ENFORCEMENT AND COMPLIANCE WITH LAWS OF RADIOACTIVITY EMISSIONS AND ITS IMPLICATIONS INTHE OIL AND GAS EXPLORATION AND PRODUCTION SECTOR IN UGANDA:

A Case Study of the Albertine Graben in Western Uganda

By

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JULY 2020

DECLARATION

I, NALULE PHIONA hereby declare that this Dissertation is my work and it has not been submitted before to any other institution of higher learning for fulfillment of any academic award.

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APPROVAL

This is to certify that, this dissertation entitled "Enforcement and Compliance with Laws of Radioactivity Emissions and Its Implications in the Oil and Gas Exploration and Production Sector In Uganda" has been done under my supervision and now it is ready for submission.

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Date……

ACKNOLEDGEMENT

I dedicate this piece of work to my parent Mr. Busuulwa Lawrence and the Energized Family who have gone an extra mile in every po6way to supporting studies in my venture to pursue this course.

May God bless you all.

ABBREVIATIONS / ACRONYMS

NORM	**-**Naturally Occurring Radioactive Material
TENORM	-Technologically Enhanced Naturally Occurring Radioactive Material
EHS	**–** Environmental Health and Safety
EIA	**–** Environmental Impact Assessment
PEPD	**–** Petroleum Exploration and Production Department
NEA	**–**National Environmental Authority
NEMA	**–**National Environmental Management Authority
CSOs	**–**Civil Society Organizations
NOGP	**–**National Oil and Gas Policy
ACODE	**–** Advocates Coalition for Development and Environment
CISCO	**–** Civil Society Coalition on Oil
ACME	**–** Africa Centre for Media Excellence
BEP	**–** Best Environmental Practices
PIL	**–** Public Interest Litigation
MODU	**–** Mobile Offshore Drilling Units
NGO	**–**Non-Governmental Organization

ABSTRACT

The purpose of the study was to examine enforcement and compliance with Laws of radioactivity emissions and Its Implications in the oil and gas exploration and production sector In Uganda". The research objectives that guided the study were to find out whether existing legal framework can effect radiation emission standards, to contrast Uganda's oil and gas radiation protection laws with selected jurisdictions (Ghana and Egypt) and make appropriate recommendations where gaps are found.

A doctrinal research design premised on legal concepts and principles of law, and statutes related to radiation protection were used. Specifically, data was collected using library research in particular documentary review methods. The study established that the Petroleum Act 2013 and other environmental Laws domesticate some international radiation emission standards in a generic way in particularly through waste management and pollution measures in oil and gas sector. However, study revealed failure to fulfill underscored standards by responsible enforcement Authorities, institutions and bodies.

In comparison with selected African Jurisdictions, the study found that all three nations Uganda, Ghana and Egypt have no specific radiation protection law for oil and gas activities. All three countries domesticate international standards generically in existing laws majorly by putting special provisions that provides for pollution, waste management, regular inspection and supervision of oil and gas process and national advice for TENORM from oil and gas activities. However, Uganda can learn from Ghana and Egypt to decentralize its enforcement mechanism to local government levels and allow for participation of local people.

The study concluded that consequences of radiation emission from oil and gas activities may become a reality unless there is strict enforcement by responsible Authorities, institutions and bodies concerned. To achieve compliance to radiation emission laws in oil and gas sector the study recommended advocacy by civil society organizations for oil exploration consistent with established laws, environmentally sound exploration technology and involvement of public build in advocacy for radiation emission standards in the oil and gas exploration

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CHAPTER ONE

GENERAL INTRODUCTION

1.0 Introduction

Oil and gas resources play a special role in the global economy. However, there are negative environmental impacts associated with processes of oil and gas exploration companies[1]. The negative environmental impacts have been partly attributed to the waste management during the process of the oil and gas production. According to National Environment Waste Management Regulations[2] "waste" includes any matter prescribed to be waste, and any radioactive matter, whether liquid, solid, gaseous or radioactive which is discharged, emitted or deposited into the environment in such volume, composition or manner as to cause an alteration of the environment.

Radioactive emitters are used widely in the gas production, including various forms of wastes comprising harmful radiation with a wide range of half-lives.[3] This existence of radioactive constituents has raised a concern regarding regulation of work-related and community exposures to harmful radiation.[4] Harmful waste produced in the oil and gas industry, includes but is not limited to Contaminated items, scales and sludges among others.

Environmental laws generally ecompass waste management and radiation protection, a body of multifaceted and interconnecting statutes, laws, conventions, treaties regulations, and policies

[1]Lodungi JF, Alfred DB, Khirulthzam AFM, Adnan FFRB, Tellichandran S (2016) A Review in Oil Exploration and Production Waste Discharges According to Legislative and Waste Management Practices Perspective in Malaysia. Int J Waste Retour 2016, 7: 260. Doi: 10.4172/2252-5211.1000260

[2]Statutory Instrument No 52/1999

[3] Ibid

[4]ALNabhani K, Khan F, Yang M, *The importance of public participation in legislation of TENORM risks management in the oil and gas industry. Process Safety and Environmental Protection*. (2016a) doi:10.1016/j.psep.2016.04.030. http://www.sciencedirect.com/science/article/pii/S0957582016300489

aimed at protecting the environment from harmful radiation by human activities: this can be in form of , determining acceptable levels of radiation emission in oil and gas exploration activities.[5]

It is the role of the legal, institutional and policy framework to ensure that oil and gas processes are not harmful to the environment, and that after the life of the project, the withdrawing procedures are able to return the environment, as far as possible, to the natural state.[6] However, radiation related laws in developing countries are often ineffectual because they are substantively inadequate and/or incompetently applied.[7] This study will set out to examine enforcement and compliance with radiation emission laws in the oil and gas exploration and production sector in Uganda, with special focus on the Albertine Graben.

1.1 Background of the study

The incidence harmful radiation materials in oil and gas exploration and production is an indicator of neccesity to regulate industrial and community exposures to harmful radiation.[8] In the year 2006, oil and gas was discovered to be sufficient for commercial purposes around Albertine Rift in western Uganda and exploitation was expected to commence soon.[9] The Ugandan government has worked on restoration of the oil sector thorough endorsing many oil exploration contracts with numerous companies such as "Dominion Uganda, Tallow Oil, Heritage Oil", among others.[10] The

[5]Doyi I, Oppon OC, Glover ET, Gbeddy G, Kokroko W, Assessment of occupational radiation exposure in underground artisanal gold mines in Tongo, Upper east region of Ghana. J Environ Radioact 2013 126:77–82

[6]Esteves, A. M., and Barclay, M., *Enhancing the benefits of local content: integrating social and economic impact assessment into procurement strategies*, in Impact Assessment and Project Appraisal, 29:3, 214 (2011)

[7]Ibid (2)

[8] (n)1

[9]According to Tullow Oil, Uganda's lead operator in oil exploration, commercial oil production is expected to start in late 2012, www.busiweek.com/11/news/ uganda/1040-uganda-oil-expectations-remain-high?tmpl=component&print=1&page (accessed on 10 febuary 2019).

[10]National Environment Management Authority (NEMA), (2009), Environmental *Sensitivity Atlas for the Albertine Graben*, www.nemaug.org/atlas/Sensitivity Atlas 2009 May.pdf (accessed on 2 march 2019), 13. See also Ibrahim Kasita, *History of Oil in Uganda*, New Vision Friday, 23 February 2019

process of oil exploration is currently at different stages of production and vast quantities of oil and gas has been discovered in the Albertine Graben. It is a well-known fact that the Albertine region is one of the global biodiversity hotspot in regard to mammals, birds and a variety animal species in Uganda and East Africa at large. This region hosts world heritage sites such as Queen Elizabeth National Park, Rwenzori Mountains National Park Kibale, Semliki and Murchison Falls National Parks, Toro-Semliki and Kabwoya wildlife reserves.[11] In addition, approximately ten national parks and over tewnty forest reserves are hosted in the same regions.[12] Bearing in mind this abundance, the area offers a range of environment services including but not limited to, sight seeing, visiting the attractions and imaginative values.[13] Consequently, survial of majority of people in the Albetine Graben is fundamentally dependent on the biodiversity of the area offers.[14]

Over thirty years' of empirical research confirm the fact that exposure to harmful radiation from oil and gas exploration is risky to community and people involved in the oil and gas industry.[15] It has even been suggested that the long term emission of alpha particles from natural radionuclide could be one of the possible sources of energy associated with the transformation of organic matter into petroleum[16] In oil and gas exploration industry, harmful radiation such as the 232Th series, and 40K are enhanced as a result of industrial processes, these ingredients are formally referred to as "Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM)"[17]. The material are relatively insoluble, particularly uranium and thorium are a fundamental part

[11]United States Agency for International Development (USAID), *Productive Resource Investments for Managing the Environment in Western Uganda Region* (2007), 2.
[12] Ibid
[13](n)13
[14] Ibid
[15]International Atomic Energy Agency IAEA. Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards. 2014.
[16] ibid
[17] (n)6

Petroleum formation. In comparison, radium is more soluble under definite physical and chemical conditions and can therefore leak from the petroleum reservoir rocks to the formation water, usually existent together with the oil in the reservoir. For example, When oil is propelled to the surface, the liquid substance normaly comes with it. Melted Mineral salts comprise this water and is suspected to be radioactive due to incidence of bi products of 226 Ra and 228 Ra. This implies harmful radiation escalates with upsurge of water pumped to the surface during oil and gas exploration. When crude oil and water are pumped to the surface, the main radionuclide that comes along is Radium. This sometimes remains in solution, some of its typical constituents may include inorganic salts, heavy metals, solids, production chemicals, hydrocarbons, benzene and in some cases naturally occurring radioactive material (NORM).[18].

The radioactivity of scale formed in crude oil exploration is a threat to environment, whether community and people involved in oil exploration activities have sufficient guidelines to mitigate harmful radiation is the focus of attention in this study. Notwithstanding the level of exposure, the consequence is likely to be catastrophic cancer to people and other animal species.[19] Poisoning resulting from contact with harmful radiation (TENORM) takes a gradual effect and therefore not easily diagonised at initial stages. Normaly health outcomes due to exposure to (TENORM) are noticeable after a period of years when it is mosttimes late for curative therapy. It is thus important that, deterrent methods are used to avert accidents relating to exposure harmful radiation and that these be carried out at an early stage. Vulnerability to harmful radiation prevented by regular

[18]Gazineu MHP, de Araujo AA, Brandao YB, Hazin CA, Godoy JM,*Radioactivity concentration in liquid and solid phases of scale and sludge generated in the petroleum industry*. J Environ Radioact 2014, 81:47–54
[19] Ibid

medical check ups for cancer and related illnesses.[20] It is important to establish the acceptable levels of safety or deterrence barricades.[21]

Radiation discharge implies any human activity which facilitates direct contact harmful radiaiton emitted by radioactive material of any source or produced by apparatus.[22] Submission to established radiation emission laws implies processes that obey radiation emission laws.[23] This covers a number of dimensions as set out in Atomic Energy regulations and related laws. Compliance is guaranteed through the procedures of enforcement used by the Government, through its lead agencies. Precisely, the tools to enforce radiation emission laws include radiation monitoring, radiation inspection, and penalties and deterrence fines among others. Therefore effective enforcement of radiation protection laws is crucial if oil companies are to comply.

The Ugandan government has developed the new policy, institutional and legal framework to regulate oil exploration.[24] The key guidelines include, the National Environment Management Policy, 1994; National Energy Policy, 2002; National Policy for the Conservation and Management of Wetland Resources, 1995; National Water Policy, 1999; Uganda Wildlife Policy, 1999; Uganda Forestry Policy, 2001; National Policy Framework for the Industrial Sector, 2008; Disaster Management and Preparedness Policy and the recent National Oil and Gas Policy, 2008. The major legislative framework is covered by the Constitution of the Republic of Uganda, 1995;

[20]ALNabhani K, Khan F, Yang M technologically enhanced naturally occurring radioactive materials in oil and gas production: a silent killer. Process Safety and Environment Protection, PSEP. 2015 http://www.psep.ichemejournals.com/article/S0957-5820(15)00177-9/pdf

[21] ibid

[22]International Atomic Energy Agency, *Hand Book on Nuclear Law*. Printed by the IAEA in Austria July 2003 STI/PUB/1160

[23] Ibid

[24]Ministry of Energy and Mineral Development (2010) Strengthening the Management of the Oil and Gas Sector in Uganda. A Development Progamme in cooperation with Norway.

the new Petroleum (Exploration, Development and Production) Act, 2013; Petroleum (Refining, Conversion, Transmission and Midstream Storage) Act, 2013; Petroleum Supply Act, 2003 and the Petroleum (Exploration and Production) (Conduct of Exploration Operations) Regulations, 1993, The atomic energy Act, National Environment Act, cap. 153; Land Act, cap.227; Water Act, cap.152; N, 2003; Mining Act, 2003; Public Health Act, cap.281; and the Occupational Safety and Health Act,2006. Relevant regulations include the National Environment (Waste Management) Regulations, 1999; National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, 1999; National Environment (Wetlands, Riverbanks and Lakeshores Management) Regulations, 2000; Water Resources Regulations, 1998 and the Water (Water Discharge) Regulations. These are supplemented by a number of regional and international environmental and radiation safety laws and instruments such as the Stockholm Declaration, 1972 and Rio Declaration, 1992 among others.[25]

This policy, institutional and legal framework adjusted the governance of oil and gas in Uganda in an attempt to set governance conditions related to Oil production.[26] For example, The Petroleum Act 2013, bestows petroleum rights in the government of Uganda. The Act presents environmental protection doctrines. This implies any person or licensee executing duties under the Act relating to oil and gas exploration must comply with environmental doctrines laid out in the NEA and other applicable laws.[27] The Atomic Energy Act regulates use of Radiation equipment as well as licensing and supervising users of potentially dangerous radiation materials. The National

[25]Emmanuel Kaweesi, "Environmental Law Compliance and its implications for Oil and Gas Exploration and Production in Uganda" 2014 at 18
[26]E. Kasimbazi, op., cit. 10
[27]Petroleum (Exploration, Development and Production) Act 2013

Environment (Waste Management) Regulations, 1999 is responsible for regulation disposal of dangerous radiation material to protect public and environment from risky exposure.

