

**ENHANCEMENT OF PRODUCTION SHARING  
CONTRACTS AND ENTITLEMENT  
STRATEGIES IN MALAYSIAN UPSTREAM  
OIL AND GAS COMPANIES THROUGH  
INTEGRATED SUPPLY CHAIN  
MANAGEMENT**

**SHAIK MOHAMED JAMIL BIN HAJA**

**ASIA e UNIVERSITY  
2025**

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SHAIK MOHAMED JAMIL BIN HAJA

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## ABSTRACT

The oil and gas industry is a cornerstone of Malaysia's economy, contributing approximately 20% to the national GDP. With the dwindling reserves and rising costs, the Madani Vision and the 12<sup>th</sup> Malaysia Plan aims to ensure continuous competitiveness and sustainability of the sector. The Production Sharing Contract (PSC) is the key governing agreement between PETRONAS, as the custodian petroleum resources in Malaysia, and oil companies. PSCs draw conceptual roots from sharecropping theory, principal-agent theory, and economic rent theory. Under the PSC, oil companies receive reimbursement for their incurred expenditures (cost oil) and a portion of the remaining profits (profit oil); collectively, these allocations are referred to as the 'entitlement'. Effective management of PSC entitlement is critical for oil companies to maximise value, attract investment and ensure the sector's long-term sustainability and competitiveness. However, in addition to the persistent challenges such as market volatility and rising production costs, the supply chain disruptions and fragmented processes adds to the challenges that hinder oil companies from fully realizing their entitlement value potential. This breakthrough exploratory study examines how integrating Supply Chain Management (SCM) strategies with PSC entitlement management can enhance operational efficiency, profitability, and strategic outcomes, focusing on upstream oil and gas companies in Malaysia, particularly those operating under PETRONAS PSC. Employing a qualitative exploratory approach within an interpretivist research paradigm, the study uses in-depth interviews with eight senior industry professionals based in Kuala Lumpur, Malaysia. This methodology aligns with the research objectives, allowing a deep exploration of subjective experiences, perceptions, and context-specific insights related to PSC entitlement management and SCM integration. Through rigorous thematic analysis, the study identifies significant opportunities arising from aligning SCM processes more closely with entitlement frameworks, notably improved coordination, reduction of operational silos, and enhanced accuracy in entitlement calculations. This study introduces the ISAC-E model, a practical, strategic framework designed to bridge existing operational and planning gaps and facilitate stakeholder collaboration, within PSC practices. The findings demonstrate that effective SCM integration not only optimizes cost efficiency and operational agility but also substantially improves regulatory compliance, and profitability essential for long-term resilience and sustained growth in the evolving global energy landscape. Ultimately, this research offers oil and gas industry stakeholders an actionable, integrated approach for navigating complex regulatory environments, and market uncertainties, ensuring Malaysia's upstream sector remains robust, competitive, and future-ready.

**Keywords:** Upstream oil and gas, production sharing contract, fiscal system, supply chain management, entitlement, business integration

## **APPROVAL**

This is to certify that this thesis conforms to acceptable standards of scholarly presentation and is fully adequate, in quality and scope, for the fulfilment of the requirements for the Doctor of Business Administration

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## **DECLARATION**

I hereby declare that the thesis submitted in fulfilment of the requirements for the Doctor of Business Administration is my own work and that all contributions from any other persons or sources are properly and duly cited. I further declare that the material has not been submitted either in whole or in part, for a degree at this or any other university. In making this declaration, I understand and acknowledge any breaches in this declaration constitute academic misconduct, which may result in my expulsion from the programme and/or exclusion from the award of the degree.

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A handwritten signature in blue ink, consisting of a large, stylized initial 'S' followed by a horizontal line and a small flourish at the end.

