



Report Type: Upstream Exploration

Geological Prospectivity of Blocks Offered in Nigeria's 2025 Oil and Gas Licensing Round

Prepared by the African Energy Research Unit

AFRICAN ENERGY RESEARCH SERIES
Volume 01 | March 2026
AER-PB-2026-001

CERTIFICATION PAGE

This report is certified as original research work conducted by African Energy Research (AER) in accordance with approved research standards, methodologies, and ethical guidelines.

Lead Researcher: Overcomer Efanga

Signature & Date:  13/01/2026

Program Lead: _____

Signature & Date: _____

Scientific Review Approval: _____

Signature & Date: _____



DECLARATION

This research report has not been submitted to any other institution for any purpose and all sources of data and references have been duly acknowledged.

aser

ACKNOWLEDGEMENTS

The authors acknowledge contributions from industry experts, regulators, institutions, and AER research staff who supported data collection, review, and analysis.



TABLE OF CONTENTS

Title page

Certification page

Declaration

Acknowledgement

Table of content

List of figures

List of Acronyms & Abbreviations

Executive Summary

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

1.2 Problem Statement

1.3 Aim and Objectives of the Study

1.4 Research Questions

1.5 Scope of the Study

1.6 Significance of the Study

CHAPTER TWO: LITERATURE REVIEW

2.1 Conceptual Review

2.2 Theoretical Framework

2.3 Empirical Review

2.4 Knowledge Gaps Identified

CHAPTER THREE: METHODOLOGY

3.1 Research Design

3.2 Data Sources

3.3 Data Collection Methods

3.4 Analytical Tools and Models

3.5 Assumptions and Limitations

3.6 Ethical Considerations

CHAPTER FOUR: DATA PRESENTATION & ANALYSIS

4.1 Data Description

4.2 Analysis and Interpretation

4.3 Key Findings

CHAPTER FIVE: DISCUSSION OF RESULTS

5.1 Interpretation of Findings

CHAPTER SIX: CONCLUSIONS & RECOMMENDATIONS

6.1 Conclusion

6.2 Recommendations

6.3 Areas for Further Research



LIST OF FIGURES

Fig.2.1 Location of Blocks for the 2025 Licensing Round (Niger Delta Basin)

Fig.2.2 Location of Blocks for the 2025 Licensing Round (Benin Basin)

aeer

LIST OF ACRONYMS & ABBREVIATIONS

NUPRC	Nigerian Upstream Petroleum Regulatory Commission
PPLs	Petroleum Prospecting Licenses
PIA	Petroleum Industry Act
FDI	Foreign Direct Investments
FPSOs	Floating Production, Storage and Offloading Vessels
IEA	International Energy Agency
NEITI	Nigerian Extractive Industries Transparency Initiative

Executive Summary

The 2025 Oil and Gas licensing round, launched by the Nigerian Upstream Petroleum Regulatory Commission (NUPRC) on December 1, 2025, offers 50 Petroleum Prospecting Licenses (PPLs) with varying geological prospectivity across onshore, shallow-water, frontiers and deep-water terrains. This initiative, aligned with the Petroleum Industry Act (PIA) 2021, seeks to attract \$10 billion in foreign direct investments (FDI), add up to 2 billion barrels of oil equivalent to national reserve, and increase production by approximately 400,000 barrels per day once fully developed. The round emphasizes a mix of mature, proven basins like the Niger Delta offering high prospectivity with estimated potential of 100-500 million barrel of oil equivalent per block and exploration, and underexplored frontier region such as the Chad Basin, which presents high-upside opportunities but with lower success rates due to limited data and geological complexities.

The pre-bid conference is scheduled for January 14, 2026 in Lagos, with international roadshows actively promoting the blocks to global investors. Public geological data is limited, requiring data packages (\$10,000-\$50,000 per block) for detailed assessment, including 2D/3D seismic and well logs. Among the offerings, shallow-water blocks like PPL 2A44 contrast with frontier blocks like PPL 901 in the Chad Basin. Investors are advised to prioritize Niger Delta Basins for lower-risk returns, acquire data packages immediately and form consortia to share exploration risk in frontier areas.

