or more versions of a chemical element that have the same number of protons but different number of neutrons. Because the number of neutrons varies, isotopes of the same element have different atomic masses and physical properties, but nearly identical chemical properties since the number of electrons remains the same.

Stable and unstable isotopes

Stable and unstable isotopes (Fig. 2) have the same number of protons but a different number of neutrons, with stability determined by the neutron-to-proton ratio and binding energy. Stable isotopes have a neutron-to-proton ratio that keeps the nucleus from decaying, while unstable isotopes have an imbalanced ratio that causes the nucleus to be radioactive and undergo decay.

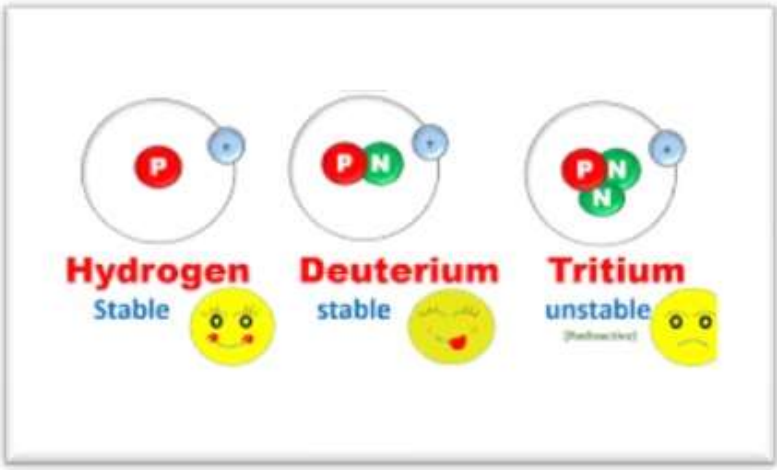
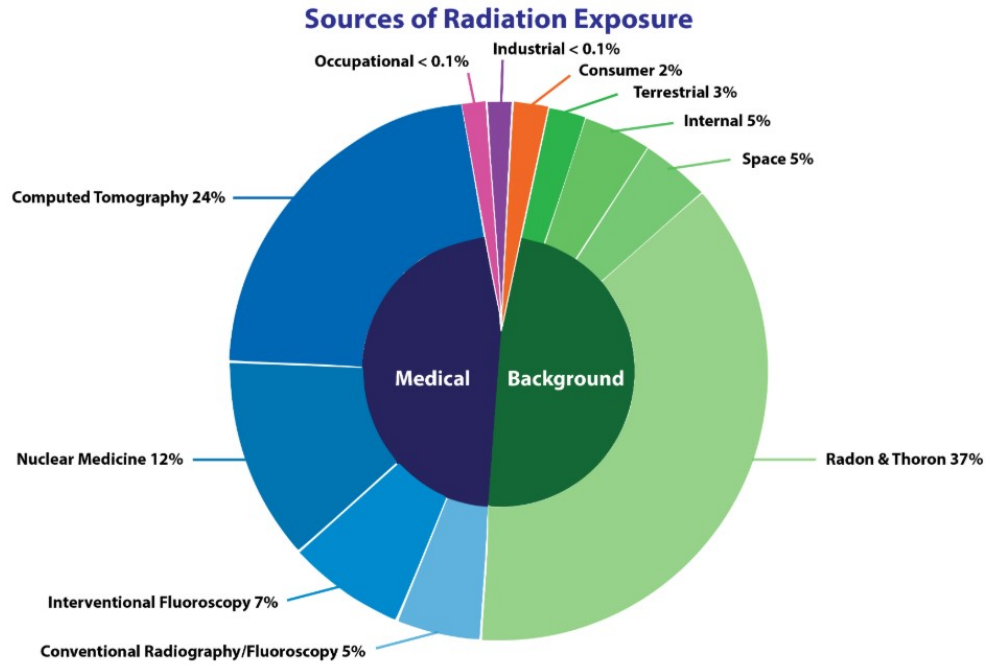


Figure 2: *Stable and unstable Isotopes*

Ionizing Radiation

Ionizing radiation is a type of energy that has enough power to remove electrons from atoms, a process called ionization. This energy comes from electromagnetic waves (like gamma rays and X-rays) or particles (like alpha, beta, and neutrons) and can cause biological damage to living organisms by disrupting molecular bonds. Sources of ionizing radiation (Fig. 3) include natural sources, such as cosmic rays and radioactive elements in the Earth, as well as artificial sources, including medical X-rays and certain nuclear processes.