In light of this background the study annaysed whether the current policy and legal framework is effective in addressing threats of harmful radiation exposure. whether there is proper enforcement and compliancy with existing radiation protection laws relating to oil and gas; and extent to which Uganda bench marks with other oil and gas producing countries in managing naturally occurring radioactive material waste to protect the public and environment from dangerous ionizing radiation..

1.2 Statement of the problem

The Albertine region in western Uganda is known for its rich biodiversity hosting many national parks and forest reserves that are habitat to a variety of animal species.[28] The livelihood of people and survival of animal species in this area depend on proper conservation of this environment and other natural resources like lakes. However, exposure to harmful radiation and its associated health consequences from commercial crude oil exploration is a serious threat to this biodiversity. Under Article 39 of the 1995 constitution as ammended the right to a clean and health environment is guaranteed. This is augmented by policy, legal instruments and regulations such as Atomic energy Act regulating radiation use and the National Environment (Waste Management) Regulations, 1999 regulating disposal potentially risky radiation waste, The Petroleum (Exploration, Development and Production) Act, 2013 championing compliance with environmental doctrines among other applicable laws.

[28]Ministry of Energy and Mineral Development (2010) Strengthening the Management of the Oil and Gas Sector in Uganda. A Development Progamme in cooperation with Norway

Despite the prevailing legal framework advocating compliance with environmental laws particular on radiation emsiion, radiation discharge associated with crude oil exploration is ongoing subtly in Albertine region. This state of affairs in oil exploration could be partly due to a lack of a specific law to deal with radiation emission in oil and gas exploration besides generic Atomic Energy Act. Similarly government appears to be less strict on enforcement of radiation emission compliance but instead more focused on economic gains of the crude oil at the expense of environmental conservation and specifically public exposure to harmful radiation. Therefore compliance with radiation protection laws could be a mere illusion in Uganda. Until we establish adequancy of radiation protection laws, enforcement and compliance with the same, the problems of ill health such as catasptohic cancer associated with exposure to harmful radiation, ecological imbalance due to destabilizing natural habbitat of animal species will escalate from bad to worse. solving these problem processes will be futile.

1.3. General Objectives

The General objective of this study is to examine the implications of enforcement and compliancy with radiation emission laws in oil and gas exploration and production sector in Uganda.

1.3.1 Specific Objectives

(1) To examine adequacy and effectiveness of existing national policy, international and regional legal framework that provides for radiation emission standards during the crude oil exploration and production in the Albertine Graben
(2) To compare Uganda's radiation protection and management of radioactive waste with other jurisdictions in crude oil exploration and production in the Albetine Graben.
(3) To give recommendation in relation to gaps existing in radiation protection laws in crude oil production and exploration in Albertine Graben.

1.4. Research Questions

1) What are the major international, regional and national institution and legal frameworks in place to effect radiation emission standards for the crude oil exploration in the Albertine Graben?
2) What similarities and differences exist in radiation protection between Uganda and selected jurisdictions in crude oil exploration and production?
3) What are the recommendations for existing gaps in radiation protection laws crude oil exploration and production in the Albertine Graben.?

1.5. Research Justification

Eversince the discovery of commercial crude oil quantities in the Albertine area in the year 2006, public concerns about environmental conservation speficially radiation emission intensified. In response, old oil and gas laws were annulled and new ones were legislated. The new legislations include the Petroleum (Exploration, Development and Production) Act, 2013, the Petroleum (Refining, Conversion, Transmission, and Midstream Storage) Act, 2013 among others. In addition, international and regional regulations were ratified such as the Rio Dijanero Declaration 2012, ILO Standards on occupational safety and health comprising the Occupational Safety and Health Convention, 1981 (No. 155) meant to inspire job related health and safe working enviroments for employees. The exploitation of viable crude oil quantities for sale has come with a threat of contact with harmful radiation to the public and natural environment. Exposure to harmful radiation destabilizes ecological balance, and alters natural habitat of all animal species including but not limited to acquatic animals and thus adversely impacting the biodiversity. These negative impacts associated with contact with harmful radiation are meant to be curtailed by new legeisaltions following deterrence doctrines.

The study examined whether there is adequate enforcement and compliancy with these laws. The research therefore will benefit institutions responsible for ensuring compliance to radiation emission laws such as the Ministry of Energy, Ministry of Labour, the Oil explorations companies, academic reseaerchers and the Albertine communities living around the oil exploration areas by not only creating awareness about the eminent danger but also devising ways to make legal and institutional framework responsive to the threat of radiation emission to ensure that there is radiation safety and compliance with laws by oil exploration areas.

1.6. Scope of the Study

1.6.1 Geographical scope

The study will focus geographically on the Albertine rift also known as the Albertine Graben. This is the area were commercial crude oil exploration is taking place.

1.6.2 Content scope

The study was limited to enforcement and compliance with oil exploration laws intended to deter harmful radiation emission and its consequences to sorrunding environments. The focus was eniromental laws with special emphasis on radioactive emission laws in Uganda. The scope of laws interrogated was national, regional and international legal frame work governing crude oil exploration. The study will also compared Uganda's radiation protection and management of radioactive waste with other selected jurisdiction in the oil and gas exploration and production sector.

1.6.3 Time Scope

The inquiry scrutinized a period starting 2006 to present. This is the period when commercial oil exploration is considered to have begun. This timing was chosen because it was convenient for investigator to review relevant peer reviewed scholarly journals, and government reports, relation to oil exploration arount the Albertine rift.

1.7. Theoretical Framework

The study was informed by the theories of environmental enforcement and compliance. Emphasis is placed on the command and control theory and Citizen Enforcement theory. Command and control theory refers to the exercise of influence by imposing standards backed by criminal sanctions. It also focuses on the force of law. The main aim of this theory is to protect the public. Thus, effective radiation laws enforcement is a key to ensuring that the goals of environmental status can be realized. Just like any governmental regulation, radioactive emission enforcement is one of the principles that are based on the theory of deterrence.

Under this theory, there is an establishment of penalties or sanctions for those engaging in offensive conduct or those who violate the law. The theory also explains the development of criminal environmental law, which imposes criminal sanctions against violators of environmental law. Under this theory, the most emphasized tools of enforcement are regular inspections and monitoring of activities to detect noncompliance.

The other theory is citizen enforcement theory where citizens / individuals in the enforcement of environmental compliance. It allows citizens to sue companies for violations when the government fails to do so, which is mainly provided in procedural conditions. It assumes that citizens can enforce environmental law compliance through their political behavior, market behavior and direct

participation. It is under this theory that people can sue for enforcement of their right to a clean and healthy environment and CSOs are enabling to enforce environmental rights of voiceless victims through public interest litigation (PIL). Thus, the above theories are affected by problems of corruption and limited judicial capacity.

Unless measures for minimizing such harm to biodiversity sensitive areas are put in place, the danger of harm to the public and environment generally by crude oil exploration is eminent in Uganda. Over the last decades an improved understanding of the global environment and the ecosystems has developed. This discourse highlights eco-friendly approaches to crude oil exploration activities. The government through NEMA could adapt existing best practices from other oil producing countries that have successfully prevented harmful radiation emission to environment. This obligation can be executed for example through tracking operational records of potential crude oil exploration companies in regard to environmental conservation specifically mitigation of radiation emission. Oil exploration Companies with good track record of mitigating harmful radiation emission as well as using new technology appropriate to our oil field and environment should be given priority.

1.8.0. Methodology

This recounts the means by which the data used in this study was collected, analyzed and applied. In so doing, it justifies the choices made and guides persons who would wish to conduct similar research in the future. The study draws much of its information already documented sources and written literature for example statutes, published work and unpublished work visited include Uganda Christian University library. I will also consult literature like text books, further data will be collected by way of library or desk research. The library which will be journals, articles,

magazines and material from Internet will also be sifted in the study so as to provide a foundation upon which the research questions will be verified.

The researcher also obtained information from lecturers and people who had sufficient knowledge about radiation emission Law and specialists in Environmental Law especially lawyers and legal researchers and Civil Society Organizations.

1.8.1. Research Design

This study will utilize the doctrinal research design to analyze constitutional provisions, statutes and judicial decisions. The research design also known as black letter is conventional in legal scholarship. This involves tracing legal precedent, legislative or statutory interpretation.[29] It is a critical conceptual Analysis of all relevant legislation and case law to establish position of the law on subject matter of the study.

Qualitative analysis will be used and analytical tools, such as: textual analysis, practical argumentation, and principled or structured reasoning. Qualitative are preferred because they are more effective when the subject of study involves textual and view-based proof and analysis as opposed to that which is numerical. Secondly, qualitative research tools are more flexible and allow for a wider range of information to be captured by a study.

1.8.2 Data collection methods

Document review was employed in this study. This involved a legal analysis of primary and secondary material for example relevant laws, text books, newspapers, journals, and reports. The

[29] Hutchinson, (2015) Writing Law Dissertation 2nd Edition, Pearson Education Ink New York

international instruments, case law and other legal material of other jurisdictions also greatly informed this paper. This further involved utilization of the library stock of books on Environmental law. Thus, an analysis and appraisal of existing literature on environmental law, and radiation emission in particular, was carried out. This research can aptly be described as 'desk research'.

Internet sources were also used. In light of the scanty availability of information on Radiation emission laws and regulation in Uganda, the law websites, virtual libraries, and relevant blog posts were an invaluable resource. Furthermore, the variety of information available online enabled multiple streams of thought and opinion to this study.

1.8.3. Data Analysis

This was done according to identified key study parameters and content categorization in view of the research objectives. Information gathered was sorted in view of its relevance to the research objectives and questions.

1.9. Limitations

No effort was spared in writing this study in a diligent and thorough manner. Nonetheless, the study was troubled by a number of limitations and challenges.

Documentary review of this study was problematic. This was largely due to the limited legal scholarly work on Radiation Emission in Uganda. Not only is there a negligible body of literature on this topic focusing on Uganda, but also the renowned Environmental Law scholars seem to be avoiding the topic and opting for other environmental threats other than radiation emission and rapid have given the topic less attention in these studies other than a mere mention of it.

This left the researcher with no other viable option but to conduct literature review of international and regional journals on the subject matter. If time had allowed this research would better done with a social legal research design with experts currently involved in Atomic energy, oil and gas and environmental protection. However, this also came with its own peculiar challenges, proving to be costly in terms of both time and monetary facilitation. This, coupled by the busy schedules of the few experts, and the researcher did not make the study any easier. Of all these limitations, perhaps, hardest one to deal with was the limited time the researcher had to complete the study and write the findings.

While the absence of the aforementioned limitations could have eased the research, their presence should not be taken to discredit this study in any way. The researcher has devoted all her labors to realizing these research objectives. Instead of being discouraged by these limitations, his daily pre-occupation was to overcome them.

1.10. Chapter Synopsis

This study is made up of three chapters ;

Chapter one; of this study is presents the introduction. This includes of the general introduction, background to the study, problem statement, objectives of the study, research questions, justification of the study, the scope of the study, theoretical framework, research methodology and limitations of the study.

Chapter two; is made up of Literature Review; it comprises scholarly literature from peer reviewed journal articles, government documents, in relation to the study. Literature review is organized based on themes relating to study objectives.

Chapter three; presents the international, regional and national legal framework for radiation emission in the oil and gas exploration and production

Chapter four; presents a discussion on comparative analysis of radiation emission and waste safety laws in the oil and gas production between Uganda, Egypt and Ghana.

Chapter five; is the summary, conclusions and recommendations

1.11. Conclusion

In conclusion this chapter established the background of radiation emission as a problem that is a threat environment particularly humans and biodiversity around the Albertine region. It has been highlighted that no much research had been done in this areas and therefore little is known in terms how laws protect people from dangerous ionizing radiation from oil and gas exploration. The study will pursue three research questions in this chapter to establish whether laws are adequate to protect society in the Albertine region and whether there is compliancy with radiation emission laws.

CHAPTER TWO

LITERATURE REVIEW

2.0. Introduction

A review and synthesis of past scholarly literature reveals many studies have been done in the area of nuclear energy particular radiation safety as an environmental concern. However few of these past studies exhaustively address the legal aspect of radiation emission in the oil and gas exploration and production sector in the context of Uganda. Preceding research on crude oil exploration have interrogated implementation and acquiescence with environmental laws with less focus on specific radiation emission aspect of the laws in oil and gas exploration.The instant study extends previous scholarly discourse with focus on whether there is submission and execution of radiation emission laws in the oil exploration.