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

Nigeria remains Africa's largest hydrocarbon province, with the Niger Delta Basin ranking among the world's most prolific petroleum systems. However, sustained underinvestment in exploration over the past decade, driven by regulatory uncertainty, security challenges, and global energy-transition pressures, has resulted in declining reserves replacement and production growth. In response, the Nigerian Upstream Petroleum Regulatory Commission (NUPRC) launched the 2025 Oil and Gas Licensing Round, offering 50 Petroleum Prospecting Licenses (PPLs) across onshore, shallow-water, deep-water, and frontier basins.

The licensing round is structured under the Petroleum Industry Act (PIA) 2021, which seeks to enhance transparency, fiscal competitiveness, and investor confidence. While fiscal and regulatory reforms are critical, the ultimate success of the licensing round depends fundamentally on geological prospectivity. Understanding the quality of source rocks, reservoir characteristics, trapping mechanisms, and migration pathways across the offered blocks is therefore essential for evaluating exploration risk, expected field size, and economic viability. This study examines the geological prospectivity of the blocks on offer in Nigeria's 2025 licensing round, providing a basin-by-basin assessment relevant to investors, regulators, and policymakers.

1.2 Problem Statement

Despite Nigeria's proven petroleum systems, many recent licensing rounds have struggled to attract sustained exploration capital, particularly for frontier and high-risk basins. Investors face uncertainty regarding the true geological potential of offered acreage, especially where data coverage is sparse and analogs are limited. There is therefore a need for an integrated geological assessment that differentiates low-risk, near-field opportunities from high-risk, high-reward frontier plays within the 2025 licensing portfolio.

1.3 Aim and Objectives of the Study

The aim of this study is to evaluate the geological prospectivity of blocks offered in Nigeria's 2025 Oil and Gas Licensing Round and assess their relative exploration potential across different basins and play types. With the objective of:

- Characterizing the petroleum system elements (source, reservoir, trap, seal, and migration) of the offered blocks.
- Classifying the blocks based on basin type (mature, emerging, and frontier) and associated exploration risk.
- Comparing the geological attractiveness of onshore, shallow-water, deep-water, and frontier blocks.
- Identifying high-prospectivity, low-risk blocks suitable for near-term development.
- Highlighting frontier blocks with high-impact upside potential and key geological uncertainties.

1.4 Research Questions

- What is the geological prospectivity of the blocks offered in Nigeria's 2025 licensing round?
- Which blocks present the most favorable balance between geological risk and potential reward?

1.5 Scope of the Study

This study focuses on a geological evaluation of the 50 PPLs offered in Nigeria's 2025 licensing round. The analysis covers onshore, shallow-water, deep-water, and selected frontier basins, with emphasis on petroleum system elements, play types, and exploration risk. Fiscal, commercial, and geopolitical considerations are discussed only where they directly influence geological evaluation and exploration outcomes. Detailed field-scale reservoir modeling and economic valuation are beyond the scope of this study.

1.6 Significance of the Study

The study provides a geological framework to support investment decision-making in Nigeria's 2025 licensing round. For investors, it reduces geological uncertainty and aids in portfolio screening and risk ranking. For regulators, it offers insights into how geological prospectivity influences bid competitiveness and exploration outcomes.

CHAPTER TWO: LITERATURE REVIEW

2.1 Conceptual Review

Upstream licensing rounds constitute a principal mechanism through which hydrocarbon-producing states allocate exploration and production rights, mobilize capital, and manage geological and above-ground risks (Tordo et al., 2010). In mature petroleum provinces such as West Africa, licensing strategies increasingly reflect a balance between geological prospectivity, fiscal competitiveness, and regulatory credibility, particularly amid declining foreign investment driven by energy transition pressures, security risks, and governance concerns (IEA, 2023).