Average Annual Radiation Dose

Sources	Radon & Thoron	Computed Tomography	Nuclear Medicine	Interventional Fluoroscopy	Space	Conventional Radiography/ Fluoroscopy	Internal	Terrestrial	Consumer	Occupational	Industrial
Units											
mrem (United States)	228 mrem	147 mrem	77 mrem	43 mrem	33 mrem	33 mrem	29 mrem	21 mrem	13 mrem	0.5 mrem	0.3 mrem
mSv (International)	2.28 mSv	1.47 mSv	0.77 mSv	0.43 mSv	0.33 mSv	0.33mSv	0.29 mSv	0.21 mSv	0.13 mSv	0.005 mSv	0.003 mSv

(Source: National Council on Radiation Protection & Measurements, Report No. 160)

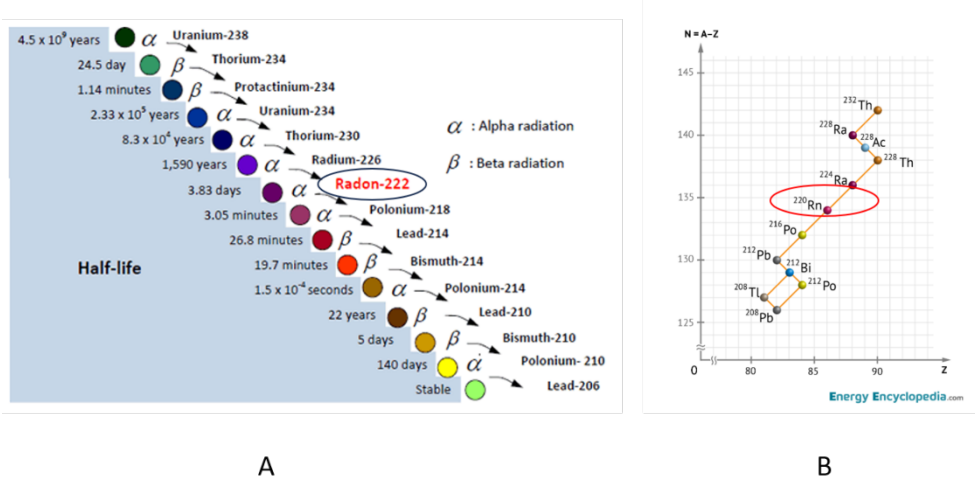
Figure 3: *Sources of Radiation Exposure*

Geological Origin and Distribution

Radon originates from the decay of uranium (^{238}U) and radium (^{226}Ra), which occurs naturally in igneous and metamorphic rocks, particularly granites, pegmatites, and shales. The rate of radon production in the subsurface depends on uranium content, mineral composition, and structural features of the host rock. Fractures, faults, and weathered zones provide conduits for radon migration. Soil porosity, moisture, and temperature further influence radon emanation and exhalation rates.

Uranium Decay

Uranium and Thorium decay (Fig. 4) is the process by which unstable uranium isotopes transform into more stable atoms by releasing energy in the form of radiation, typically by emitting alpha particles. This process occurs in a sequence called a decay chain, where the parent uranium atom changes into a different element, which then decays into another, and so on, until it becomes a stable isotope, such as lead.



A B

Figure 4: *Uranium and Thorium Decay Chain Yield (A) radon (222Rn) and (B) Thoron (220Rn)*

Why Radon is Unique?

It is colourless, odourless, and tasteless, making it undetectable without instruments, yet it is a major contributor to background radiation exposure. The World Health Organization (WHO) and the International Atomic Energy Agency (IAEA) identify radon as the second leading cause of lung cancer after smoking.

A study by the USEPA reported that radon is the third highest mortality for selected cancers and the highest cause of premature deaths compared with other causes per year in the UK (Figure 5). Figure 6 depicts how radon affects human health.

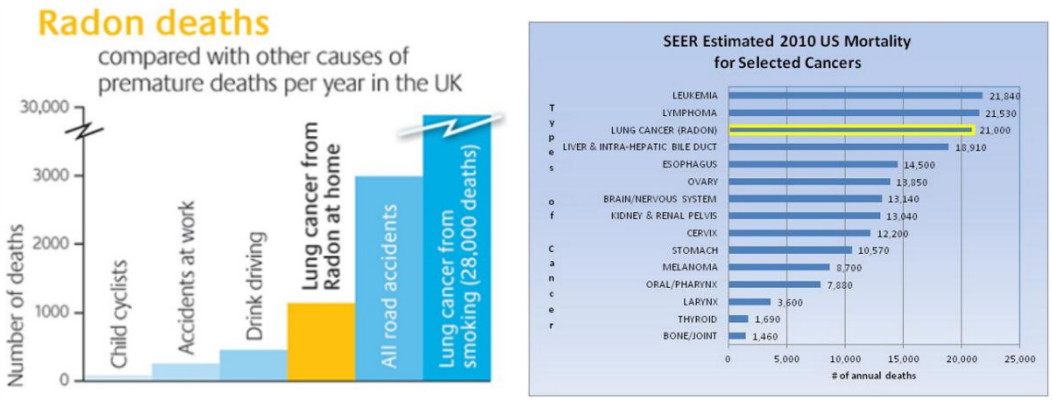


Figure 5: *Demonstrates radon as the leading cause of cancer compared to other causes of death in the UK and third among other cancer-caused mortality (USEPA, 2000)*