2.1 The Radiation Emission in the Oil and Gas Exploration and Production Process

The oil industry comprises of two parts, the *"upstream"* which is the exploration and production sector of the industry, and *"downstream"* which deals with refining and processing of crude oil and gas products as well as their distribution and marketing.[30] In this regard crude oil exploration firms are said to be integrated mutually comprising "upstream" and "downstream" aspects. Meaning crude oil exploration comapanies could opt to focus on either exploration and production or just purifying and selling. Exploration refers to activities to ascertain existence of crude oil through processes such as "geological, geophysical, geochemical and geotechnical surveys and

[30] UNEP (1997) Environmental Management in Oil and Gas Exploration and Production: An Overview of Issues And Management Approaches. UNEP/IE PAC Technical Report 37, pg.4, and E.B. Kasimbazi, "Environmental Regulation of Oil and Gas Exploration and Production in Uganda" in Journal of Energy and Natural Resources Law Vol. 30:2 (2012) at 187

drilling of wells for the purpose of discovery''.[31] The actual retrieval of crude oil from beneath the earth is production. This involves sophiscated and rigorous recovery process "using the naturally occurring pressures, secondary or tertiary recovery techniques required for recovery of petroleum from the reservoir within the earth, and the separation and treatment of the oil in bulky vessel, craft or vehicle, as a commodity".[32]

Radiation emission is a result from the oil and gas production and processing equiptment at the different satges of oil exploration and production. Although oil exploration and production process undergoes five stages, Uganda has accomplished only three. Whereas the first stage has no serious environmental threats the other four are actually dangerous and must be regulated[33]. In 1912 geolists dicovered cushing field in United States of America, this marked the beginning of the present systematic exploration of crude oil. Ultimately, this process has persisted through recent times using improved technology that yields superior results and rated safe.[34] Analysis of the threat of harmful radiation during the exploration process is discussed on a stage by stage basis as fololws.

2.2.1 Exploration Surveying

This is the first stage, it is basically about identification of crude oil among formation rocks. This is done using expert studied 'geological maps' to identify potential hydrocarbon reservoirs. "Aerial photography may then be used to identify promising landscape formations such as faults and anticlines".[35] Through rigorous process of geological valuation more data is gathered, after which

[31] E.B. Kasimbazi, at 188
[32] Ibid
[33] 'Kasimbazi (n 31)
[34] 'Unep (n 30)
[35] ibid

a couple of survey methods are used to validate the finidings. Normaly the surveys are said to take form of "magnetic, gravimetric and seismic methods".[36] Disparities in the 'magnetic field' determine character of formation rocks using the magnetic technique. Whereas mesasures of deiations in 'gravitional field' on the earth surface or offshore using a plane makes up gravimetric technique.

The seismic technique is normaly used as the initial activity after crude oil company is licencesed , to determine whether hydrocarbons exist in the right quantities for commercial exploration. The method depends ascertaining variation in sound waves below the earth and water. This procedure involves transmition of rhythm of audio energy moving as an upsurge into the ground from particular source in the earth surface or beneath the water on case a by case basis. Where different types of geological layers manifest, the audio waves are conveyed to abysmal stratas beneath the ground and rest redirected back onto the surface. The waves are then received *"geophones" or "seismometers"* on earth surface or *"hydrophones"* underwater. Disitinct cords are used to convey electrical signals to moveable workroom for amplification and then copied on magnetic tapes for analysis. Ancient techniques used explosions as energy base, in recent times due to environmental concerns this was stopped instead "*vibroseis"* are preffered especially on land. This utilizes manaual generator to convey hydraulic pulse into the ground and "the air gun" discharges compacted air throughout exploration under water. Around the Albertine region, conseration of plantlife (flora, foliage and shrubbery) is a necessity dur to biodivestity, "the dynamite (short-hole)" technique is desirable.[37] This stag is less harmful in terms of radiation emision however, all

[36] ibid
[37] Ibid

surveys were halted by the governmentof Uganda in 2007 to first update the legal framework governing the oil sector.

2.2.2 Exploration

The only way to affirm presence and closeness of hydrocarbons when a potential geological structure is established is to bore exploratory holes. The wells bored to reach hydrocarbons are refered to as *"exploration wells"* or *"wildcats"*. The features of the geological structure determines where hole are drilled. This makes it possible to have to device an eco-friendly drilling. Oil exploration on earth surface requires a cushion to be placed at the land site to support drilling apparatus and associated facilities. The nature of cushion constructed depends on toporgraphy, quality of soils and seasonal restrictions. The cushion for a well may take up 4000-15000m2. On the other hand exploration on water is done using autonomous equipment refered to as 'mobile offshore drilling units (MODUs)', choosing optimal and appropriate water drilling equipment depends on depth of water, weather constraints such as speed of wind and water current among others.

Drilling at this stage is done to establish if there any viable quantities of crude oil, before the appropriate exploration equipment such as 'a well head valve' can be mounted. Whereas if no viable quantities of hydrocarbons are found the site is retired and restored to it normal and safe state, usually this is agreed in exploration contracts. [38] whether such sites are actually restored to safe environmental state contestable. It should known that Uganda has gone beyond this stage. However this stage of drilling is the most dangerous as regards potential radiation emission danger if safety standards are not followed. This study will interrogate if companies at this stage strictly

[38] Ibid note 30

comply to laws requiring them to mitigate harmful radiation emission to the environment generally.

2.2.3 Appraisal

This is done after the first stage is successful, usually a process to comfirm whether the crude oil discovered is viable for economic development and the procedure involves drilling a few more wells termed 'appraisal' or 'our step' wells. The focus at this stage is to quantify the hydrocarbons found in reservoirs and establish scope of the field it is found. This further comfirms if any more technical work is neccesary.[39] The procedure for drilling appraisal wells is similar to that explained in the exploration stage involving drilling. The major difference is 'appraisal wells' are drilled adjacent to the 'wildcats' so as to evaluate other 'explorational wells'. The idea is conserve land and put it to better use.[40] The appraisal of oil wells in Albertine rift was successfully done comfirming 3.5 billion barrels of hydracarbons. This stage is as dangerous as the first stage in terms of radiation emission hence the researchers interest in compliance with laws to mitigate the threat.

2.2.4 Development and Production

This is the stage of formation of petroleum from the 'explorational wells' by foundation pressure, simulation lift among other techniques to exhaust the hydrocarborns from the rock earth beneath.[41] This involves boring " production wells" after establishing and comfriming viable quantities.

[39]J. Kathman& Megan Shannon „Oil Extraction and the Potential for Domestic Instability in Uganda" African Studies Quarterly, Vol. 12. Issue 3 (Summer 2011) at p1,
[40] Ibid
[41] Sembuya Magulu Douglas (2015) The Legal Regime and Environmental Dimensions of Oil and Gas Exploration and Production in Uganda. unpublished scholarly article (accessed via academia.edu.ojijopascal on 12 February 2019.

Where the scope of oil field is limited, an 'appraisal well' can be turned into production well and where scope of the field is large additional 'production wells' could be drilled. To minimize the production cost boring is done on the same pad or cushion.[42] The physical structure and substance of the earth determine the amount of production wells to be drilled bearing in mind the size of the oil field. The susbstitution of weighty boring pipe with less weighty plumbing how a viable oil well is made ready for production.[43] "It is at this stage that a blow-out preventer is replaced by a control valve assembly".[44]

It is known fact that viable petroleum is flows up to the surface by natural forces or pressure from beneath the earth. Factors such as stickiness or thickness of the petroleum fluid, constant pressure and qualities of rock reservoirs determin the free flow to the surface. Inconsistences of these factors means artificial technological aids like water injection also know as "hydraulic fracturing of the hydrocarbon bearing formation and acid treatment (particularly of limestone)" could be used to widen flow canals.[45] This technique is used to make flow pressures constant for optimal petroleum production.

At the surface crude oil directed through 'central production Facility' to isolate hydrocarbons from gas and water that comes with it. "This procedure of ensures petroleum produced is free from elements such as hydrogen sulphides, dissolved gas and carbon dioxide". It is at this stage that radiation emission mitigation is crucial, exploration companies are expected to treat waste water

[42] ('n 37)
[43] ibid
[44] J. Kathman & Megan Shannon, "Oil Extraction and the Potential for Domestic Instability in Uganda" African Studies Quarterly, Vol.12. Issue 3 (Summer 2011) at 1, and E. Kaweesi op cit, at 11
[45] ALNabhani K, Khan F, Yang M technologically enhanced naturally occurring radioactive materials in oil and gas production: a silent killer. Process Safety and Environment Protection, PSEP. 2015 http://www.psep.ichemejournals.com/article/S0957-5820(15)00177-9/pdf.

before it is disposed.[46] In addition day to day safety procedure at the 'production well' like " monitoring, safety, security programmes, maintenance tasks and periodic down-hole servicing using a wire line unit or a work-over rig are done".[47] At the time of study Uganda was at this stage. The Early Production System has been established at Kaiso-Tonya. Also developments are on going to construct a refinery in Hoima, pipelines connecting the Exploration and Production Areas to the sea port in Kenya and Uganda's central business capital Kampala, and restoration of the railway transport system. It is hoped that commercial production shall have commenced at least by 2020.

2.2.5 Decommissioning and Rehabilitation

This the final stage, it is about retiring crude oil 'exploration wells'or 'wildcats' including all apparatus on the sites when viable hydrocarbons are depleted or not found on surveyed and drilled reservoirs. Specifically this involves repair and renovation of the site and taking off site machinery. This is intended to refurbish the site to eco-friendly conditions for natural processes to processes to reoccur. In practice decommissioning could take place after a period of over 20 years of active oil production on viable site and requires constant supervision to ensure compliance to set guidelines after site retirement. The strategy to retire oil 'production wells' should have been incorporated into the entire process of exploration and production design whether on land or water.[48] The rationality is that numerous 'exploration wells' turnout not viable for economic

[46] ibid
[47] ibid
[48]S.A Sader et al, (1997) Time series Tropical Forest Change Detection for the Maya Biosphere Reserve.

production and may have to be retired a few months after appraisal to avoid land degradation and environmental hazzards.[49]

It is however, not known if exploration and appraisal wells drilled and found not viable or depleted of commercial quantities in the Albertine Graben have up to date been retired or renewed. Whether decomisioning complys with laws to mitigate radiation emission is not known with certainity and yet this is the issue is posing a serious risk to human and wild animal biodiversity. Previous studies chronicle the fact that animals regularly drink water collected in these abandoned 'wild cats' considered unsafe consumption. It has been reiterated that different animal species have directly been killed by falling into these exposed 'exploration wells'.[50] This study will investigate whether all processeses of exprolation and production comply with established environmental and related laws to mitigate all known forms harmful radiation exposure.

2.3.1 Compliance with legal and policy Framework for Radiation Emission Protection in Oil and Gas Exploration Sector.

The procedure of exploration and production of hydrocarbons radiates unacceptable levels of harmful materials in the form watercourse waste called "Naturally Occuring Radiative materials" ('NORMS'). Assement of past schrolarly studies indicate that high absorption levels of Radium, barium, and sodium among other are dissolved in waste deposits in water formed during the procedure. This has damaging radiation on employess and genral public in the area. ALNabhani K, et al observed that:

[49] Ibid
[50] (n)49

septic activities of 226 Ra are in the ranges up to 3500 kBq/kg, 367 kBq/kg, 1200 Bq/kg and 40 Bq/kg for scale, sludge, produced water and formation water respectively. 228 Ra has up to 2195 kBq/kg, 343 kBq/kg, 180 Bq/kg, and 59 Bq/kg for solid scale and sludge, produced water and formation water respectively. The activities of both radionuclides exceed the exemption level of 10 kBq/kg recommended by IAEA safety standards.[51]

The suggest that day to day processes in hydrocarbons exploration needs constant supervision to stop excessive concetrations in "TENORM waste". Contact with harmful radiation is normaly due to Gamma ray emmisions at a given time during exploration and production. Globaly nations have developed laws and regulations to mitigate radiation emission to protect the envvironment and public from harmful radiation.[52] This study will examine enforcement and compliance with radiation emision laws in Uganda's oil and gas exploration sector.

Petroleum production and ecploration procedures generates enormous amount of wastes all physical states of of matter 'solid, liquid or gaseous form'.[53] This sector is characterised by, "upstream" or earth surface exploration reserves and "downstream" or beaneath water exploration reserves.[54] The rising demand for petroleum products has advanced day to day processes of crude oil exploration and thus making the risk of exposure to harmful radiation eminent on society.[55] These risks to society have caused a challenge of harmonizing the concerns of public and

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[52]M. S. Al-Masri , H. Suman, NORM waste management in the oil and gas industry: the Syrian experience. Atomic Energy Commission of Syria (AECS) Damascus, SYRIA 2016.

[53] R.D. BARIED, G.B. MERRL, R.B. KLEIN, V.C. ROGERS, K.K NILSON, Management and Disposal Alternatives for NORM Wastes in Oil Production and Gas Plant Equipment (American Petroleum Institute, 1996),1-1-5-18.

[54] Ibid

[55]ALNabhani K, Khan F, Yang M (2015) Technologically enhanced naturally occurring radioactive materials in oil and gas production: a silent killer. Process Safety and Environment Protection, PSEP .http://www.psep.ichemejournals.com/article/S0957-5820 (15)00177-9/pdf

economic growth. Abdel-Sabour argues that harmonizing economic development and environmental and public concerns can be done,

'through the establishment of an adequate regulatory framework consisting of policies laws and regulations setting out rights, obligations, procedures and standards, and regulatory institutions charged with responsibility for monitoring compliances'.[56] Managing waste at industrial scale from procedures such as oil exploration justifiably presents numorous problems.[57]. It is known fact that radiactive waste in petroleum production is unavoidable but could be remedied by good practices to prevent or make minimal its harmful impact if any. The good practices must be anchored in good enironmental laws, continuous monitoring chemical discharge especially "downstream" operations and encouraging use of advanced techniques that eco-friendly.