Nigeria 's 2025 Licensing Round is the third phase of a reform-driven effort to revive the country's upstream Oil and Gas sector after years of declining foreign investment caused by energy transition pressures, security risk and regulatory uncertainty. It builds on the 2024 round, which used a transparent digital bidding system that produced litigation-free awards and earned praise from NEITI for improved governance. The 2025 round offers a mix of blocks. The round emphasizes a mix of mature, proven basins like the Niger Delta offering high prospectivity with estimated potential of 100-500 million barrel of oil equivalent per block and exploration, and underexplored frontier region such as the Chad Basin, which presents high-upside opportunities but with lower success rates due to limited data and geological complexities.

In any upstream licensing round, geological prospectivity is the primary value determinant. Fiscal terms, political risk, and infrastructure only matter if hydrocarbons exist in commercial volumes. Geological prospectivity determines: Probability of discovery, expected field size, speed of the first oil, development complexity, and economic break-even price.

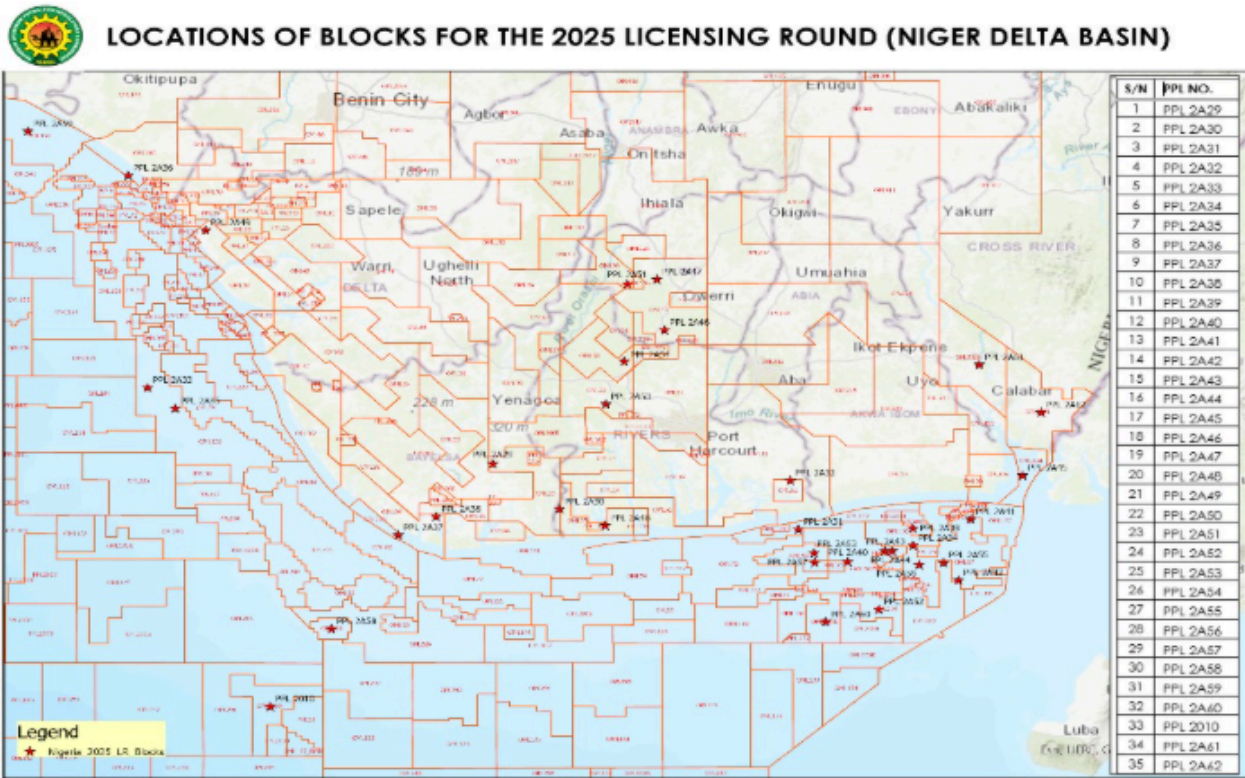


Fig.2.1 Location of Blocks for the 2025 Licensing Round (Niger Delta)