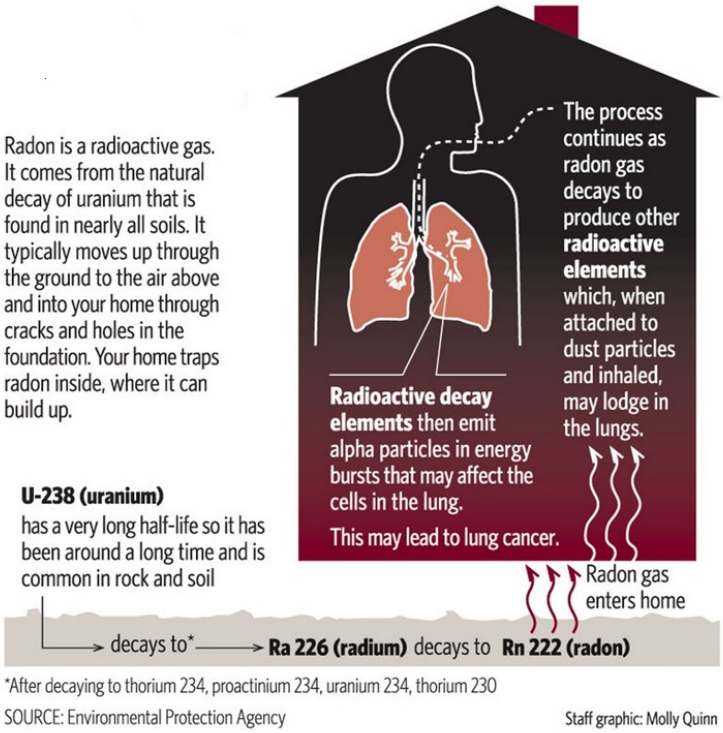


Figure 6: *How radon affects human health (Cancer Association of South Africa (CANSA) 2021)*

Radon infiltrates indoor air through cracks in floors, walls, and foundations, as well as through groundwater used in homes. Figure 7 demonstrates the Lifetime risk of lung cancer death from Radon exposure in homes.

Lifetime Risk* of Lung Cancer Death from Radon Exposure in Homes

Radon level (pCi per L)	Never smokers	Current smokers	General population
20	3,600	26,000	11,000
10	1,800	15,000	5,600
8	1,500	12,000	4,500
4	730	6,200	2,300
2	370	3,200	1,200
1.25	230	2,000	730
0.4	73	640	230

Note: The estimated risk at the U.S. Environmental Protection Agency action level of 4 pCi per L is 7 per 1,000 individuals in never smokers and 62 per 1,000 individuals in current smokers.

*—Risk is shown per 100,000 individuals.

Adapted from Conference of Radiation Control Program Directors. Reducing the risk from radon: information and interventions. A guide for health care providers. http://www.radonleaders.org/sites/default/files/HealthCareProfessionalsGuide_Radon_2018_FINAL_CRCPD%20E-18-2.pdf. Accessed June 27, 2018.

Figure 7: *Lifetime risk of lung cancer death from Radon exposure in homes*

http://www.radonleaders.org/sites/default/files/HealthCareProfessionalsGuide_Radon_2018_FINAL_CRCPD%20E-18-2.pdf. Accessed June 27, 2018)

Radon Emanation and Exhalation

Radon emanation is the process by which radon gas escapes from the individual grains of a material, while exhalation is the release of that radon from the material's surface into the surrounding air over a period of time (Fig. 8). Emanation refers to the initial escape from the grain itself, and exhalation is the bulk release from the entire sample, which is influenced by factors like porosity, moisture, temperature, and grain size.

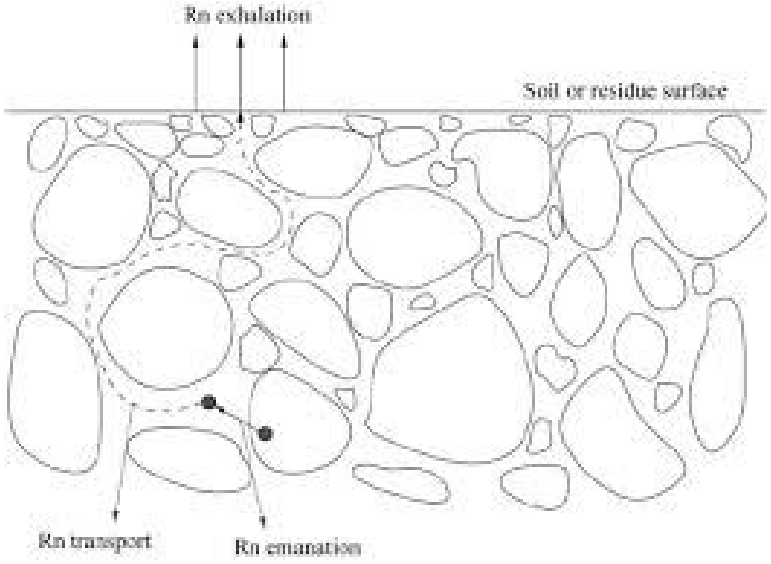


Figure 8: *Emanation, Exhalation, and Emission Coefficient*

How Does Radon Enter Homes and Offices?

While radon can be found in outdoor air, it becomes a problem when it enters and accumulates inside our homes (Fig. 9). The EPA estimates that nearly one out of every 15 homes in the United States has elevated radon levels.