**Signature of Student:**

**Date: 8 September 2025**



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## TABLE OF CONTENTS

<b>ABSTRACT</b>	<b>ii</b>
<b>APPROVAL</b>	<b>iii</b>
<b>DECLARATION</b>	<b>iv</b>
<b>ACKNOWLEDGEMENTS</b>	<b>vi</b>
<b>TABLE OF CONTENTS</b>	<b>vii</b>
<b>LIST OF TABLES</b>	<b>x</b>
<b>LIST OF FIGURES</b>	<b>xiv</b>
<b>LIST OF ABBREVIATION</b>	<b>xvi</b>
<b>CHAPTER 1 INTRODUCTION</b>	<b>1</b>
1.0 Overview	1
1.1 Background of the Study	3
1.1.1 Overview of the Upstream Oil and Gas Industry	3
1.1.2 Upstream Oil and Gas Industry in Malaysia	7
1.1.3 Supply Chain Management in Oil and Gas Industry	12
1.1.4 PETRONAS' Role in Malaysia's Oil and Gas Industry	15
1.1.5 Emerging Issues in Oil and Gas Industry in Malaysia	18
1.2 Problem Statement	18
1.3 Research Questions	24
1.4 Research Objectives	25
1.5 Scope of Study	26
1.6 Justifications for the Study	26
1.7 Definition of Terms	28
1.8 Organization of the Dissertation	32
1.9 Summary of Chapter	33
<b>CHAPTER 2 LITERATURE REVIEW</b>	<b>34</b>
2.0 Introduction	34
2.1 Upstream Oil and Gas Industry & Host Government Agreement (HGA)	34
2.1.1 Upstream Oil and Gas Industry Life Cycle and Risk Allocation	35
2.1.2 Host Government Agreements (HGAs)	45
2.1.3 Emerging Trends in Upstream Oil and Gas Industry	57
2.2 Origin of Production Sharing Contract & Entitlement Management	63
2.2.1 The Origin of the Production Sharing Contract	63
2.2.2 Philosophical Framework of PSC	65
2.2.3 PSC Fiscal Terms and the Impact on Entitlement	71
2.2.4 Entitlement and Revenue Recognition Standards	75
2.2.5 Criticism of PSC and Challenges	76
2.3 Supply Chain Management in Upstream Oil & Gas Companies in Malaysia	81
2.3.1 Definition and Principles of Supply Chain Management	81
2.3.2 SCM Processes in Upstream Oil and Gas in Malaysia	83
2.3.3 Challenges and Complexities in Supply Chain Management	88
2.3.4 Causes of Disintegration of SCM	91
2.3.5 Integrated Supply Chain Managements	93
	vii

2.4	Underpinning Theories Business Integration & Collaborative Strategy	97
2.4.1	Lean Management & Six Sigma	98
2.4.2	Value Chain Management and Agile Methodology	100
2.4.3	Business Process Management (BPM)	100
2.5	Conceptual Framework	103
2.6	Summary of Chapter	105
<b>CHAPTER 3 METHODOLOGY</b>		<b>107</b>
3.0	Introduction	107
3.1	Research Paradigm	107
3.2	Research Design	110
3.2.1	Research Approach	111
3.2.2	Research Method	111
3.2.3	Research Strategy	112
3.2.4	Time Horizon	114
3.2.5	Data Collection and Analysis	114
3.3	Ethical Consideration	121
3.4	Summary of Chapter	122
<b>CHAPTER 4 ANALYSIS AND FINDINGS</b>		<b>123</b>
4.0	Introduction	123
4.1	Revisit of Research Objectives	123
4.2	Data Collection and Analysis	124
4.2.1	Thematic Analysis	124
4.2.2	Triangulation	126
4.3	Interview Participants Profile	126
4.3.1	Self-Reflection from the Interview	136
4.4	Presentation of Findings Using Thematic Analysis Process	137
4.4.1	Thematic Analysis Process	138
4.4.2	Question 1: What Are the Key Issues and Obstacles That Impact the Accuracy and Efficiency of Entitlement Calculation Within the PSC Framework?	138
4.4.3	Question 3: To What Extent Do Internal and External Factors Impact the Accuracy and Efficiency of Entitlement Calculations?	150
4.4.4	Question 3: How Could Integrating Key Departments, Particularly SCM, Into a Unified Model Enhance the Accuracy and Efficiency of Entitlement Calculations? What Strategies Do You Believe Would Be Most Effective in Improving the Entitlement Process?	168
4.5	Summary of Chapter	182
<b>CHAPTER 5 CONCLUSION AND RECOMMENDATIONS</b>		<b>185</b>
5.0	Introduction	185
5.1	Research Objective and Discussion of Results	185
5.1.1	Research Objective 1: To Explore the Current Challenges Faced in Entitlement Calculation	185