Fig.2.2 Location of Blocks for the 2025 Licensing Round (Benin Basin)

2.2 Theoretical Framework

This study is tied-up in petroleum systems theory and risk-reward portfolio theory. Petroleum systems theory emphasizes the integrated functioning of source rocks, reservoirs, seals, traps, and migration pathways as prerequisites for commercial hydrocarbon accumulations. From an investment perspective, portfolio theory explains how firms allocate capital across assets with varying geological risk, capital intensity, and upside potential to optimize returns under uncertainty.

Nigeria's 2025 Licensing Round reflects this framework by offering a diversified asset mix spanning mature onshore fields, shallow-water extensions, frontier inland basins, and deepwater turbidite plays. This structure enables investors to balance lower-risk, infrastructure-led developments against higher-risk, high-reward frontier exploration opportunities.

2.3 Empirical Review

2.3.1 Geological Characteristics of Offered Blocks

- **Onshore Blocks (PPL 2A29- PPL 2A43: 15 Blocks)**

Located in the mature Niger Delta Basin (Delta, Rivers and Bayelsa states), these blocks exhibit high prospectivity with proven petroleum systems .

-Source rocks: The Akata formation marine shales, rich in Type II kerogen, have been generating hydrocarbons since the Eocene.

-Reservoirs: The Agbada formation sands serve as the primary reservoirs characterized by excellent quality with porosity of 20-30%, and permeability ranging from 500-2000 millidarcies.

-Traps/seals: Structural traps are formed by growth faults, and anticlines, while effective seals are provided by interbedded claystone seals.

-Migration: Hydrocarbons migrate effectively upward along the fault system.

This combination of elements results in a highly favourable and predictable petroleum system, making these blocks among the most attractive in the round for low-risk, high-potential exploration and development. PPL 2A24 lies in the same structural and stratigraphic trends that hosts Oloibiri, Amenam, Ekulama, Bonny and

Membe fields. These fields all share Agbada channel sands, fault-bounded traps, and Akata- sourced oil. This makes PPL 2A44 one of the lowest-risk exploration assets in the entire round.

- **Shallow-Water Blocks (PPL 2A44-2A62, PPL 2010: 19 Blocks)**

The shallow-water blocks are located on the Niger Delta shelf, extending the basin's proven hydrocarbon plays into the offshore environment. The primary source rock is the Akata formation shales (marine Type II kerogen), while reservoirs consist of Agbada formation shelf sands often featured in prominent gas caps. Structural traps are predominantly rollover anticlines formed by growth faults with effective claystone seals. Key advantages include close proximity to existing FPSOs and pipeline infrastructure, enabling rapid tie-backs and reduced evacuation costs.

- **Frontier Blocks (PPL 307-309, 700-703, 800-803, 901-903: 15 Blocks)**

These are underexplored inland basins with speculative prospectivity.

1. PPL 307-309 (Anambra/Bida) featuring intracratonic rift structure with lacustrine shales as the primary source rock and cretaceous sandstone as reservoirs, sealed by fault-block traps.
2. PPL 700-703 (Dahomey) representing western offshore extensions along the Nigeria-Benin border, with the Araromi formation shales serving as the primary source rock. The main reservoirs consist of cretaceous sands while traps are predominantly stratigraphic.
3. PPL 800-803 and 901-901 are situated in the northern Chad and Bida basins, featuring rift structures with lacustrine and marine shale as the primary source rocks and cretaceous sandstones as the main reservoirs, sealed by horst-block trap.

- **Deepwater Block (PPL 900:1 Block)**

Nigeria's deep-water is not a frontier, it is a world- class petroleum province. Major discoveries include: Agbami, Bonga, etc. These fields produce from submarine fan

turbidite reservoirs which have very high porosity, thick stacked sand packages and large area extent. Geological characteristics of deep-water Niger Delta are reservoirs (turbidities and sand), source rock(same Akata), traps(stratigraphic pinch-out and structural closure), seals (deep marine shale), migration (long-distance lateral migrations). Deepwater blocks have lower probability than shallow-water but much larger price sizes.