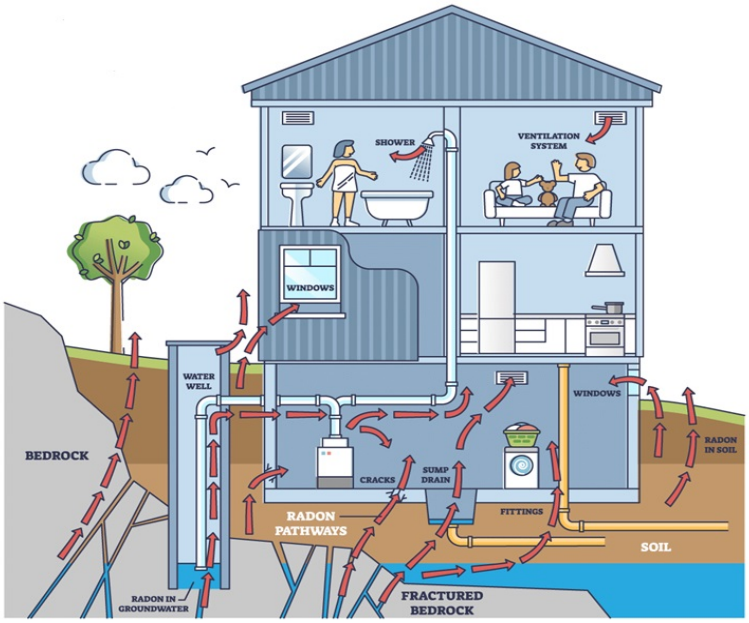


Figure 9: *Radon entry points in homes*

(Google image 25th October, 2025)

Hydrogeological Pathways

Groundwater serves as both a transport medium and a source of indoor radon. As uranium and radium decay within aquifer matrices, radon dissolves into groundwater and is released during domestic use - especially when water is heated, aerated, or used for bathing and washing. This degassing process contributes to indoor radon levels and poses dual ingestion and inhalation risks (WHO, 2009).

Measurement and Monitoring

Radon concentration is typically expressed in becquerels per cubic meter (Bq/m^3) for air or becquerels per liter (Bq/L) for water. Global agencies, including the WHO and USEPA, recommend action levels of 100 Bq/m^3 and 11.1 Bq/L, respectively (WHO, 2009; USEPA, 2018). Measurement techniques range from passive track detectors

(CR-39, LR-115) to active electronic monitors, while soil and water radon are analyzed using scintillation or liquid scintillation methods.

Health Effects and Exposure Pathways

The primary health effect associated with radon exposure is lung cancer. When inhaled, radon decay products emit alpha particles that damage bronchial epithelial cells. The International Agency for Research on Cancer (IARC) classifies radon as a Group 1 human carcinogen (IARC, 2019).

Epidemiological Evidence

Epidemiological studies of miners in the 1940s and 1950s established a causal relationship between radon exposure and lung cancer incidence (NRC, 1999). More recent residential studies across Europe, North America, and China have confirmed this risk even at low exposure levels. The combined effects of smoking and radon exposure are synergistic rather than additive, meaning that smokers exposed to radon face a disproportionately higher risk of lung cancer (WHO, 2009).

Other Health Concerns

While lung cancer is the most established outcome, emerging studies suggest possible associations between radon exposure and diseases such as leukaemia, skin cancer, and neurological disorders, although evidence remains inconclusive (UNSCEAR, 2020).

Exposure Pathways

Radon infiltrates indoor environments through cracks in floors, walls, and foundations, through construction joints, and via groundwater used in homes. The risk increases in poorly-ventilated structures and areas underlain by uranium-rich

basement rocks. Occupational exposures are common in mining, quarrying, tunnelling, and laboratory environments.

Global and National Research Perspectives

Globally, radon research integrates geology, physics, health science, and policy studies. Developed nations have implemented mitigation and public education programmes that have dramatically reduced indoor radon exposure. For example, Sweden and Canada conduct routine mapping of radon-prone areas, while the United Kingdom enforces building codes mandating radon-resistant construction in high-risk zones (IAEA, 2020).

In contrast, radon research in Africa remains nascent. Nigeria's first major studies, including those led by Arabi *et al.* (2021, 2022, 2023), filled critical data gaps by measuring radon in groundwater, soils, and mining areas. These studies established empirical baselines that are invaluable for national risk assessment and policy formulation.

The findings reveal that radon concentrations in parts of north-central and northeastern Nigeria exceed global safety limits by several magnitudes, underscoring the urgency of policy intervention. In this regard, my research aligns with the Sustainable Development Goals (SDGs 3 and 6) by linking environmental protection with health and water safety.

My Scholarly Contributions (Arabi *et al*., 2021–2023)

Over the last decade, my research has contributed substantially to the empirical understanding of radon dynamics, exposure risk, and geochemical modeling in Nigeria. This section summarizes three major studies that form the foundation of my scholarship.

Study 1: Radon Dynamics in Groundwater, Insights from the Federal Capital Territory (Arabi *et al*., 2021)

Published in the *Arabian Journal of Geosciences*, this study presented one of the largest groundwater radon surveys in Nigeria, encompassing 135 samples from the Federal Capital Territory and its environs. Radon concentrations ranged from **609 to 92,500 Bq/m³**, with an average of **16,628 Bq/m³**. Nearly half of the samples exceeded the USEPA (2018) maximum contaminant limit of **11.1 Bq/L**.