5.1.2	Research Objective 2: To Assess to Extend which Internal and External Factors Influence Entitlement Calculation	190
5.1.3	Research Objective 3: To Evaluate Potential Benefit of Integrated Supply Chain Management for Entitlement Optimizations	198
5.1.4	Research Objective 4: To Develop an Integrated Framework to Optimize Entitlement	204
5.2	Contribution of Study	210
5.2.1	Contribution to Practice	210
5.2.2	Contribution to Theory	213
5.3	Limitation of Study and Future Direction of the Research	214
5.4	Conclusion of the Study	217
5.5	Chapter Summary	219
	<b>REFERENCES</b>	<b>220</b>
	<b>APPENDICES</b>	<b>235</b>
	Appendix A: Letter of Invitation to Participate in Interview	235
	Appendix B: Thematic Metrics Table	237
	Appendix C: Sample Transcript (P8)	243
	Appendix D: Literature Review Table	250
	Appendix E: Footnote	256

## LIST OF TABLES

<b>Table</b>		<b>Page</b>
Table 2.1	Summary of Fiscal Terms Components	72
Table 4.1	Research Objectives	124
Table 4.2	Interview Participants Profile	135
Table 4.3	Responses on Cost Control and Recovery (Q1-T1-C1)	140
Table 4.4	Responses on Operational Planning and Budget Alignment (Q1-T1-C2)	141
Table 4.5	Responses on Production Forecasting & Variability (Q1-T1-3)	142
Table 4.6	Responses on Interdepartmental Coordination Challenges (Q1-T1-C4)	143
Table 4.7	Responses on Procurement & Contracting Delays (Q1-T1-C5)	144
Table 4.8	Responses on Vendor and Partner Dependencies (Q1-T2-C1)	145
Table 4.9	Responses on Market Volatility & Price Fluctuations (Q1-T2-C2)	146
Table 4.10	Responses on Scenario Planning and Forecasting (Q1-T3-C1)	147
Table 4.11	Responses on Financial Oversight & Decision-Making (Q1-T3-C2)	148
Table 4.12	System Limitations and Manual Processes (Q1-T4-C1)	149
Table 4.13	Responses on Cultural and Organizational Alignment (Q1-T5-C1)	150
Table 4.14	Responses on Governance and Internal Controls (Q2-T1-C1)	152
Table 4.15	Responses on Internal Coordination (Q2-T1-C2)	153
Table 4.16	Responses on Strategic Planning (Q2-T1-C3)	154
Table 4.17	Corporate Transitions and Governance Delays (Q2-T1-C4)	154
Table 4.18	Responses on Cost Management (Q2-T2-C1)	155
Table 4.19	Responses on Forecasting (Q2-T2-C2)	156

Table 4.20	Responses on Budgeting and Financial Planning (Q2-T2-C3)	157
Table 4.21	Responses on Operational Performance (Q2-T3-C1)	158
Table 4.22	Responses on Production Performance (Q2-T3-C2)	159
Table 4.23	Responses on Project Execution and Timing (Q2-T4-C1)	160
Table 4.24	Responses on Resource Management (Q2-T4-C2)	160
Table 4.25	Responses on Supply Chain Management (SCM) (Q2-T5-C1)	161
Table 4.26	Responses on Procurement and Contracting (Q2-T5-C2)	162
Table 4.27	Responses on External Approvals and Regulatory Delays (Q2-T6-C1)	163
Table 4.28	Responses on Partner Influence and Governance (Q2-T6-C2)	164
Table 4.29	Responses on Investor and Financial Pressures (Q2-T6-C3)	164
Table 4.30	Responses on Operational Uncertainties (Q2-T7-C1)	165
Table 4.31	Responses on Environmental Factors (Q2-T7-C2)	166
Table 4.32	Responses on Procurement and Logistics Delays (Q2-T7-C3)	166
Table 4.33	Responses on Market Dynamics & Pricing Fluctuations (Q2-T8-C1)	167
Table 4.34	Responses on Resource Availability and Competition (Q2-T8-C2)	168
Table 4.35	Responses on Contracting and Budgeting Process Alignment (Q3-T1-C1)	169
Table 4.36	Responses on Integration of SCM and Entitlement Processes (Q3-T1-C2)	170
Table 4.37	Responses on Strategic Vision and Long-Term Partnerships (Q3-T1-C3)	171
Table 4.38	Responses on Internal Communication & Cross-Dept. Coordination (Q3-T2-C1)	172