Whereas there many laws and regulations to mitigate radiation emission durring oil exploration Uganda, the major ones include but are not limited to:

- National Environment (Waste Management) Regulations, 1999
- The Petroleum (Exploration, Development and Production) Act, 2013
- Atomic Energy Act 1973
- The Atomic Energy Regulations, 2012
- National Environmental Bill Supplement No. 10, 2017

[56]Abdel-Sabour MF (2014) NORM in waste derived from oil and gas production. http://www.researchgate.net/profile/Mamdouh_AbdelSabour/publication/264722815_NORM_in_Waste_Derived_From_Oil_and_Gas_Production.pdf

[57]El Afifi EM, Awwad NS (2005) Characterization of the TENORM waste associated with oil and natural gas production in Abu Rudeis, Egypt. J Environ Radioact 82:7–19

Notwithstanding existence of these laws little is known of their effectiveness in the ongoing crude oil exploration in the Albertine Graben. Whether regulatory institutions enforce and monitor compliance with radiation emission laws in oil exploration is the motive of this study. Past scholars have categorized harmful radiation emission under environmental pollution and argue generally that laws of environmental protection are not properly enforced and complied with in oil and gas sector.[58]

Alexandra S.Wawryk **a**sserts that "Oil and gas exploration and production has the potential to cause severe environmental degradation, not only to the physical environment, but also to the health, culture, and economic and social structure of local and indigenous communities".[59] Conversely, many developing nations have weak and insufficient enviromental laws and these not strictly and regularly imposed. In this regard environmental scholars, advocates and activist of environmental safety have made pleas to oil exploration companies to willingly bench mark good practices that mitigate radiation emission in nations with poor environmental regulations such as Uganda. The article further examined generally exixting enviromental guidelines followed by oil exploration companies and organizations reffered to as "best practice". Five environmental best practices with potential to remedy undesirable effectsof due to oil exploration were highlighted. The practices are 'environmental and social impact assessment (EIA and SIA); environmental management systems (EMS); environmental performance evaluation (EPE); environmental monitoring and auditing; and environmental reporting'.[60] The author suggest that adapting these

[58] Kasimbazi (n 3)
[59] In some cases, the impact of environmental degradation on the culture and traditional lifestyle of the indigenous community is so devastating that a breach of human rights occurs. Inter-American Commission on Human Rights, *Report on the Situation of Human Rights in Ecuador*, OAS Doc OEA/Serv.L/V.II.96, doc 10, rev 1, 24 April 1997, Inter-American Commission on Human Rights www.cidh.oas.org/country.htm.
[60] Ibid (n 56)

standards mean they must be in harmony and not contradict with local laws. In Uganda Article 254 provides that any law that contradicts another constitution shall be construed to conform with with the constitution.[61] Whereas the article did not address radiation emission specifically, whether these enironmental best practices have been adapted and are remedying radiation emission in Uganda is the gist of this study and will be widely examined in further chapters of this research.

Similarly Emmanuel Kaweesi asserts that, compliance with environmental standards means all economic undertakings must follow established legislations.[62] He further observes that amenability to "eco-friendly" legislation take on different dimensions such as 'compliance with environmental quality standards, Strategic Environmental Assessment (SEA), Environmental Impact Assessment (EIA); respect of environmental rights especially the right to a clean and healthy environment, transparency and accountability, public participation and many others'.[63]

The author suggestted that investigations be made to establish degree to which oil exploration and companies submit to environmental conservation dimensions aforementioned.[64] He notes that compliance by oil and gas companies to good environmental practices necessitates reinforcing environmental legislations in Uganda.[65] It should therefore be noted that compliance to existing environmental legislation is determined by implementation of the laws. It goes without saying that oil and gas exploration process should comply to established environmental laws, however not all environmental laws concern radiation emission. In the context of oil exploration, the instant research will explore whether there is compliance with eniromental laws in terms of radiation

[61] The 1995 constitution as amended
[62] Emmanuel K, "Environmental Law Compliance and its Implications for Oil and Gas Exploration in Uganda" at Page 13.
[63] Ibid
[64] ibid
[65] ibid

safety standards set out in the atomic energy Act 2008 and corresponding Atomic Energy Regulations 2012 among others

Kasimbazi Emmanuel, reiterates in his article that environmental degradation and compliance by oil companies to established laws as key concerns. [66] The study concludes that unless enforcement of measures is strengthened, environmental harm in the Albertine region due to oil exploration is eminent. He argues that although Uganda enacted new legislation for oil exploration these are not adequate and there is limited knowledge of the legal provision by the public as well as monetary and human resources to enforce the provisions to the dot. He recommended strengthening human resource capacity to enforce provisons, establishing clear pollution management and waste management plans.[67] The instant study will pursue the recommendation in light of radiation safety as an environmental concern and establish adequacy radiation protection laws in the oil and gas exploration sector.

Radiation emission is also an occupation health and safety concern to workers in the oil exploration industry. Seth Opong affirms that exposure to harmful radiation for long hour of work has adverse health consequences such as cancer. Workers on oil rigs elsewhere (Uganda inclusive) have suffered and continue to suffer, occupational diseases.[68] Studies reveal that workers in oil and gas exploration require radiation safety awareness through training suited to specific exposure relating to their work. This could be elementary training about safety when working with radiation emitting techniques, caution when working around or near radiation sources, emergency measures in case

[66]Emmanuel. B Kasimbazi, *"Environmental Regulation of Oil and Gas Exploration and Production in Uganda"*Journal of Energy & natural resources law Vol 30 No 2 2012
[67] ibid
[68]Seth O, "Common Health, Safety and Environmental Concerns in Upstream Oil and Gas Sector: Implications for HSE Management in Ghana" Academicus International Scientific Journal (Academicus International Scientific Journal), issue: 9 / 2014, pages: 93106, on http://www.ceeol.com

of explosure to harmful radiation at work and general guidelines concerning radiation applications and safety.[69] In work environment it important radioactive material are used under close supervision of qualified expert normaly called Radio Protrction officer (RPO). The role of the expert is to assess experience of workers before handling specific radioactive equipment or materials and their technical knowledge of danger signals and cautions. The workers handling any kind of radioactive equipment or material must bring to awareness of th "RPO" any radiaton leakages due to erros or accident so measures can be taken to secure harmful exposure with emergency safety measures.[70] The Atomic Energy Regulations provide for radiation monitoring in the work place. This study will seek to establish whether there is proper enforce radiation monitoring in the work place and if this is complied with in oil and gas exploration sector for the safety of workers. Whereas seth's study on radiation exposure was focused on occupational health and safety, it did not focus specifically on oil exploration. The instant study will extent seth's finding with more emphasis on occupational heatlth and safety for workers in the oil and gas exploration.

The government of Uganda through the department responsible for regulating energy and mineral development acknowledges environmental threat of crude exploration sites being located in an area rich with biodiversity such as the Albertine regions.[71] The authors posit that amidst such a challenge, extraordinary enviromental planning in these areas is crucial to remedy ecological disruption in all its forms. The ministry is aware that haphazard crude oil exploration is also precursor for undesirable alteration of our economic and social cultural heritage.[72] In response to

[69] ibid
[70](n)58
[71]Ministry of Energy and Mineral Development, (n 3)
[72] ibid

this the Ministry observes that these negative impacts need to be mitigated and addressed to ensure eco-system integrity by updating general management plans and developing new ones taking into account the oil exploration activities.[73] However, the author gives no guidance on how these plans should specifically be developed and/or updated. In relation to waste management, the Ministry notes that waste management in oil and gas exploration and production has emerged as a challenge. Most of the drill mud contains heavy metals and rock cuttings which render it hazardous and since there is not yet any clear mechanism of handling this, operators have been instructed to containerize their waste.[74] This view seems to be the actual problem considering these waste contains harmful radiation that is a threat to public, environment and workers at these exploration sites. The current study establish if containerization of crude oil waste is complied with and further examine how other jurisdictions are dealing with the same challenge and recommend to Ministry of Energy benchmark good practices in waste management of successful juridictions.

2.4. Conclusion

Literature relating to the state of hydrocarbons exploration indicates that Uganda is still in nascent stages. Proceeds from oil exploration are expected to enhance social economic development. However study after study show that oil exploration presents potential threat of dangerous harmful radiation emission from the exploration process if not well regulated. Whereas some countries have developed specific oil and gas radiation emission standards for safety, Uganda has no specific law on the same. The laws for radiation safety are generic environmental laws regulating petroleum exploration and production process, however research reviewed suggest compliance to these laws

[73] Ibid.
[74] Ibid, at 33

has so far been poor[75]. Radiation emission is categorized under environmental threats with adverse impact to biodiversity in particular public health, flora and fauna and aquatic species. The study extended previous studies on radiation safety with focus on whether existing environmental, oil and gas laws and policies can remedy radiation emission from oil and gas exploration processes in the Albertine area.

[75] (n 32)

CHAPTER THREE

GLOBAL, REGIONAL AND NATIONWIDE LAW REQUIREMENTS FOR RADIATION EMISION IN THE OIL AND GAS EXPLORATION AND PRODUCTION SECTOR IN UGANDA.

3.0. Introduction

Contact with harmful radiation threatens human survival in terms of catastophic genetic ailments associated with radioactive materials. This threat particularly through oil and gas exploration is widely known and appreciated. Radiation emission safety standards integrate transnational laws relevant aim at safe guarding international community. The global standards are anchored on the mutual understaning that nations oblige to prohibit any undertaking within their boundaries that could upset environment of its neighbours. In recent times this has been extended to a litany of universal regulations ratify aned by Uganda and therefore enforceable. This section discusses the existing global, provincial and nationwide radiation emission safety laws relating to crude oil exploration in Uganda.

3.1. Binding International and Region Radiation Emission Laws

The republic of Uganda has endorsed compulsory global and provincial legislations to standardize crude oil exploration. These coventions are mandatory and enforceable, requiring that eniromental standards including radiation safety must be obeyed. These laws include;

The 1972 Convention for the Prevention of Marine Pollution by Dumping of Wastes and Other Matter,

The Contracting Parties to this Convention, Recognizing that the marine environment and the living organisms which it supports are of vital importance to humanity, and all people have an

interest in assuring that it is so managed that its quality and resources are not impaired; Recognizing that the capacity of the sea to assimilate wastes and render them harm less, and its ability to regenerate natural resources, is not unlimited; Recognizing that States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction. Noting that marine pollution originates in many sources, such as dumping and discharges through the atmosphere, rivers, estuaries, outfalls and pipelines, and that it is important that States use the best practicable means to prevent such pollution and develop products and processes which will reduce the amount of harmful wastes to be disposed of; for example, it totally prohibits the dumping in the sea of radioactive waste and provides for rigorous control.[76] Uganda in 2010 ratified this convention Uganda is host to international waters Lake victoria one the largest lakes in the world as well as Lake Albert. The interconnections of these international waters to regional waters and international water mean Uganda is responsible for safe guard the waters from marine pollution. However since oil and gas exploration begun no much is known or reported on measure in place to safe guard international waters from pollutionfrom waste discharge from oil and gas exploration which is known to contain radioactive materials. Without compliance to international safeguards citizens in the region are exposed to radiation and it associated effects through water polution. The study sough to examine execution of this international convention in regard to oil and gas radiation emission in form of liquid waste that could be discharged in international waters like lake Albert.

[76]Kenneth Kakuru & Irene Sekyana, (2009) Hand book of Environmental Law in Uganda 2nd ed. Enironmental Law Institute Vol.1

The International Atomic Energy Agency Statue 1956

This is an autonomous geopolitical agency founded in 1957 to work as an epicenter for atomic collaboration as part of the United nations. The agency's cardinal purpose is to engage partner states to make use of nuclear- powered technologies safe and non-violent. The agency enacted its original statute endorsed by 81 member states in the year 1956, summarizing its working pillars as:

> (i) Safeguards and Verification: The IAEA is the world's nuclear inspectorate, with more than four decades of verification experience. Inspectors work to verify that safeguarded nuclear material and activities are not used for military purposes. (ii) Safety and Security: The IAEA helps countries to upgrade nuclear safety and security, and to prepare for and respond to emergencies. Work is key to international conventions, standards and expert guidance.[77]

Mitigating undesirable radiation contact is one of its purporse in regard "safeguards and verification". The activities of "Atoms of Peace" include 'installations, radioactive sources, radioactive materials in transport, and radioactive waste'.[78] An essential element of IAEA is advocating the use of "international safety standards" to regulate atomic energy and associated radiation emission.

The international safety principles enacted by IAEA guide partner and member states in performance of their duties under global laws. The established safety measures also enhance self reliance of member states for protection in international trade. Inotherwords the ideals represent harmony among member states in safeguarding environment and people from harmful radiation exposure. IAEA Safety Reports Series No. 34 Radiation Protection and the Management of

[77]

[78]INTERNATIONAL ATOMIC ENERGY AGENCY, Predisposal Management of Radioactive Waste, Including Decommissioning, Safety Standards Series No. WS-R-2, IAEA, Vienna (2000).

Radioactive Waste in the Oil and Gas Industry provide radiation safety standards, guides and fundamental some of which have been domesticated in Petroleum Act 2013.[79] Uganda is member state to IAEA however it is yet to be established if there is compliance to international safeguards to regulate use of radiactive material in oil and gas exploration activities to safe guard the public and workers in the industry.

Convention on Wetlands of International Importance especially as Waterfowl (Ramsar Convention) (1971)

This is commonly known as the Ramsar Convention. Uganda ratified this Convention on 4th March 1988. The Ramsar Convention seeks to ensure the sustainable, wise use of wetland resources including designation of wetland sites of international importance and to ensure that all wetland resources are conserved, now and in the future. Countries are required to implement the *"wise use" principles* of the Convention (including wetland policies, awareness programmes, and legislative review) and cooperate with other Contracting Parties; manage a network of protected wetland sites of international importance in cooperation with provinces, territories, and non-governmental organizations (NGOs); foster cooperation through joint work plans and Memoranda of Understanding (MoUs) with the Convention on Biological Diversity (CBD), Bonn Convention, the World Wildlife Fund for Nature (WWF), Wetland International, Birdlife International, IUCN, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and other international treaties and organizations; and contribute financially to the Convention. This convention is very instructive especially when it comes to operations on

[79]INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Protection and the Management of Radioactive Waste in the Oil and Gas Industry, Safety Reports Series No. 34, IAEA, Vienna (2003).

the immediate shores of Lake Albert which is a wetland of international importance (Ramsar site) within the meaning of the convention. The study sought to examine whether oil and gas activities in partticular exploration and production are complying with principles in this treaty to safe guard lake Albert from waste discharge with potentially harmful radiation.