PPL 900 is a deep-water offshore block in the Niger Delta, underlain by the prolific Akata shale source rock. Hydrocarbons are expected to be trapped in Miocene age turbidite sand reservoirs, which are the same type of high-quality reservoirs that host major fields such as Agbami and Bonga. The block contains both stratigraphic and structural traps, giving it strong geological potential. While development costs are high due to deep-water drilling and subsea infrastructure requirements, the size and quality of potential discoveries makes PPL 900 offers very large upside for investors willing to take on higher capital risk.

2.4 Knowledge Gaps Identified

Despite extensive literature on Niger Delta petroleum systems and West African deep-water exploration, notable gaps persist. Addressing these gaps is essential to evaluating whether reform-driven licensing initiatives can translate geological potential into sustained investment and production growth. The key gaps identified in the existing literature include:

- Limited integration of geological prospectivity with evolving fiscal and licensing reforms, particularly within the context of Nigeria's post-Petroleum Industry Act (PIA) regulatory framework.
- Insufficient evidence on the influence of digital licensing transparency on investor risk perception, bidding behavior, and capital allocation decisions.

CHAPTER THREE: METHODOLOGY

3.1 Research Design

This study adopts a qualitative–analytical research design grounded in basin-scale geological evaluation and comparative prospectivity analysis. The design integrates petroleum systems analysis with risk-based screening to assess the geological attractiveness of blocks offered in Nigeria's 2025 Oil and Gas Licensing Round. A comparative case-study approach is employed to evaluate blocks across different basin types, mature (onshore Niger Delta), shallow-water, deep-water, and frontier basins, allowing for systematic differentiation of exploration risk and reward profiles.

3.2 Data Sources

Primary data for this study consist of officially released information related to Nigeria's 2025 Licensing Round, including block location maps and acreage descriptions issued by the Nigerian Upstream Petroleum Regulatory Commission (NUPRC). Other data sources include:

- Published geological literature on the Niger Delta, Dahomey, Anambra, Bida, and Chad basins.
- Peer-reviewed journal articles, textbooks, and basin studies on petroleum systems and exploration plays.
- Industry reports from international oil companies, energy consultancies, and multilateral agencies.
- Regulatory and policy documents related to the Petroleum Industry Act (PIA) 2021 and previous Nigerian licensing rounds.

3.3 Data Collection Methods

Data collection involved documentary analysis and technical synthesis of geological, regulatory, and industry materials. Basin-specific information on source rocks, reservoir quality, trapping mechanisms, seals, and migration pathways was extracted from existing studies and integrated with block-level descriptions from the licensing round. Analog field comparisons were used to infer expected play performance where direct subsurface data were limited, particularly in frontier basins. No direct field sampling or proprietary seismic interpretation was conducted.

3.4 Analytical Tools and Models

Petroleum Systems Analysis, focusing on the presence, effectiveness, and timing of source, reservoir, trap, seal, and migration elements.

Play Fairway Analysis, used to compare geological risk across basin types and block categories.

3.5 Assumptions and Limitations

The study assumes that published geological data and analog field information accurately represent subsurface conditions within the offered blocks. It also assumes continuity of petroleum system elements within established basin trends. Limitations include restricted access to proprietary 3D seismic data, limited well control in frontier basins, and the absence of quantitative volumetric or economic modeling. As such, findings are qualitative and indicative rather than deterministic.

3.6 Ethical Considerations

This research relies exclusively on publicly available and ethically sourced secondary data. No confidential, proprietary, or restricted industry datasets were used. All referenced materials are appropriately cited to acknowledge original authors and institutions.