The study demonstrated that **aquifer lithology, fracture density, and water-rock interaction** significantly influence radon concentration. Correlation analysis revealed strong relationships between radon, temperature, and total dissolved solids (TDS), indicating that radon serves as both a **hydrogeochemical tracer and a radiological hazard**. The calculated total annual effective dose (up to 19.6 mSv/year) far exceeded the WHO (2009) guideline of **0.1 mSv/year** for drinking water, establishing a critical baseline for environmental health policies.

Study 2: Radon and Mining, Monte Carlo Simulation of Exposure (Arabi *et al*., 2022)

The second major study, also published in the *Arabian Journal of Geosciences*, applied a **Monte Carlo stochastic modeling approach** to quantify risk associated with radon exposure in and around the Maiganga Coal Mine, northeastern Nigeria.

The results showed that **98% of measured samples** exceeded the reference occupational dose limit of **1,150 µSv/year**, and predicted **excess lifetime cancer risks** (ELCR) were several times higher than the International Commission on Radiological Protection (ICRP) safety threshold of **0.00375**.

By introducing probabilistic methods to quantify uncertainty, the study became the first in Nigeria to employ **Monte Carlo simulation** for radon risk modeling. It further recommended that **thermoluminescent dosimeters (TLD badges)** be made mandatory for mine workers and that **radon monitoring protocols** be integrated into national mining regulations.

Study 3: Hydrogeochemical Correlates of Radon, Geochemometric Modeling (Arabi *et al*., 2023)

The third major contribution, published in *Environmental Geochemistry and Health*, expanded the analysis to include **multivariate geochemical modeling and geochemometric techniques**. Using Principal Component Analysis (PCA), Cluster Analysis, and PHREEQC-based simulations, this work identified both **natural and anthropogenic factors** influencing groundwater chemistry and radon behavior in the Maiganga watershed (Akko Local Government, Gombe State, Nigeria).

The findings demonstrated that radon mobility is not solely a function of lithology but also of **carbonate dissolution, ion exchange, and evaporite mineral interaction**. This study established a novel framework for integrating **geochemical modeling with environmental radioactivity assessment**, representing a methodological leap in tropical geoscience research.

From our data, the pathways of radon exposure in Nigeria can be summarized as follows:

Table 1: *Summary of radon exposure in Nigeria*

Source	**Mechanism of Entry**	**Affected Setting**	**Health Implication**
Groundwater	Degassing during domestic use	Homes	Lung & stomach cancer
Building materials	Diffusion from granitic/uraniferous rock fragments	Homes/Offices	Indoor inhalation
Soil gas	Diffusion and advection via cracks and voids	Homes, basements	Cumulative exposure
Mining environments	Radon exhalation from fractures and coal seams	Workers	Occupational hazard

Note: *In the case of inhalation, even the lowest level of radon can be carcinogenic if the residence time is large.*

Interdisciplinary and Collaborative Work

The interdisciplinary nature of my work reflects the growing recognition that **environmental radioactivity is not merely a geological issue but a public health concern**. Collaborations with hydrogeologists, medical physicists, engineers, and policy experts have been crucial to advancing this research.

I have collaborated with colleagues from **Ahmadu Bello University, Zaria**, **Abubakar Tafawa Balewa University, Bauchi**, **Poznań University of Life Sciences (Poland)**, and **Universiti Putra Malaysia**, integrating laboratory expertise and computational modeling. These collaborations enhanced the precision of radon measurements, facilitated data comparison across regions, and promoted capacity building among postgraduate students.

The interdisciplinary approach ensures that **scientific findings are translated into actionable frameworks**, aligning with Bayero University's commitment to research-driven societal development.

Impact and Legacy

The impact of my research extends across three dimensions: **scholarly influence, human capacity development, and policy relevance**.

Scholarly Influence

My publications have provided baseline data for environmental radiation studies across Nigeria and West Africa. They are increasingly cited in research addressing **groundwater safety, environmental health, and geological risk assessment**. The integration of **geochemometric modeling** into radon studies has opened new pathways for quantitative environmental geology.

Human Capacity Development

Over the years, I have supervised numerous M.Sc. and PhD students on hydrogeology, groundwater radioactivity, and geochemical modeling. Many of these students have continued into academic and professional positions, forming part of a growing national cadre of environmental geoscientists.

My mentorship philosophy emphasizes **rigour, innovation, and societal responsibility**, ensuring that every research effort contributes to improving human welfare.

Policy Relevance

The evidence generated by my research underscores the urgent need for a **National Radon Action Plan (NRAP)**. Through various engagements with regulatory

agencies, including the **Nigeria Atomic Energy Commission (NAEC)** and the **Nigeria Geological Survey Agency (NGSA)**, I have advocated for incorporating radon awareness into environmental policy and construction standards.