Radiation Protection Convention, 1960 (No. 115)

The objective of the Convention is to set out basic requirements with a view to protect workers against the risks associated with exposure to ionizing radiations. Protective measures to be taken include the limitation of workers' exposure to ionizing radiations to the lowest practicable level following the technical knowledge available at the time, avoiding any unnecessary exposure, as well as the monitoring of the workplace and of the workers' health. The Convention further refers to requirements with regard to emergency situations that may arise. In regard to Uganda this has not been ratified, This implies this is not binding to Uganda and in particular oil and gas activities regulation. This implies that such international measures to protect citizens may not be in place and therefore many nationals and wildlife could be already exposed and affected harmful radiation from oil and gas production. The study sought to look at alternative measures Uganda has localy in place to protect citizens from radiation protection particularly those working with and/or leaving near oil and gas exploration activtities and establish if there is compliance to those measures to safe guard citizens.

Occupational Cancer Convention, 1974 (No. 139)

The purpose of this convention is put in place institutions to make policy that responds work related risks resulting from detrimental contact with harmful radiation due to radioactive materials at

places of work such as industries, oil exploration among others. In regard to this aim, partner states have a duty to periodicaly scrutinize for cancer-causing constituents at the work place and outlaw contact with them. The duty to remove dangerous substances and recommend protective gear and other precautionary measures such as mandatory remedial examinations for all workers lies with partner state. Oil and gas scholars globally have reiterated the fact that the process of exploitationand production involves radiation emission which may result into catastrophic cancer when one is exposed for longer periods. This implies neighborhoods and workers exposed to oil and gas exploration waste products are at high risk of cancer. However Uganda has not ratified the occupational cancer conventions, 1974.This is an indicator of laxity in protection of citizens in occupations with radiactive materials from contact. Whereas there national radation laws t regulate use of radaitoactive subsatance not ratifying international treaty points to lack of commitment to the cause. The study will seek to establish how Uganda protects citizens working with oil exploration companies engaging in routine use of radioactive materials are protected from contact with these cancer causing constituents.

Working Environment (Air Pollution, Noise and Vibration) Convention, 1977 (No.148)

This treaty promotes safety of the occupational spaces from all forms of harmful sustances owing to air, noise pollution. To remedy this member states must oblige to ensuring strict measures are in place to regulate processes, additional measures can be put in place relating to to safe working arrangements. Uganda has not ratified this treaty whereas this doesnot direct relate to radiation emission it is an indicator of laxity to safeguard occupation health of workers and this could easily be extended in oil and gas production and explorations exposing workers not only to airpollution , noise and vibrations associated with oil exploration but also radiation emission form the same

processes. Whether Uganda protects it oil and gas workers from potentially harmful work environment will be the focus of the study.

Chemical convention 1990 (No. 170)

The law advocates upholding and enforcement of rational policy to remedy harmful applications of chemical at occupational settings. The policy regulates:

> the production, the handling, the storage, and the transport of chemicals as well as the disposal and treatment of waste chemicals, the release of chemicals resulting from work activities, and the maintenance, repair and cleaning of equipment and containers of chemicals. This also involves, assigning particular duties chemical to states dealing and distributing the same in transnational trade.[80]

Uganda has not ratified this convention and this means there is a possibility of harmful chemicals being exposed to workers in occupational settings of oil and gas exploration. It should be noted that many of these chemicals are associated with radionuclides which sometimes may exceed the exemption level of 10 kBq/kg recommended by IAEA safety standards.[81]

The Vienna Convention on the Protection of the Ozone Layer (1985)

The republic of Uganda ratifies this accord in the year 1988, the purpose was to safeguard human well being as well as the environment from harzadous human undertakings transforming the "ozone layer" ; and harmonizing precautionary measures to regulate undertakings dangerous to the environment through adapting good scientific practices and knowledge sharing.[82] The treaty

[80] ibid
[81] Ibid (n 40)
[82] See the Convention summary

inaugurated an official body and outlined chemical elements considered harmful to the "ozone layer". The chemicals outlawed are, 'carbon substances like carbon monoxide (CO), carbon dioxide (CO2), methane (CH4); nitrogen substances including nitrous oxide (N2O); and Chlorine substances'. The accord precisely is geared towards decreasing manufacture and routine consumption of chemical thought to be harmful to the environment in particular the "ozone layer" by partner states involved. Such chemical discharge is eminent in hydrocarbons exploration procedures and therefore oil producing companies and states are required to abide to set limits of "gas flaring and venting".[83] Whether oil and gas production and exploration in Uganda strictly abide by provisions of this treaty in their processes is focus ot the study.

Bamako Convention on the ban of the Import into Africa and the Control of Tran boundary Movement of Hazardous Wastes within Africa (1991)

The convention established to reduce smuggling into africa and production of all potentially harmful waste as a measure to safeguard human life and environment against all human activities including those enhanced by technology. Partner states are required to abide with obligations of the convention by prohibiting discharge into the environment potentially harmful waste material without waiting approval of science.[84] These regualtions are relevant to oil and gas exploration, the Uganda oil exploration policy (NOGP) imbedded the same safety precautions. The trajectory of river Nile flowing though lake Albert also known as "Albert Nile" implies that unregulated waste disposal by oil exploration procedures in the "Albert Nile" could result into radiation

[83] "Flaring" means the combustion of hydrocarbons without the application of the resulting heat or gases for any useful purpose; and "gas venting" means the release of gas to the atmosphere (s.2 of the Petroleum (EDP) Act, 2013). The effect of these two actions is to introduce those dangerous gases into the atmosphere with all the dangerous constituents we have seen above. These elements include Carbon monoxide, carbon dioxide, Particulate Matter, Nitrogen oxide and sometimes sulphur oxides.

[84] Article 3(d) of the Agreement.

exposure to citizens of other neighbouring states where the river Nile flows such as south sudan, Egypt among others in contravention of convention. This implies licenced oil exploration companies have a duty to ensure water waste from exploration isn't discharged into international waters like the "Albert Nile"

3.2 Non-Binding (Soft Law) Principles

United Nations Environment Program (UNEP) 1997

The underlying principles this international treaty is that nations where oil exploration and production is taking place must appreciate the harmful environmental impact and enact laws to standardize procedures. Licensed oil companies should be supervised to ensure radaiton emission standards (HSE) are followed.

The policies to be followed are to designed by host nations and in addition enact suitable and enforceable global and national legislations consistent human undertakings. The laws must clearly outline:

> responsibilities and appropriate liabilities, enforceable standards for operations, appropriate monitoring procedures and protocols, performance reporting, adequately funded and motivated enforcement authorities, existence of adequate consultation and appeal procedures, appropriate sanctions and political will for their enforcement.[85]

The convention validated set up for oil exploration and production required to safeguard against exposure to harmful radiation, this includes:

> Policy formulation and regulations, Baseline environmental surveys, Assessment and approvals, Inspection, monitoring, enforcement, Services, water, power, waste disposal,

[85] (n 10)

> Emergency response, Logistics and transportation, External supplies/services, construction, materials, engineering, consultants, Technical services, laboratories, laboratory supplies, and equipment, Training institutions, standards associations.[86]

The treaty in addition emphasizes work place safety, risk valuation and supervision, training in radiation safety among others. Likewise 'factories Inspectorate, and the Fee Zone Board together with the National Fire Service and National Occupational Health Unit should develop a Health and Safety Performance Framework for periodic workplace radiation safety audits and inspections'. Fundamentaly there must be radiation precautionary measure backed by national policy and laws used as performance evaluation for companies associated with radioactive materials.[87] In regard to Uganda many of these safety measures appear to be in place, whether there is compliance to policies in place , laws and other measures to mitigate raidation emission is focus of this study.

3.3. Regional Radiation Emission Law Standards.

The Treaty of the East African Community (1999)

This was consensus of East African states to harmonize policy and law enforcement on issues of environment and development.[88] The aim of the treaty to advocate for environmentally friendly use nature resources among member states. The treaty inspires partner nations ensure environmental conservation when exploiting natural resources to achieve intergenerational

[86] (n)11
[87] Ibid
[88] E. Kaweesi Op cit

equity.[89,90] This agenda is in accordance with the National oil and gas policy 2008. The crucial Articles reiterate the agende and as such:

> include Article 151(1) which provides that partner states undertake to conclude such protocols as may be necessary in each area of cooperation which shall spell out the objectives, scope of and institutional mechanisms for cooperation and integration. Article 111 and 112 of the EAC Treaty provide for conservation and management of environmental and natural resources.[91]

Uganda ratified this treaty as partner state and therefore must abide by all regulations therein regarding environmental preservation alongside development innitiatives such as crude oil exploitation. Partner states should have mutual consultations and collaborations appropriate oil and gas machinery to be used to prevent interstate discharge of harmful radioactive susbstances in the province.

3.4. National Laws

The Constitution of the Republic of Uganda (1995) (as amended)

The principle law of Uganda is the 1995 Constitution, which is the supreme law in Uganda.[92] The national objective XXVII, demands that government must make concerted effort to safe guard vital natural resources in the best interest nation and its people. such natural resources are flora and fauna, land, minerals, and water resources among others. The principles of environmental conseration are specifically enshrined in ***Article 39 of the 1995 Constitution***, this provides that 'every Ugandan has a right to a clean and healthy environment'. This Article places a duty on the

[89] Article 151
[90] Article 111
[91] Article 114
[92] Article 1

government to ensure the clean environment including the restriction and regulation of the oil and gas industry. This means government has obligation to safeguard the public and environment from any foem of harmful radiation including that from oil and gas exploration.

Article 245(a), (b), (c) of the Constitution empowers Parliament to provide for measures intended to: Protect and preserve the environment from abuse, pollution and degradation; to manage the environment for sustainable development, and to promote environmental awareness. It follows from these provision that government has duty to regulate pollution from oil exploration that is potential radioactive and create environmental awareness about dangers of radiation exposure from oil and gas activities. Numerous studies[9394] have reiterated that whereas oil exploration companies are aware of radiation emission dangers the public is less aware and there has been no formal effort from concerned environmental Authorities to create this awareness. Therefore government's commitment is on paper and not yet implemented.

Atomic Energy Act cap 143

An Act to regulate the peaceful applications of ionizing radiation; to establish the Atomic Energy Council; to provide for the protection and safety of individuals, society and the environment from the dangers resulting from ionizing radiation; to provide for the production and use of radiation sources and the management of radioactive waste; to provide for a framework for the promotion and development of nuclear energy for use in power generation and other peaceful purposes; to provide for compliance with international safety requirements for the use of ionizing radiation,

[93] E. Kasimbazi op ct
[94]Ojija Pascal (2017) Environmental Impact Assessments in the oil and gas sector in Uganda.

radiation protection and security of radioactive sources; to repeal the Atomic Energy Act, Cap. 143; and for other related matters.

This Act establishes the Atomic Energy Council and provides with respect to development and management of nuclear power and radiation safety.[95] The Act also concerns the management of radioactive waste and emergency preparedness and response.[96] The Council is a body corporate, which shall, among other things, issue authorizations and grant exemptions for the possession and use of radiation sources and carry out inspections. The Council shall appoint Radiation Protection Officers.

It has however been observed the Act is for general purpose application on issues of radiation in oil and gas. It has no special provision to address peculiar oil drilling and exploration activities and therefore undermines radiation emission at the various subtle stages of oil and gas exploration. Researcher has revealed that the council has no published any special reports on Radiation emission in the oil and gas sector so far.[97] This is an indicator of non-compliance with radiation emission standard in the oil and gas sector.

The Mining Act (2003)

The Act was intended to repeal and replace the old Mining Act Cap. 248 with a new legislation on mining and mineral development which conforms, and otherwise gives effect, to the relevant provisions of the Constitution; vest control and ownership of all minerals in Uganda in the Government; provide for the acquisition of mineral rights and other related matters. This law

[95] Section 4
[96] Part VII, Section 54
[97] State of Environment Report 2014

mandates all licenced mining and oil exploration companies conduct enviromental studies on the effect of their activities in line with laws provided under the National Environment Act, Cap 153[98]

Occupational Safety and Health Act (2006)

The rescinded Factories Act Cap 220 neccesitated enacting thw aforementioned Act to regulate safety and well being of employees at the work places and related matters. .[99] The Act guarantees employees at the work place safe working conditions for their welfare and provides for requisite training of workers. Section 18 (1) assigns responsibily of observing strict regulation of discharge of harmful materials into the environment to employers. In this regard it is duty of the employer to procure appropritate technology or machinery to observe discharge of any form into the soil, water and air is safe from dangerous substances. Subsection (2) requires the safe custody documents relating to aforementioned duties on employer in subsection (1) for inspector's access when needed. This law is not only relevant to oil and gas exploration and production companies but alos minning firms owing to the environmental hazards their procedures pose to the public.

Similary the IAEA standards of occupational dangers of harmful radiation are domesticated in this Act. In particular 'radiological measures in the workplace such as control of the occupancy period Exposure to airborne dust is likely to be controlled already in many workplaces through general occupational, health and safety (OHS) regulations'.[100] Employees at oil exploration firms under this statute are classified as mining workers and therefor must be provided with protective gear against harmful radiation emission.