CHAPTER FOUR: DATA PRESENTATION & ANALYSIS

4.1 Data Description

The data analyzed in this research consist of qualitative geological and basin-scale information derived from officially released licensing round documents, peer-reviewed literature, basin studies, and analog field data. The dataset covers 50 Petroleum Prospecting Licenses (PPLs) offered in Nigeria's 2025 Oil and Gas Licensing Round, distributed across four principal geological domains:

- Onshore Niger Delta Basin (15 blocks)
- Shallow-water Niger Delta Shelf (19 blocks)
- Deepwater Niger Delta (1 block)
- Frontier Basins including Anambra, Bida, Dahomey, and Chad basins (15 blocks)

For each category, data describe key petroleum system elements: source rock type and maturity, reservoir quality, trapping styles, seal effectiveness, and hydrocarbon migration pathways.

4.2 Analysis and Interpretation

4.2.1 Onshore Niger Delta Blocks

Analysis indicates that the onshore Niger Delta blocks exhibit the highest geological certainty within the licensing portfolio. The presence of mature Akata Formation source rocks, high-quality Agbada reservoirs, well-defined structural traps, and proven migration pathways significantly reduces exploration risk. The spatial continuity of producing trends and proximity to legacy fields suggest a strong likelihood of modest-to-medium sized discoveries suitable for rapid development. These blocks are therefore interpreted as low-risk, near-field exploration and appraisal opportunities.

4.2.2 Shallow-Water Blocks

The shallow-water blocks extend the Niger Delta petroleum system offshore and retain most of its favorable geological attributes. Reservoirs are predominantly Agbada shelf sands with rollover anticline traps associated with growth faults. The analysis highlights the strategic advantage of these blocks due to existing FPSOs and pipeline infrastructure, which enhances development economics and shortens time to first oil. Geological risk is marginally higher than onshore blocks due to increased structural complexity but remains relatively low by regional standards.

4.2.3 Deepwater Block (PPL 900)

The deepwater block represents a high-capital, high-impact play underpinned by world-class turbidite reservoirs sourced by the Akata shale. Although exploration risk is higher due to drilling depth and development complexity, the potential field size and reservoir quality significantly elevate upside potential. Interpretation suggests that this block aligns with a portfolio strategy targeting large reserve additions rather than near-term cash flow.

4.2.4 Frontier Basin Blocks

Frontier basin blocks exhibit the highest geological uncertainty across the dataset. While analogs from the Muglad and Doba basins indicate the possibility of significant discoveries, limited seismic coverage, uncertain source rock maturity, and sparse well control constrain prospectivity confidence. The Chad Basin blocks, in particular, are interpreted as high-risk, high-reward exploration opportunities requiring extensive data acquisition and patient capital.

4.3 Key Findings

The analysis reveals clear stratification in geological prospectivity across Nigeria's 2025 licensing portfolio. Onshore and shallow-water Niger Delta blocks offer the most attractive balance between geological certainty and development readiness,

making them suitable for risk-averse investors seeking near-term returns. The deep-water block presents impactful upside potential but demands substantial capital and technical capability. Frontier basin blocks carry elevated exploration risk but could unlock significant long-term value if geological uncertainties are resolved. Overall, the licensing round provides a diversified asset mix that enables investors to align exploration strategies with varying risk appetites while leveraging Nigeria's proven petroleum systems.

CHAPTER FIVE: DISCUSSION OF RESULTS

5.1 Interpretation of Findings

The findings of this study directly address the primary objective of evaluating the geological prospectivity of blocks offered in Nigeria's 2025 Oil and Gas Licensing Round. Onshore and shallow-water Niger Delta blocks emerge as the most geologically robust assets, characterized by proven Akata–Agbada petroleum systems, well-established migration pathways, and extensive analog control. These attributes support their classification as low-risk, near-field opportunities suitable for rapid exploration-to-development cycles.

The higher-risk profile of frontier basins identified in this study reflects findings from comparative African basin analyses, which note that intracratonic and rift basins such as Chad and Bida often suffer from uncertain charge timing and limited calibration wells. Similarly, the deep-water Niger Delta results confirms global deep-water literature that characterizes turbidite plays as lower-probability but high-volume targets requiring advanced technical and financial capacity.