Policy and Societal Implications

Radon poses a significant but underappreciated threat to public health in Nigeria. The absence of a **comprehensive monitoring and mitigation framework** exacerbates this risk. Based on my research, the following policy actions are recommended:

a) **National Radon Mapping:** Establish a countrywide radon risk map using geological, radiometric, and hydrogeochemical data.

b) **Building Code Revision:** Incorporate **radon-resistant construction features** such as sub-slab ventilation, membrane sealing, and active depressurization systems in new buildings.

c) **Regular Monitoring:** Mandate routine radon testing in **schools, hospitals, offices, and mines**.

d) **Public Awareness:** Launch nationwide campaigns to educate citizens about radon hazards.

e) **Research and Development:** Support university-based **radon laboratories** for continuous monitoring, training, and data archiving.

By implementing these measures, Nigeria would align with best practices established by the WHO, IAEA, and USEPA, ensuring that geoscientific knowledge directly informs **national health and safety frameworks**.

The Next Frontier

The next stage of my research focuses on expanding radon mapping across **Nigeria's major geological provinces**, the Basement Complex, Younger Granites, and Sedimentary Basins. Future projects aim to integrate **satellite remote sensing, GIS-based risk modeling, and AI-driven prediction algorithms** to identify radon-prone zones.

Additionally, my goal is to establish a **BUK Radon Research and Training Laboratory**, serving as a regional hub for environmental radiation studies. This centre would promote interdisciplinary research linking geology, medicine, and engineering while supporting national efforts toward **radiological safety and sustainable development**.

Conclusion

Radon exemplifies the paradox of nature: a noble gas formed deep within the Earth that poses a profound hazard to human health when misunderstood.

My journey through radon research demonstrates that geology is not merely the study of rocks but a discipline that safeguards life. The invisible threat beneath our feet demands visible action from policymakers, researchers, and citizens alike.

As we continue to build homes, schools, and industries, we must ensure that **the air we breathe remains safe and clean**. Our duty as scientists is to transform knowledge into protection and to bridge discovery with responsibility.

Acknowledgements

- ✓ I express profound gratitude to **Almighty Allah** for the gift of knowledge, health, and perseverance.
- ✓ I thank the **Vice Chancellor and Senate of Bayero University, Kano** for their continued support of scholarly advancement.
- ✓ My appreciation extends to my **collaborators** from Ahmadu Bello University, Zaria, Abubakar Tafawa Balewa University, Bauchi, Poznań University of Life Sciences (Poland), and Universiti Putra Malaysia.
- ✓ To my **students**, whose dedication continues to inspire innovation, and to my **family**, for their love, patience, and unwavering encouragement and to whom I owe this achievement.

References

Arabi, S. A., Tukur, Z., Funtua, I. I., *et al*. (2021). Radon dynamics, activity concentration, and radiological risks associated with groundwater around tremor-prone Federal Capital Territory and environs, north-central Nigeria. *Arabian Journal of Geosciences, 14*(2479).

Arabi, S. A., Mohammed, A. U., Aris, A. Z., *et al*. (2022). A Monte Carlo simulation of unmitigated risk of radon exposure from soil and groundwater around Maiganga Coal Mine, North-Eastern Nigeria. *Arabian Journal of Geosciences, 15*(1297).

Arabi, S. A., Mohammed, A. U., Aris, A. Z., *et al*. (2023). Groundwater pollutants characterization by geochemometric technique and geochemical modeling in the tropical savanna watershed. *Environmental Geochemistry and Health*, 45(6):1–66. DOI:10.1007/s10653-022-01468-6

Darby, S., Hill, D., Auvinen, A., *et al*. (2005). Radon in homes and risk of lung cancer: collaborative analysis of individual data from 13 European case-control studies. *BMJ, 330*(7485), 223–227.

International Atomic Energy Agency (IAEA). (2020). *Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards.* IAEA Safety Series No. GSR Part 3. Vienna: IAEA.

United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR). (2020). Sources and effects of ionizing radiation. UNSCEAR 2020 Report.

United States Environmental Protection Agency (USEPA). (2018). *Assessment of risks from radon in homes.* Washington, D.C.

World Health Organization (WHO). (2009). *WHO Handbook on Indoor Radon: A Public Health Perspective.* Geneva: WHO Press.

APPENDIX

LIST OF INAUGURAL LECTURES TO DATE

S/N	NAME	DEPT	DATE	TOPIC
1st	Emmanuel Ajayi Olofin	Geography	4th March, 1992	The Gains and Pains of Putting a Water Lock on the Face of the Drylands of Nigeria
2nd	Garba Dahuwa Azare	Education	24th June, 2000	BASIC CONCERNS: Revitalizing Nigeria's Primary Education in the New Millennium
3rd	Dajuma Abubakar Maiwada	Education	29th July, 2000	Improving Teaching and Learning in University Education with Particular Reference to Bayero University, Kano
4th	Majekodunmi Oladeji Fatope	Chemistry	7th July, 2001	NATURAL PRODUCTS SCIENCE: Looking Back and Looking Forward
5th	Muazu Alhaji Zaria Sani	Nigerian Languages	13th October, 2001	A focus on Some Segmental and Suprasegmental Features in Hausa Phonology
6th	Isa Hashim	Political Sciences	20th March, 2004	Planning and Budget Implementation in the Health Sector
7th	Abdulla Uba Adamu	Education	24th April, 2004	SUNSET AT DAWN, DARKNESS AT NOON: Reconstructing the Mechanisms of Literacy in Indigenous Communities
8th	Auwalu Hamisu Yadudu	Private and Commercial Law	5th June, 2004	LAW AS INTERPRETATION: An Exploratory inquiry from Islamic Law Jurisprudence