[98]Sections 43 and 108
[99] Long Title
[100]

The Petroleum (Exploration, Development and Production) Act 2013

This is the principal legislation governing the oil sector its preamble states that it is to give effect to Article 244 of the constitution, regulate the petroleum production, the licensing of companies, the revenue, and promotion of oil exploration and also set a safe environment for the operations and plan for the decommissioning. The act repeals the Petroleum (Exploration and Production) Act, Cap 150 and the related matters. The Act guides the establishment of the Petroleum Authority [101]of Uganda and the National Oil Company, which have administrative powers to oversee the protection of environment through licensing and regulation of activities. This law reiterqates environmental principles in NEA and related laws and thus make it obligation for any one undertaking petroleum related activities under it to comply with principles there in.[102] NEMA still has the mandate to monitor and supervise the activities so as to protect the environment as provided for under ***Section 17*** to the board of directors. This requirement covers the upstream and downstream protection of the environment in accordance with the license.

The act requires the carrying out of environmental impact assessment before the opening of the new site[103] and in the operation and work all work should be environmentally sensitive.[104] In case the pollution occurs the company is required to make good the loss which includes treatment of the waste ***section.88 (g***). This precaution is to ensure waste containing harmful radiation be treated before discharge. ***Section.1 (e)*** is principally to protect the public from environmental hazards and ailments asscociated with work place in relation to the Occupational

[101] Section 9
[102] Section 5
[103] Section 47
[104] Section 88.

Health and Safety Act, 2006[105], ***section141*** provides for safety precautions and 142 for emergency preparedness, the safety zones under ***section144*** this all in all protects the people and the environment for a safety and sustainable oil and gas production.

Under ***section 102,*** excessive combustion of hydrocarbons and releasing of fumes in the air beyond the acceptable standard operating levels is outlawed except with authorization by minister. The authorization of " flaring" and "venting" is only given where it is indispensable for the procedure to comply sternly to the Act with written consent. However, even where "flaring" or "venting" is done without consent as an emergency, the licensee should ensure that the flaring or venting is kept at the lowest possible level, and submit a technical report to the authority detailing the nature and circumstances that caused the emergency situation, and it is an offence for any licensee who fails to submit the technical report to the authority or keep the flaring or venting at the lowest possible levels.

The Act introduces the decommissioning plan and fund that is to cater for the restoration of the environment to the normal state just in case the company shuts down which in the essence protects the environment from open holes and sites.

Part XI makes provisions for public access to information and documentation. According to section 74, the Minister may, in accordance with the Access to Information Act, 2005, make available to the public, details of all agreements, licenses and any amendments to the licenses or agreements whether or not terminated or valid; details of exemptions from or variations or

[105] Ibid

suspensions of, the conditions of a license; and all assignments and other approved arrangements in respect of a license.

This statutes has sections than prescribe penalties for environmental offenses due to failure to comply. Sections 127 and 162 'impose strict liability for pollution damage and negligent contraventions of the legal provisions. However, the fines, both for entities and companies, are extremely lenient considering the high value nature of the sector'.[106] Similarly Section 6, outlaws any involvement with "petroleum activities" devoid of permission provides punishments for non compliancy. The penalties in section 6 are:

> (1). Petroleum activities in, on or under any land or waters in Uganda is subject to Ugandan jurisdiction, shall not be conducted without an authorization, licence, permit or approval issued in accordance with this Act.[107]
>
> (2) A person who contravenes subsection (1) commits an offence and is liable on conviction— (a) if an individual, to a fine not exceeding ten thousand currency points or imprisonment not exceeding ten years or both; and (b) If a body corporate, to a fine not exceeding one hundred thousand currency points.[108]

Under ***section 4(5)*** provides the penalty charge of up "5,000 currency points" for an entity "who carries out the management of the production, transportation, storage or treatment of waste arising out of petroleum activities without license."[109] These very small fines are not preventive enough against welth oil exploration companies. To achieve compliancy the fines levied for non compliancy should be equated criminal punishments and consquently license of malpracticing companies and entities should be cancelled. The companies leadership in charge responsible for

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106

107

108 ibid

109

breach of laws should personaly accountable for their actions. The legislation make all penalty charges non taxable or there should be no recovery of cost on the same. It should precisely be noted that amidst discovery of commercial oil reserves and on going exploration the essence NOGP established to enforce environmental fortification in oil exploration activities is futile with small fines charged for non compliance. This leaves the threat of harmful radiation exposure and its asscociated effect almost a reality in the Albertine region,

Finally, sections 4(6) requires that National Environment Management Authority design and adopt rules governing the management of the production, transportation, storage and treatment of waste arising out of petroleum activities. However the question of enforcement is weak due to the under facilitation of the environmental sector and poor response of Nema according to the auditor general's report[110]. Therefore NEMA lacks the technical capacity and budget support to execute its mandate. For example, NEMA currently has only about one-third of the technical staff that it needs to fully and effectively perform its assigned tasks. In addition, the institution is yet to develop and adopt appropriate air, water and soil quality standards for the industry. Therefore the Petroleum Authority and Nema together with other Sectorial organs need to work together to protect the environment radiation emission in the bio diverse Albertine Graben.

The Petroleum (Exploration and Production) (Conduct of Exploration Operations) Regulations (1993)

These were made under the Petroleum (Exploration and Production) Act, Cap. 150 (now repealed) but they were saved to remain in force in so far as they are not inconsistent with the repealing Act,

[110] Ibid article 31

until they are revoked by a statutory instrument made under the repealing Act. The Regulation 51 (1) prohibit environmental pollution of any form during oil exploration and production procedures as well as carriage or freight environment. Regulation (35) limits oil exploration activies on land, in particular only temporary structures allowed in licensed areas except where commissioner gives permission otherwise. Written approval must be give by commissioner and this must indicate location of site and reason

Permision to construct permanent structures on site must be in form of written approval Under Regulation 36, an application for the consent of the Commissioner to the construction or installation of a fixed platform should be made in writing and should state among others the location at which it is intended to construct or install the fixed platform; the reasons, including the geological evidence, for the selection of that location; be accompanied by copies of reports and recommendations made by persons responsible for ascertaining the criteria determining the design; state particulars of the depth of the lake and the nature of the lake bed and sub-soil at that location. The Regulations also control disposal of waste material. Under Regulation 51 (2), in the disposal of any waste material, a licence holder should not create any conditions which may adversely affect public health, life, property, aquatic life, wildlife or vegetation. The Regulations further require that before drilling operations are commenced in any licensed area, the person-in-charge should submit, for approval by the Commissioner, a description of procedure, personnel, equipment and materials that will be used in reporting, cleanup, and prevention of the spread of any pollution resulting from exploration or development activities. The Regulations under Regulation 56 also bar the disposal of drilling mud into any lake, river, stream, pond or other water body. Under Regulation 56(2), produced water may be disposed into an operating area after satisfying, with the commissioner's approval, that the oil content of produced waters discharged from offshore

platforms has been reduced to an average of not more than 10 mg/l during normal operation. Regulation 59(1) stipulates that all spills of oil and liquid pollutants and all other instances of pollution occurrences should be immediately reported orally to the commissioner and should be confirmed in writing. Regulation 61(1) prohibits any person to import explosives without a license into Uganda for use in petroleum operations. The Regulations make provisions regarding safety issues. Regulation 85(1) requires the operator to prepare a manual of instructions for safety in operations and draw it to the attention of every person who is about to be engaged in, or concerned with, the carrying out of operations or the execution of works in any licensed area. The Regulations further cover health issues. Regulation 105 (1) requires the person-in-charge to provide or cause to be provided and maintained on all platforms and all vessels such First Aid equipment and facilities as may be required in each case by the Commissioner. Regulation 112 further requires that all confined areas where operations could lead to the emission and accumulation of explosive mixtures or toxic gases should be provided with suitable means of ventilation and with a continuous ventilation monitoring system approved by the commissioner which should be fitted with an audible warning device. Regulation 114 requires that at appropriate distances from every place where gases such as hydrogen suplhate are or could be a hazard, the person-in-charge should cause to be displayed suitable signs warning of the presence of the gases and any person observed approaching that place should be warned of the danger that exists. Regulation 115 is to the effect that, the exhaust gases from engines or motors or devices using gas in place of steam or air to operate pumps and other power driven equipment should be discharged in a direction and location where they will not create a health hazard to any person. These regulations serve to protect the environment for degradation such that it can be enjoyed by present and future generation long after the oil exploration.

This Act domesticates some International Atomic Energy Agency measures of radiation protection in the conduct oil exploration. These in particular include Waste Management and decontamination of NORM Waste volumes, decommissioning planning activities, occupational exposure and Radiation monitoring among others.

The Petroleum Supply Act (2003)

This Act makes provisions for the protection of public safety and the environment. It requires the Commissioner to develop and implement or cause the implementation of a programme of gradual adoption and adaptation of the prevailing international standards, technical specifications and codes of practice in relation to the petroleum supply industry in co-operation with the National Bureau of Standards and the Committee. It further provides that the standards, specifications and codes of practice as established by the standards developing organizations which are recognized by the International Petroleum Industry (IPI) in matters of quality, industrial safety and environmental protection should be adopted by the Uganda National Bureau of Standards (UNBS) by reference and declared as national standards in accordance with the UNBS Act after being adapted as necessary taking into account the socio- economic realities of the petroleum products market in Uganda.

National Environment Act (NEA), Cap 153

The parliament through ***Article 245*** of the Constitution Supra passed a law (The National Environment Act 1995) to provide for sustainable Management of the environment. The act is the principal legislation for the protection of the environment. This law also established an Authority called the National Environment Management Authority (NEMA) which is a co-ordinating,

monitoring and supervisory body for that purpose; and for other matters incidental to or connected with the foregoing[111]. Under ***Section 2 (2)*** the principles of environmental management include . . . using and conserving the environment and natural resources of Uganda equitably for the present and future use, establishing adequate environmental protection standards and to monitor changes in environmental quality, and ensuring that the entire and total costs of environmental pollution are borne by the polluter. The NEA makes EIA a legal requirement. Under section 19(3), EIA is to be undertaken by the developer if the project is likely to have an impact on the environment, or is likely to have a significant impact on the environment, or will have a significant impact on the environment. ***Section 3(2)*** of the act confers on every person the right to a healthy environment and also states that every person has a duty to maintain and enhance the environment, including the duty to inform the authority or the local environment committee of all activities and phenomena that may affect the environment significantly. ***Section 157*** of the Act prohibits any person from carrying out any activity that is likely to pollute the air, the water or the land in excess of any standards or guidelines prescribed or issued under the Act. Thus a person requires a pollution license to carry out a polluting activity. A pollution license cannot be issued unless the licensee is capable of compensating the victims of the pollution and cleaning the environment in accordance with the "polluter pays" principle.

The Land Act Cap. 227

The Land Act is the main law dealing with land management in Uganda. As such it has implications for oil and gas activities and the right to clean and healthy environment. Section43 requires that any person who owns or occupies land manages and utilizes it in accordance with the

[111] Section 4 , NEA

existing environmental laws such as the Forests Act, the Mining Act, the National Environment Act, the Water Act and the Uganda Wildlife Act. It also requires that environmentally sensitive areas are protected in trust and for the common good of the people of Uganda. In this regard oil exploration areas are prone to radiation emission from drilling activities and should be protected to safeguard the public from dangerous ionizing radiation from wastes.

Section 44 reserves all the water rights any natural spring, river, stream, watercourse, pond, or lake on or under land, whether alienated or alienated, to the Government of Uganda therefore such water can be obstructed, dammed, diverted, polluted or otherwise interfered with, directly or indirectly, except with the permission in writing granted by the Minister responsible for water or natural resources. This provision restricts carrying out of oil activities around natural water resources. This specifically is geared towards preserving natural water resources from pollution by soluble radioactive waste from oil and gas exploration activities.

Environmental Regulations

Uganda has various regulations regarding protection of the environment, as below analyzed. The National Environment (Waste Management) Regulations, SI No 52/1999, which apply to all categories of hazardous and non-hazardous waste, storage and disposal of hazardous waste and their movement into and out of Uganda and to all waste disposal facilities, landfills, sanitary fills and incinerators[112].

[112] Ibid Note 106

Atomic Energy Regulations 2012

These Regulations, made by the Atomic Energy Council under section 73 of the Atomic Energy Act, 2008: (a) specify the minimum requirements for the protection of individuals, society and environment from the dangers resulting from ionizing radiation; (b) provide for the safety and security of radiation sources. They also concern management of radioactive wastes, discharge or release of radioactive substances to the environment, disposal of radioactive waste, and transport of radioactive waste. Oil and gas waste management and any radiation emission protection measure should follow these guidelines. However there are no known compliancies reports know to the public since its inception. Therefore whereas regulations are in place compliance in the oil and gas sector is undocumented in Uganda.

The National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, SI No 5/1999172 provide the standards for effluent or waste water before it is discharged into water or onto land. The Regulations provide for the general obligation to mitigate pollution[113].

The National Environment (Wetlands, River Banks and Lake Shores Management) Regulations, SI No 3/2000, regulate the management of wetlands, river banks and lake shores. The objectives of the Regulations include the conservation and wise use of wetlands and their resources in Uganda, thus minimizing and controlling pollution of rivers and lakes and controlling pollution or degrading activities[114].

[113] Regulation 18
[114]Ibid

3.5 Policy Framework

There are three major national policies that regulate oil and gas exploration in Uganda. This section examines whether these policies provided regulation of radiation emission of oil activities.