Table 4.39	Responses on Risk Management and Operational Efficiency (Q3-T2-C2)	173
Table 4.40	Responses on Strategic Planning and Financial Alignment (Q3-T2-C3)	174
Table 4.41	Responses on SCM Process Optimization & Integration with Entitlement Management (Q3-T3-C1)	175
Table 4.42	Responses on Contract Execution Efficiency & Vendor Management (Q3-T3-C2)	176
Table 4.43	Responses on Cross-Functional Coordination & Accountability in SCM (Q3-T3-C3)	177
Table 4.44	Responses on Leadership-Driven Cultural Transformation & Strategic Thinking (Q3-T4-C1)	178
Table 4.45	Responses on Education, Awareness, and Stakeholder Advocacy (Q3-T4-C2)	179
Table 4.46	Responses on Performance Measurement, KPI Alignment, and Progress Tracking (Q3-T5-C1)	180
Table 4.47	Responses on Process Optimization through Technology & Strategic Planning (Q3-T5-C2)	181
Table 4.48	Summary Responses Q1: The Current Challenges Faced in Entitlement Calculation among Upstream Oil And Gas Companies in Malaysia	182
Table 4.49	Summary Responses Q2: Extent to Which Internal Factors and External Factors, Influence the Entitlement Calculation Process	183
Table 4.50	Summary Responses Q3: How Could Integrating Key Departments (Especially SCM) Processes Into a Unified Model Can Enhance	

the Accuracy and Efficiency of Entitlement Calculation? What Strategies Do You Believe Would Be Most Effective in Improving the Entitlement Process?

184

Table 5.1 ISAC-E Model Strategies and Tactics

209

## LIST OF FIGURES

<b>Figure</b>		<b>Page</b>
Figure 1.1	History of Oil Price & Key Events	4
Figure 1.2	PSC Total Royalty vs Total Entitlement	10
Figure 1.3	SCM in Upstream, Downstream and Midstream	13
Figure 1.4	Malaysia Oil and Gas Basin Maps	15
Figure 1.5	Upstream Oil and Gas Companies in Malaysia	16
Figure 1.6	Upstream Oil and Gas Players in Malaysia	17
Figure 2.1	E&P Life Cycle of Oil and Gas Fields	35
Figure 2.2	E&P Life Cycle and Risk	37
Figure 2.3	Different Types of Contractual Arrangements	45
Figure 2.4	Evolution of PSC in Malaysia	51
Figure 2.5	Key Takeaways from Petroleum Development Act 1974	52
Figure 2.6	PETRONAS Portfolio	54
Figure 2.7	Worldwide Government Take for Oil	56
Figure 2.8	Energy Trilemma	60
Figure 2.9	Fiscal Terms	66
Figure 2.10	Key Theories Incorporated into PSC Model	70
Figure 2.11	PSC Total Royalty vs Total Entitlement	73
Figure 2.12	Flow of Material and Services to Upstream O&G Activities	82
Figure 2.13	Arc of Integration	93
Figure 2.14	Conceptual Framework	103
Figure 3.1	Research Onion	109
Figure 3.2	Outline of Research Design	110
Figure 5.1	Challenges in Entitlement Calculation	186

Figure 5.2	Factors Impacting Entitlement Calculation	191
Figure 5.3	Strategies to Improve Entitlement Calculation	199
Figure 5.4	The ISAC-E Model	205

## **LIST OF ABBREVIATION**

EIA	U.S. Energy Information Administration
HGA	Host Government Agreement
JOA	Joint Operating Agreement
PDA	Petroleum Development Act 1974
PETRONAS	Petroleum National Berhad
PSC	Production Sharing Contract
SCM	Supply Chain Management