Within the broader industry and policy framework, the findings underscore the strategic logic of Nigeria's post-PIA licensing architecture. By offering a diversified mix of mature, deep-water, and frontier assets, the 2025 Licensing Round enables investors to construct balanced exploration portfolios aligned with varying risk preferences. This approach is consistent with global best practices in upstream licensing, particularly in capital-constrained environments shaped by energy-transition pressures. Overall, the study demonstrates that geological prospectivity remains the foundational determinant of licensing round success, shaping both investor behavior and the realization of Nigeria's upstream growth ambitions.

CHAPTER SIX: CONCLUSIONS & RECOMMENDATIONS

6.1 Conclusion

Nigeria's 2025 Oil and Gas Licensing Round represents a major opportunity to reset and strengthen the country's upstream sector through a balanced mix of low-risk and high-impact exploration assets. By offering acreage across the mature Niger Delta, the deep-water offshore, and frontier basins, Nigeria has created a portfolio that can appeal to both conservative investors seeking near-term cash flow and risk-tolerant explorers targeting large reserve additions. Combined with the improved fiscal and regulatory framework under the Petroleum Industry Act, the 2025 Licensing Round positions Nigeria as one of Africa's most competitive and geologically attractive upstream destinations

6.2 Recommendations

Based on the findings derived from Petroleum Systems Analysis, and play fairway evaluation, a set of recommendations is proposed to address the key challenges identified and to enhance future exploration and licensing decision-making. These recommendations include:

- Prioritizing Proven Petroleum Systems for Early Wins
- Portfolio-Based Capital Allocation
- Applying Advanced Subsurface Analytics
- Applying risk-sharing models

6.3 Areas for Further Research

Future research should move beyond qualitative assessments by applying probabilistic basin and play-level risking to estimate chance of success, recoverable volumes, and risk-weighted resources for individual PPLs. In frontier areas such as the Chad, Bida, and Anambra basins, high-resolution seismic reprocessing, basin

modeling, and source rock maturity studies are required to reduce subsurface uncertainty and refine petroleum system understanding. Finally, post-award studies evaluating exploration outcomes, infrastructure constraints, and data accessibility would provide empirical evidence on how geological prospectivity translates into realized discoveries and production growth.

REFERENCES

- Demerais et al. (2017). *Play Fairway Analysis—Methodology and Applications*. AAPG Bulletin.
- Doust, H., and Omatsola, E., 1990, Niger Delta: in Edwards, J. D., and Santogrossi, P. A., eds., *Divergent/passive margin basins*: AAPG Memoir 48, p. 239–248.
- International Energy Agency (IEA), 2023, *World energy investment 2023*: International Energy Agency, Paris, 256 p.
- Nigerian Extractive Industries Transparency Initiative (NEITI), 2024, *Oil and gas industry report: Governance and licensing transparency in Nigeria*: Nigerian Extractive Industries Transparency Initiative, Abuja.
- Nigerian Upstream Petroleum Regulatory Commission (NUPRC), 2024, *Guidelines and information memorandum for the 2025 oil and gas licensing round*: Nigerian Upstream Petroleum Regulatory Commission, Abuja.
- Nigerian Upstream Petroleum Regulatory Commission (NUPRC), 2025, *Block location maps and acreage data for the 2025 oil and gas licensing round*: Nigerian Upstream Petroleum Regulatory Commission, Abuja.
- Petroleum Industry Act (PIA), 2021, *Petroleum Industry Act No. 6 of 2021*: Federal Republic of Nigeria Official Gazette, Abuja.
- Schlumberger, 2019, *Niger Delta petroleum systems*: Oilfield Review, Schlumberger Limited, Houston.
- Tordo, S., Johnston, D., and Johnston, D., 2010, *Petroleum exploration and production rights: Allocation strategies and design issues*: World Bank Working Paper 179, World Bank, Washington, D.C., 92 p.