The National Environment Management Policy

This policy whose overall goal objective under Principle 2.1 is to ensure a sustainable social and economic development which maintains or enhances environmental quality and resource productivity on a long-term basis that meets the needs of the present generations without compromising the ability of future generations to meet their own needs. This is in line with the international law and policy of sustainable development of the Stockholm Declaration. Albertine region being an environmentally sensitive area with biodiversity and numerous forests, wildlife and aquatic life, there is needed to observe the policies for a sustainable development. Principle 2.3 states that, Uganda's economy should be based on a sustainable natural resource usage and sound management in line of petroleum under Principle it advocates for using reasonably the nonrenewable resources. The policy is generic in its out look to radiation emission compliancy. The objectives of National environmental management policy relating to radiation emission measures in oil exploration are operationalized in National Environmental Act infra

The Energy Policy

This policy aims at guaranteeing that the energy needs of the Ugandan population in terms of social and economic development are met in an environmentally sustainable manner. The national Energy Policy objectives include . . . to manage energy related environmental impacts. The fifth objective in the policy requires the government to ensure that environmental considerations are

given priority by energy suppliers and users to protect the environment and put in place a monitoring mechanism to evaluate compliance with established environmental protection guidelines. This essentially protects the community and obligates the developer be environmentally sensitive and also to the Government to monitor compliance. Principle 4.2.2 of the policy provide for the objective of the upstream and downstream. Upstream is basically centered on the exploration, development and eventual production of petroleum while the downstream covers transportation (of both crude and refined products), refining, storage, distribution and marketing of petroleum products stated in Principle 1.2.3. The basic strategies is to develop mitigating plans to reduce environmental hazards in all oil operations, this emphasizes the need to use the oil and gas in an environmentally conscience way.

To meet the above objectives, Government shall: promote the use of alternative sources of energy and technologies which are environmentally friendly; sensitize energy suppliers and users about the environmental issues associated with energy; work towards the establishment and acceptance of broad targets for the reduction of energy-related emissions that are harmful to the environment and energy users; promote efficient utilization of energy resources; and strengthen the environment-monitoring unit in the energy sector. Because this policy was developed before Uganda's oil potential had been fully appreciated, the policy does not specifically address the radiation emission concern of oil and gas exploration in Uganda. This left the gap for the development of the National Oil and Gas Policy for Uganda in 2008.

Oil and Gas Policy 2008

The policy, under principle 5.1.3, focuses on the balance of the environment, human development and biodiversity for mutual benefit and survival and adds that many of the developers focus on

benefit in disregard of the likelihood of harm. The policy aims at the promotion sustainable development. The responsibility is placed of licensed oil companies to protect the environment where they work or any areas in the country impacted by their operations and the Government obliged to legislate, regulate and monitor compliance.

Further, Principle 6.2.5 of the policy recognizes the need to protect the health of the community; it anticipates the negative effects of oil and gas for example oil spills that contaminate the water sources and also the blowouts that are likely to cause death on the life. Gas flares and dust result in air contamination leading to sickness. The policy required the developer to set up of best international practices for prevention and rapid emergency response mechanisms designed to mitigate against air and water pollution.

The policy also recognizes the indigenous community in the mining areas, areas in which the people are settled there is need to protect the water sources from hazardous contamination. It also considers the interconnection of the pollution and which covers the aquatic life, wildlife and human life given the biodiversity of Albertine Graben. It affirms the need to collaborate with other relevant policies, to support the review, updating and implementing the waste disposal standards, together with the establishment and enforcement of the necessary monitoring, evaluation and control mechanisms.

To achieve the above strategies, the Policy proposes to the following actions: upgrading the relevant Environment and Biodiversity legislation to address oil and gas activities; strengthening the institution with a mandate to manage the impact of oil and gas activities on the

environment and biodiversity and developing master plans for the oil and gas producing region (Albertine Graben).[115]

The National Water Policy (1999)

The overall objective of the policy is to manage and develop the water resources of Uganda in an integrated and sustainable manner. The water policy requires application of Environmental Impact Assessment in all water related projects and for integration of the water and hydrological cycle concerns in all development programmes. With respect to oil exploration the policy provides for: upstream and downstream water use relationships; regulation of industrial discharges of effluents to water; use and sharing of water resources by various stakeholders; and international cooperation of trans-boundary water resources. This policy is crucial for oil exploration and production because it emphasizes water quality and quantity. Hence in light of the policy the operators should ensure that their activities do not lead to pollution of neighboring waters for example through discharge of aqueous wastes. Researchers have found that aqueous waste from oil drilling have soluble radiation elements that can expose public to ionizing radiation[116]. According to a survey done in Bunyoro area the oil wells were found to have spilled into neighboring areas causing pollution of the land. This was contrary to The National Water Policy as pointed out. Henceforth the oil and gas industry is to some extent non-compliant to these standards.

[115]Ojijo Pascal (2016) the legal Regime for protection of Environmental during Oil and Gas Exploration: Case study of Uganda. Unpublished (accessed via academia .edu.ojijalpascal on 13th Jan 2019)
[116] Ibid (note 28)

4.6. Conclusion

International laws on radiation emission compliance requirements set good international standards for the oil and gas industry in particular. Uganda should aim at observing them if radiation emission is to be remedied. One of the major challenges of enforcing international law is its non-binding character. The law does not prescribe punitive reinforcements against violators. Even where such sanctions are prescribed, there may be no clear and/ or affordable system of pursuing remedies. In addition, international and regional tribunals are less functional in environmental matters in particular radiation emission for oil and gas. However all this can be overcome by domesticating those standards into local oil and gas legislation which should clearly highlight radiation emission safety standards, punishments for noncompliance and the procedures for pursuing remedies.

Similarly the discourse on compliancy requirement set out in oil and gas domestic laws and policy for radiation emission protection indicates that Uganda has no specific oil and gas law for radiation protection. However many of the local laws have domesticated similar International Radiation safety measures generically. These laws provide for Waste management regulations; such as discharge of oil exploration waste in water and wetlands, Pollution regulations, environmental Monitoring, Environmental Impact Assessments, Licensing procedures among others that are generically aimed to radiation protection.

It should also be noted that in spite of the punishments/fines prescribed for non-compliance, laws are not deterrent enough to effectuate Radiation emission compliance under the deterrence theory. It was also observed that some regulations were enacted before discovery of commercial petroleum and have since become obsolete in regard current environmental threats like radiation emission.

Hence there is urgency to enact a specific radiation emission laws, non-compliancy penalties and amend existing ones to come up with a responsive laws to Radiation Emission in Uganda's oil and Gas sector.

CHAPTER FOUR

COMPARATIVE ANALYSIS OF RADIATION PROTECTION AND WASTE SAFETY LAWS IN THE OIL AND GAS INDUSTRY BETWEEN UGANDA, EGYPT AND GHANA RESPECTIVELY

4.0. Introduction

Radiation emission is an environmental concern for all oil and gas producing countries. At a global level the International Atomic Energy Agency (IAEA) is authorized to establish standards of safety for protection against ionizing radiation and to provide for the application of these standards to peaceful nuclear activities[117]. The IAEA makes regulatory publications through which established safety standards and measures are issued to member states Uganda inclusive. This safety standards covers nuclear safety, radiation safety, transport safety and waste safety, and also general safety (that is, of relevance in two or more of the four areas), and the categories within it are safety fundamentals, safety requirements and safety guides. The IAEA's safety standards are not legally binding on Member States but may be adopted by them, at their own discretion, for use in national regulations in respect of their own activities. The standards are binding on the IAEA in relation to its own operations and on States in relation to operations assisted by the IAEA[118]. It is therefore imperative to the researcher to establish through literature review how much of the safety standards are integrated in oil and gas exploration and production activities by member states. This will be done by means of a comparison of radiation waste and safety application laws in selected oil

[117] IAEA, Regulatory and management approaches for the control of environmental residues
Containing naturally occurring radioactive material NORM – Proceedings of a Technical Meeting held in Vienna, 6–10 December 2004. TECDOC-1484. IAEA, Vienna
[118] Ibid (62)

producing member states of IAEA. Good practices in one state will be recommendation to another state such as Uganda in this study.

4.1 Oil and Gas Radiation Emission laws in Uganda

Uganda is a member to the IAEA, Atomic energy use in Uganda was initially limited to agricultural and health sectors[119]. The recent discovery of oil reserves has extended atomic energy use to oil and gas exploration and production in Uganda.[120] Atomic energy matters are regulated in Uganda by the Atomic Energy Act 2008 [121] and corresponding Atomic Energy Regulations 2012. The laws have established an Atomic Energy Council to regulate the peaceful applications of ionizing radiation in the country. Though the council is not fully constituted, however the legal and institutional framework for regulating atomic energy matters is not directly applicable in the oil and gas sub-sector in Uganda. The oil and gas sector is regulated by Petroleum Exploration and production Act 2013.

A review of atomic energy annual reports from (2012 – 2013)[122], (2014 -2015)[123] and (2017 – 2018)[124] reveals that the Council has extended services to various areas of the Country ranging from registering facilities that use radiation sources, authorization of operators, monitoring occupational workers, carrying out inspections in facilities among others. However there is no specific report on such council activities in the oil and gas sub sector in relation to radiation emission. Emphasis on council activities is in areas medical, Agricultural and industrial practices.

[119]Robert Tumwesige, Paul Twebaze, Nathan Makuregye, ElladyMuyambi, *Key issues in Uganda's Energy Sector ;Pro-Biodiversity Conservationists in Uganda*. International Institute for Environment and Development (UK) in 2011
[120] ibid
[121] Cap 143 Laws of Uganda.
[122] Atomic Energy Council, Annual report 2012 - 2013
[123] Atomic Energy Council, Annual Report 2014 - 2015
[124] Atomic Energy Council, Annual Report 2017 - 2018

This leaves a question begging as whether the council is meeting its mandate to protect environment and public from the threat of ionizing radiation emission from oil and gas activities in the Albertine Graben. Under the ongoing Public Service Reform Programme, it is proposed to establish a National Radiation Protection Commission (NRPC) under the MEMD. Key issues in the atomic energy subsector

- There is formal institutional and legislative framework for regulating atomic energy activities though its activities have focused less on oil and gas production in Uganda
- Budgetary constraints have negatively affected: (i) Uganda's contributions to the International Atomic Energy Agency (IAEA), thus lowering the country's bargaining power; and (ii) co-ordination of activities.
- There is a lack of public awareness about the threats of radiation emission from oil and gas activities, laws relating to the same and the role of Atomic energy council to mitigate the threats using nuclear radiation techniques in the economy.

The major challenges[125] of radiation protection in Uganda are;

- Inadequate inspection and monitoring equipment
- Lack of radiation protection and safety laboratories
- Limited office space and equipment space
- Inadequate staffing
- Limited stakeholders and general public awareness about AEC and its roles.

[125]ALNabhani K, Khan F, Yang M (2015) Technologically enhanced naturally occurring radioactive materials in oil and gas production: a silent killer. Process Safety and Environment Protection, PSEP .http://www.psep.ichemejournals.com/article/S0957-5820 (15)00177-9/pdf.

4.2 Oil and Gas Radiation Protection Laws of Nigeria

The oil production, with their potentials for environmental degradation and pollution, were carried out in an uncontrolled manner, leaving a legacy of deterioration of health quality, pollution41 of water resources and destruction of traditional economic infrastructures within communities hosting some of these investments. Prior to the dumping of toxic waste in Koko village, in Delta State, in 1987, there were no institutional arrangements or mechanisms for environmental protection and enforcement of environmental laws and regulations in the country. Following the Koko toxic waste episode, the Federal Government promulgated the Harmful Waste Decree 42 of 1988, which facilitated the establishment of the Federal Environmental Protection Agency (FEPA) (Federal Republic of Nigeria, 1988). This was followed by the National Policy on Environment (FEPA, 1989) which sets out the goals of securing and conserving the quality of the environment for health and wellbeing for the benefit of present and future generations. The passing of the Environmental Impact Assessment (EIA) Act of 1992 (Federal Republic of Nigeria, 1992) brought the core legislation that governs EIA in respect of proposed projects in Nigeria which flows directly from the provisions of the principles of the United Nations Conference on Environment and Development held in Rio de Janeiro, Brazil in 1992. The Act makes it mandatory that before the final decision is taken or approval given for any activity likely to significantly affect the environment, the effect of such activity shall first be taken into account. The Act also provides, among others, the promotion of implementation mechanisms at the federal, state and local governments; Any person or community to be affected directly or remotely shall be notified and there shall be “consultations” which means that the person or community affected shall have a say in the final decision of FEPA42. This is the trend of the Nigerian law after the impacts of the oil.

4.3 Oil and Gas Radiation Emission Protection Laws of GHANA

In June 2007, Ghana officially announced oil and gas discovery in the western part of the country.[126] The primary institution established to ensure environmental protection in Ghana is the Environmental Protection Agency, (EPA), created under the Environmental Protection Agency Act, Act 490 of 1994. The policy direction of the Agency is contained in the Environmental Assessment Regulations, LI 1652. These two legislations empower the Agency to manage, control and monitor compliance of environmental regulations by specific industries. The laws require all companies whose operations affect the environment to register with the Agency for clearance and approval of projects[127]. This is essential to the environmental protection. A leaf to pick from Ghana environmental protection is the distribution of agency to every district so as to monitor compliance.[128]

4.4 Oil and Gas Radiation Emission Protection Laws in Egypt

Egypt is dependent on oil and gas as the main sources of energy with the development engines utilizing more than 90% of its energy needs from oil and gas.[129] Due to major recent discoveries, natural gas is likely to be the primary growth engine of Egypt's energy sector for the foreseeable future. Foreign oil companies began more active exploration for natural gas in Egypt beginning in the early 1990s, and very quickly found a series of significant natural gas deposits in the Nile Delta, offshore from the Nile Delta, and in the Western Desert.