S/N	NAME	DEPT	DATE	TOPIC
9th	Mohammed Sanni Abdulkadir	History	31st July, 2004	STRUCTURING, STRUGGLING AND SURVIVING ECONOMIC DEPRESSION IN NORTHERN NIGERIA: The 1930s As Preview of the present
10th	Muhammad Sani Sule	Bio-chemistry	23rd March, 2013	Enzymology and Radiation Biology in the Understanding of Biochemistry
11th	Essiet Unanaowo Essiet	Agriculture	22nd May, 2013	AGRICULTURE SUSTAINABILITY IN THE DRYLAND OF NIGERIA: Realities and Prospects
12th	Aliyu Kamal	English Studies	5th March, 2014	The Islamic Novel Style and Structure
13th	Abdu Ahmed Manga	Agriculture	9th April, 2014	Horticulture as a Panacea for Food Insecurity and Unemployment
14th	Sa'idu Muhammad Gusau	Nigerian Languages	26th May, 2014	Wakar Baka Bahaushiya (The Hausa Oral Songs)
15th	Abdallah Uba Adamu	Mass Comm-unication	9th July, 2014	IMPERIALISM FROM BELOW: Media Contra-Flows and Emergence of Metro-Sexual Hausa Visual Culture
16th	Ghaji Abubakar Badawi	Library and Information Sciences	29th July, 2015	THE ROLE OF PUBLIC LIBRARIES AS CENTERS OF INFORMATION TO DISADVANTAGED GROUPS: A 2004 - 2014 Study of the Information Needs of Gada Prostitutes in Dawakin Kudu Local Government Area of Kano State, Nigeria.

S/N	NAME	DEPT	DATE	TOPIC
17th	Mohammed Kabir	Community Medicine	16th September, 2015	Public Health Concern for Chronic Non-Communicable Diseases Surpasses Anxiety Over Most Infections
18th	T.I. Oyeyi	Biological Sciences	30th March 2017	Linking Schistosomiasis and Water Resources Development in Kano State Nigeria: Public Health Impact and Mitigation
19th	Abdulrazaq G. Habib	Medicine	27th April, 2017	Medicine, Science and Society – The Global Health Imperative
20th	S. Y. Mudi	Chemistry	6th July, 2017	Natural Products: Plants as Potential Sources of Drugs
21st	Sani Ibrahim	Biological Sciences	27th July, 2017	BETWEEN LIFE AND DEATH: Water Quality and Resource Evaluation - The Place of Hydrobiologists
22nd	J. Afolabi Falola	Geography	26th October, 2017	The Poor We Have With Us Always
23rd	Umar G. Danbatta	Electrical Engineering	2nd November, 2017	GETTING OUT OF THE WOODS: Diversifying Nigeria's Economy Through the Telecommunications Sector
24th	Adelani W. Tijani	Nursing	23rd November, 2017	Wholesome Alimentation: Path to Radiant Health
25th	Juwayriya Badamasiuy	Private and Commercial Law	21st December, 2017	Uncovering Patriarchy in the Law: Feminist Movement for Re-Interpretation of Islamic Law in Focus.
26 th	Isa Mukhtar	Nigerian Language	25th January, 2018	STYLISTIC THEORIES AND THE LINGUISTICS OF HAUSA PROSE TEXTS: the (SFL) approach.

S/N	NAME	DEPT	DATE	TOPIC
27th	Ganiyu Sokunbi	Physiotherapy	29th March, 2018	TODAY IT HURTS, TOMORROW IT WORKS: Complimentary and Alternative Therapy for Failed Back Syndrome
28th	Aminu K. Kurfi	Business Admin. and Entrepreneurship	19th April, 2018	Micro-finance as an Elixir for Poverty Alleviation and Wealth Creation in Nigeria
29th	Muhammad S. Khamisu	Arabic	17th May, 2018	Substitution in Arabic Languages Rules and Types
30th	Habu Nuhu Aliyu	Pure and Industrial Chemistry	21st June, 2018	SCHIFF BASES AND THEIR TRANSITION METAL COMPLEXES: The Drug for the Next Generation
31st	Hashim M. Alhassan	Civil Engineering	19th July, 2018	EASING THE BURDEN OF TRAVEL: Can Roadway Capacity Modeling Help?
32nd	Habu Mohammed	Political Science	13th September, 2018	TUG OF WAR OR ECHO IN THE DARK? Civil Society Organizations (CSOs) and the Fight Against Corruption in the Era of Change Mantra in Nigeria
33rd	Bello Idrith Tijjani	Physics	20th September, 2018	NAVIGATING THE DATA LABYRINTH: Application of Some Advanced Statistical Analysis in Atmospheric Physics
34th	Mohammed Ajiya	Electrical Engineering	18th October, 2018	SEAMLESS GLOBAL CONNECTIVITY AT THE SPEED OF LIGHT: Converting Intrinsic Phenomena in Optical Fibers to Capacity Increase.
35th	Abdulrahman Abdul Audu	Pure and Industrial Chemistry	25th October, 2018	MY ACADEMIC VOYAGE IN WATER INTO THE WORLD OF HEAVY METALS
36th	Ibrahim Rakson Muhammad	Animal Science	21st February, 2019	FORAGE AND FODDER PRODUCTION IN NIGERIA: Its Sensitivity in Sustainable