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[126]United States Agency for International Development (USAID), *Productive Resource Investments for Managing the Environment in Western Uganda Region* (2007), 2.
[127] ibid
[128] Ibid
[129]Nadia Helal, *Annual Forum of the International Decommissioning Network (IDN) Vienna, Austria 5-7 December 2017*. Project Proposal for Decommissioning of NORM Facilities With Emphasis to Oil and Gas Industries: a Typical Example of NORM Affected Industry in Egypt

Egypt's natural gas sector is expanding rapidly with production having more than doubled between 1999 and 2003 and tripled by 2007, giving a good chance for export. From this point came the importance of controlling offshore health and safety aspects in Egypt. The production sites in Egypt include Eastern Desert, Sinai, Western Desert and Gulf of Suez, the northern part of the Red Sea, where 90% of the Egyptian oil exploration and production activities. These areas are considered a significant source of environmental contamination with TE-NORM[130].

Management of NORM in Egypt

Egyptian Nuclear& Radiation Law

- The Egyptian Nuclear and radiation Law No. 7 of 2010 was promulgated on March 29th, 2010.
- The Law no. 7 of 2010 established an independent body known as "Egyptian Nuclear & Radiological Regulatory Authority (ENRRA)",
- Article (2) of the law states that: "The RB shall carry out all regulatory and control works related to treatment of natural radioactive materials naturally occurring from oil extraction or ores production".
- The law regulates the decommissioning of nuclear facilities. The law has legal arrangement for a financing mechanism covering decommissioning.
- The legal system in Egypt covers all aspects for non-radioactive materials parts of decommissioning. The legal framework for implementing safeguards cover nuclear activities including decommissioning

[130] ibid

National NORM Guidance

- Egyptian Atomic Energy Authority has asked the radiation protection advisory committee to provide advice on NORM
- In 1999: Pet (1) was issued to meet Atomic Energy Authority 'requirements for site categorizations.
- In 2006: PET (1) has been updated to PET(2).

Regulations and Regular Inspection are implemented in Egypt's oil and gas exploration sector.

Current Situation in Egypt

- There is an established system of regulations specified for NORM operations, residue and wastes.
- There is a national waste management facility.
- The facility is operated by EAEA
- The national regulation on NORM is based upon IAEA safety standards.
- There are decontamination facilities specifically for items contaminated with NORM.
- In the interim NORM wastes stored at the operator's site in accordance with requirements defined by the regulator.
- Wastes requiring clearance from the site are monitored, analyzed and comply with release criteria defined by the regulator prior to release.

Challenges

- Lacking of a facility authorized to accept NORM waste for treatment and disposal.
- No inventory for NORM legacy sites.

- Legacy sites require be identifying and investigating during the radiological hazard assessments of each NORM industry.
- No decommissioning strategy (plan) for oil and gas NORM facilities

Egypt at Annual Forum of the International Decommissioning Network (IDN) Vienna, Austria 5-7 December 2017**,** proposed Decommissioning of NORM Facilities with Emphasis to Oil and Gas Industries: a Typical Example of NORM affected Industry in Egypt[131].

4.5. Conclusion

The above comparison between Uganda, Ghana and Nigeria revealed all the three nations have no specific oil and gas radiation protection law. The three have national nuclear or Atomic energy law of general application to issues of radiation emission. However Uganda and Ghana rely more on environmental laws. Ghana has well decentralized it enforcement of environmental laws regulating radiation emission standard unlike Uganda that has a centralized system. Egypt is the model example in radiation protection laws, Egypt's Nuclear land Radiation have specific provisions on Radioactive waste management in oil and gas and provides for NORM advise committee on issues of oil and gas exploration. Uganda should bench mark with Ghana in decentralizing it environmental laws that integrate radiation emission and Egypt in updating its Atomic Energy laws and regulations to specifically address peculiar oil and gas radiation emission processes.

[131] ibid

CHAPTER FIVE:

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter presents the summary on the findings. The summary gives an overview of the research from which conclusions and recommendations are drawn in relation to the research. The study was premised on three research, findings are summarized in relation to the study objectives, and literature reviewed. These study objectives are stated below:

1) To examine adequacy and effectiveness of existing national policy, international and regional legal framework that provides for radiation emission standards during the oil and gas exploration and production in the Albertine Graben
2) To compare Uganda's radiation protection and management of radioactive waste with other jurisdictions in oil and gas exploration and production.
3) To give recommendation in relation to gaps existing in radiation protection laws in the oil and gas production and exploration in Albertine Graben.

5.1 Summary of Findings

5.1.1 Adequacy and effectiveness of existing policy and legal framework that provides for radiation emission standards in oil and gas exploration in Uganda

The findings suggest Uganda is expected to start the process of commercial oil and gas production at least by 2020. This follows the discovery of oil deposits worth about 3.5 billion barrels. In the course of this study it was found that the oil industry of Uganda has reached the midstream stage. This is a stage of development and production, storage, distribution and marketing. The ongoing stage now is development of structures and facilities for commercial production. The main of these is the plan to construct a refinery.

The study established that the oil and gas exploration and production process involves a number of activities which have adverse implications for environment in particular radiation emissions. These activities include exploration surveying; exploration drilling; appraisal; development and production; transportation of oil and gas; storage and site decommissioning and rehabilitation. However, radiation emission resulting from these activities is an actual threat considering Uganda has no specific law to regulate it in the oil and gas sector. This implies these processes of oil exploration are not properly managed under a specific radiation emission legal regime. Consequently exposures to ionizing radiation from the oil and gas activities are already affecting the environment. These are manifested in public health impacts such cancers through atmospheric/ air pollution; soil/ terrestrial pollution; degradation of the aquatic environment.

The study found Uganda has ratified a number of international binding and non-binding statutes on radiation emission. These include radiation convention and International Atomic Energy Agency statute among others. However locally there isn't a specific radiation emission law regulating oil and gas activity. The study established that Uganda instead has thorough policy and legislative petroleum and environmental law regime through which some international radiation emission safety standards are domesticated or integrated. These laws are composed of international and regional binding and non- binding instruments which Uganda has ratified, and national enactments and regulations. Findings further established that existing Petroleum exploration and environmental laws and Regulations especially on environmental standards need to be updated to meet radiation emission standard particularly in oil and gas exploration.

The study also established through literature that policy and environmental laws through which radiation emission standards are integrated are not fully enforced and complied to. Previous studies

reviewed in context radiation emission as an environmental threat revealed that So far, the performance of the actors as regards environmental law compliance is not desirable. Though some progress was made for example by formulating the Environmental Sensitivity Atlas for the Albertine Graben; Albertine Graben Monitoring Plan and conduct of EIA and SEA, there is still a lot to be desired. Weaknesses stem right from the government which is being too slow in enacting new required laws and Regulations and/or updating existing ones. There is also a problem with implementation of EIA as baseline studies and reports prepared by operators are still facing a lot of criticism. Also the multi-Sectorial monitoring system proposed is not operating to the required standards due lack of clarity of duties and responsibilities especially as between the central government sectors and local governments. The oil companies have also not yet published their waste management plans, something which still poses a big problem to radiation emission safety standards. Therefore radiation emission threat is a reality in the Albertine Graben due to poor enforcement and non-compliancy with existing environmental laws, lack of specific law on oil and gas radiation emission standards

5.1.2 Comparative Analysis of Uganda, Egypt and Ghana's radiation protection laws in oil and gas exploration and production.

Findings revealed that Uganda has no specific radiation emission laws for oil and gas exploration. The Atomic Energy Act is the main law regulating nuclear energy use and radiation related issues. However, this Act does not specifically provide for oil and gas radiation emission safety standard. It is a generic law on issues of radiation emission.

Uganda ratified a number of international laws on radiation emission standard such as International Atomic Energy Agency statute, the Radiation emission convention among other that are integrated

in the national legislative framework of environmental laws. It is these environmental laws that are being used to regulate radiation emission in the oil and gas activity sector. However Uganda faces enforcement and compliancy issues in implementation of these laws in relation to radiation emission which is a prevailing threat.

Ghana is another oil producing country with similar characteristics like Uganda. Ghana has no specific law on oil and gas radiation emission but rather integrated radiation emission in existing environmental laws. The danger of this is that unique characteristics of oil and gas radiation emission emanating from various stages and activities may go unregulated and unnoticed just like in Uganda. The primary institution established to ensure environmental protection in Ghana is the Environmental Protection Agency, (EPA), created under the Environmental Protection Agency Act, Act 490 of 1994. The policy direction of the Agency is contained in the Environmental Assessment Regulations, LI 1652. These two legislations empower the Agency to manage, control and monitor compliance of environmental regulations by specific industries including oil and gas. The laws require all companies whose operations affect the environment to register with the Agency for clearance and approval of projects· This is essential to the environmental protection and is similar to Ugandan laws of licensing oil companies. A leaf to pick from Ghana environmental protection is the distribution of agency to every district so as to monitor compliance. Uganda has centralized environmental protection agency that doesn't reach the grass roots. Monitoring and supervision of environmental matters in oil and gas has consequently suffered setbacks leaving public susceptible dangerous radiation emission from oil activities

Egypt on the other hand is the leading example in oil and gas environmental regulation in particular radiation emission standards. Like Uganda and Ghana it has no specific law on oil and gas radiation

emission but has a law on Nuclear and Radiation, which provides for radiation safety standard in oil and gas. The Law no. 7 of 2010 established an independent body known as “Egyptian Nuclear & Radiological Regulatory Authority (ENRRA)”,

Article (2) of the law states that: “The RB shall carry out all regulatory and control works related to treatment of natural radioactive materials naturally occurring from oil extraction or ores production”.

Regulations and Regular Inspection are implemented in Egypt’s oil and gas exploration sector.

Egypt has national guidance on TE, NORM. The Egyptian Atomic Energy Authority has asked the radiation protection advisory committee to provide advice on NORM from oil and gas activities.

However like Uganda and Ghana Egypt has no decommissioning strategy for oil and gas NORM facilities. Egypt at Annual Forum of the International Decommissioning Network (IDN) Vienna, Austria 5-7 December 2017**,** proposed Decommissioning of NORM Facilities with Emphasis to Oil and Gas Industries.

5.2. Conclusion

The recent discovery of commercial oil in Uganda signaled prospects of rapid social economic development. It has been revealed in this study that oil exploration process is a potential radiation emission threat to the public in surrounding areas. Radiation emission resulting from oil activities has not been given enough emphasis and there is little local research on the problem. Uganda has enacted numerous laws to regulate oil and gas production; however there is no specific oil and gas radiation emission safety standards law. Radiation emission as an oil and gas environmental threat has been left to regulation by generic environmental and petroleum laws. Uganda has the Atomic

Energy Act though has no specific provision for oil and gas radiation emission safety standard, it is a general purpose Act on issues of Nuclear energy and radiation. The study established that the Petroleum Act 2013 and Environmental Laws domesticate some radiation emission standards in a generic way in particular waste management and pollution measure to address radiation emission in oil and gas. However previous researchers have revealed there is no environmental law compliance in Uganda's oil sector. This because of the failure to fulfill the above underscored standards. Firstly the EIA conducted has been criticized for lacking full appreciation of the problem (Radiation emission) and full public participation.

In comparison with other African Countries Uganda, Ghana and Egypt have no specific radiation protection law for oil and gas activities. However Uganda can learn from Ghana to decentralize its enforcement mechanism to local government levels and allow for participation of local people. Egypt has like Uganda has nation nuclear and radiation law; unlike Uganda this law has specific provisions for pollution and waste management in oil and gas. It provides for regular inspection and supervision of oil and gas process and national advice for TE, NORM from oil and gas activities. Uganda should consider learning from Egypt and Ghana if it is to respond to radiation emission in oil and gas which is a reality now.

5.3. Recommendations

Strengthening Existing legal, policy and institutional frameworks and Enacting New Laws.

There is need to enact new Oil and Gas regulations that contain new regulatory requirements and standards for radiation emission in oil and gas exploration and production; The Atomic Energy law should have specific regulations for oil and gas radiation emission in the exploration area.

Existing Environmental laws should establish clear waste management planning in oil and Gas processes

Waste Management strategy in oil and gas is crucial. Uganda has no clear waste management plan in regard to radiation protection in oil and gas management. It has been revealed that one of the major challenges to radiation safety compliance in Uganda's oil and gas sector is due to poor waste management. Hence there is need to develop an oil and gas waste management plan identifying anticipated solid and liquid waste streams and addressing determination, inspection and waste minimization procedures, storage locations, and radiation safety waste-specific management and disposal requirements.

Uganda should benchmark and adapt Egypt's waste management strategy. NEMA should establish a NORM waste management site. Where Wastes requiring clearance from the site are monitored, analyzed and comply with release criteria defined by the regulator prior to release. Ensure that NORM wastes stored at the operator's site in accordance with requirements defined by the regulator in the Law.

Oil exploration processes should adopt environmentally sound technology

Finding revealed the oil and gas technology used in the oil exploration is main cause of radiation emission at various levels. This study recommends utilization of efficient and Environmentally Sound oil drilling Technology. Environmentally sound technologies protect the environment, are less polluting, use all resources in a more sustainable manner. Environmentally sound technologies in the context of radiation are "process and product technologies" that generate low or no waste, for the prevention of pollution. They also cover "end of the pipe" technologies for

treatment of pollution after it has been generated. We recommend inspection of oil exploration technologies by experts in oil and gas exploration before licenses are given.

Intensifying Advocacy by Civil Society Organizations

Environmental Civil society organizations should intensify radiation emission activism ensuring that oil exploitation activities are undertaken in a manner that is consistent radiation safety standard in national policy and legislation in Uganda. CSOs need to also build capacity for public to get involved in advocacy for radiation emission standards in the oil and gas exploration area. Where there a criticism by a CSO the government should feel advised rather than insulted, and the recommendations should be implemented.

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APPENDICES

Appendix 1: Documentary Review Check List

- ✓ The Constitution of Republic of Uganda 1995 Amended
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Appendix II: Map of Albertine Region