S/N	NAME	DEPT	DATE	TOPIC
				Ranching.
37th	Muhammad Bashir Ibrahim	Department of Pure and Industrial Chemistry	14th March, 2019	WATER POLLUTION AND THE QUEST FOR ITS REMEDIATION: The Natural Resource Option
38th	Oyerinde O. Oyesegun	Department of Physical and Health Education,	4th April, 2019	MAN DOES NOT DIE BUT KILLS HIMSELF: The Dilemma of the Health Educator and the Moderating Influence of Health Education
39th	Danladi Ibrahim Musa	Department of Physical and Health Education	25th April, 2019	WAGING WAR ON THE DEADLY QUARTET AND ITS CO-MORBIDITIES: A Physical Activity Panacea
40th	Kabiru Isa Dandago	Department of Accounting	2nd May, 2019	THE ACCOUNTING IN HUMANITY KNOWS NO BOUNDS
41st	Mustapha Hassan Bichi	Department of Civil Engineering	20th June, 2019	MAN, ENVIRONMENT AND WATER - The *Moringa oleifera (Zogale)* Intervention
42nd	Mustapha Muktar	*Department of Economics*	27th June, 2019	PEOPLE, PLANET AND PROFIT: Peaceful Bed Fellows at the Best of Times But Strange Roommates at Present - The Economist's Approach to a Peaceful and Sustainable Co-Existence
43rd	Mohammed Atiku Kano	*Department of Biochemistry*	25th July, 2019	Serum Lipids and Lipoproteins - A Curse or a Blessing?
44th	Rabi'u Mohammed	*Department of Physical and Health Education*	8th July, 2019	EXERCISE AND SPORTS FOR THE ATYPICAL PERSONS: A Multidimensional Analysis
45th	Yahaya, D.B.	Department of Mechanical	12th December 2019	GETTING OUT OF THE DARKNESS: The Solar Energy Solution

S/N	NAME	DEPT	DATE	TOPIC
		Engineering		
46th	Shehu Alhaji Musa	*Department of Agricultural Economics & Extension*	22nd April 2021	CROSSING THE CHASMS OF AGRICULTURAL DEVELOPMENT IN NIGERIA: Consumer Preference Studies: Market Integration Syntheses and Value Chain Diagnoses to the Rescue
47th	Shehu U.R. Aliyu	*Department of Economics*	24th June, 2021	What Have We Learnt From Modelling Stock Returns In Nigeria: Higgledy-Piggledy?
48th	Kamilu Sani Fage	*Department of Political Science*	8th July, 2021	FROM DIVIDEND'S OPTIMISM TO DASHED HOPES: The Imperatives of Leadership Re-Engineering in Nigeria
49th	Babatunde Olamide Bamgbose	*Department of Oral Diagnostic Sciences*	9th Sept., 2021	MATRIX OF THE KNOWLEDGE OF LIGHT AND KNIFE: The Journey of a Maxillofacial Surgeon into Imaging
50th	Umar Ibrahim Gaya	*Department of Pure and Industrial Chemistry*	4th Nov., 2021	In Search of Catalysts…
51st	Ahmad Muhammad Tsauni	Department of Economics	19th December, 2024	Economic Progress on a Tightrope
52nd	Bashir Muhammad Fagge	Department of Animal Science	30th January 2025	An Odyssey into Foods of Animal Origin: Fortification and Modifications for Health and Sustainable National Development

S/N	NAME	DEPT	DATE	TOPIC
53rd	Mu utassim Ibrahim	Department of Pediatrics,	27th February, 2025	Pathways to Progress: Pediatrics Care, Child Health and Medical Education in Nigeria.
54th	Lawal Yazid Ibrahim	Department of Physical & Health Education	27th March 2025	SPORT IS WAR; WAR IS SPORT: Ethical and Integrity Concerns
55th	Mahmoud Ibrahim Daneji	Department of Agricultural Economics and Extension	7th August, 2025	DIVERSIFYING THE NIGERIAN ECONOMY: Analysis of Extension Advisory Services as Critical Component of Sustainable Agricultural Development
56th	Abdulwahab Lawan	Department of Information Technology Faculty of Computing Bayero University, Kano	6th November 2025	BRIDGING THE DIGITAL DIVIDE: Using A Modified Unified Theory of Acceptance and Use of Technology to Predict the Determinants of Telecentre Adoption
57th	Abdullahi Sule-Kano	Department of Political Science	29th January 2026	The Political Economy of Malnutrition and the Unliberatable Capitalist Transformation of the Nigerian Food Culture