# CHAPTER 1

## INTRODUCTION

### 1.0 Overview

The upstream oil and gas industry plays a critical role in Malaysia's economy, contributing a significant 20% to the nation's GDP (PwC, 2023). According to the U.S. Energy Information Administration (EIA, 2023), Malaysia is the second-highest producer of petroleum and other liquids in Southeast Asia and the fifth-highest exporter of liquefied natural gas (LNG) globally in 2023. As Southeast Asia leading producers of oil and gas, Malaysia relies heavily on its oil and gas industry to fuel economic activity, secure energy needs, and maintain a prominent position in global energy markets (EIA, 2023). The industry, however, faces increasing complexity in managing Production Sharing Contracts (PSCs), which govern the extraction of resources between governments and oil companies. These contracts involve complex fiscal terms, cost recovery mechanisms, and profit-sharing clauses, all of which directly influences the how much of the oil and gas produced by the oil company would be able to be taken by the oil company, known as entitlement which determines the profitability (Pereira et al., 2023).

The upstream oil and gas industry is also inherently capital-intensive, with increasing operational costs per barrel, presenting significant challenges, especially when oil prices fluctuate (International Energy Forum & S&P Global, 2024)<sup>1</sup>. Accenture report in 2020<sup>2</sup> highlighted that inefficient investments in the oil and gas industry have led to a staggering US\$320 billion in trapped value. Therefore, effective cost management is critical, and this is where Supply Chain Management (SCM) plays a central role to ensure efficient coordination of capital and operational expenditures by strategically managing sourcing, procurement, logistics, and storage (Boston

Consulting Group, 2022). This will ensure timely, cost-effective, and high-quality deliveries of the equipment and services (Jiang et al., 2021). In the Malaysian context, local content requirements by PETRONAS introduce additional complexity to the SCM process, affecting the quality, cost, and timeliness of resources deliveries (Kasahara et al., 2025; Menhat et al., 2019). These challenges, in turn, impact oil companies' ability to optimize their entitlements, which are vital for maximizing profitability.

Oil companies investing in exploration and development activities face significant risks, with returns largely dependent on the terms of the Production Sharing Contract (PSC) with the government or host authorities such as Petronas. Under the PSC model, the oil company bears the majority of the risk, ranging from exploration to abandonment, while the government shares in the profits once hydrocarbons are produced (Pereira et al., 2023). The contractor's share of these profits, referred to as the entitlement, is determined by the fiscal terms outlined in the PSC. The contractor's entitlement share is influenced by various factors such as oil prices, production volumes, and expenditures. Optimizing all these factors, particularly expenditures, is a complex yet crucial task for oil companies to maximize their entitlement and, ultimately, profitability (BCG, 2024).

PSC management also requires managing the stakeholder interests—governments, oil companies, and subcontractors—all of whom have differing priorities (Candeias, 2024). This misalignment often leads to process inefficiency, bureaucratic hurdles, delayed decision-making, and inefficiencies (Masud et al., 2019). In Malaysia, where PSCs are central to the governance of oil and gas resources, these challenges can impact profitability, operational efficiency, and the ability to attract further investment (Pereira et al., 2023).

In this context, the integration of Supply Chain Management (SCM) with PSC entitlement management becomes crucial. As noted by Frohlich and Westbrook (2001) and later carried on by Partyka and Paiva (2024), integration across the supply chain fosters value creation by streamlining operations and aligning data flows. By aligning specific SCM process with PSC management process, companies can reduce inefficiencies, optimize resource allocation, and enhance decision-making processes (Mehmet et al., 2019). Thus, the effective management of SCM is fundamental for upstream oil and gas companies to navigate these complexities and achieve sustainable profitability (Mckinsey & Company, 2023).

Therefore, there is a need for integrated solutions for entitlement optimization and it is heightened by the evolving energy landscape, where oil and gas companies now face growing regulatory pressure, rising operational costs, and the imperative to adopt sustainable practices – the challenges framed by energy trilemma (Oke et al., 2024). With increasing technological advancements, including AI, data analytics and automation, companies have the opportunity to modernize PSC entitlement processes, minimize value leakage, and improve profitability (Eggers, 2024). This study explores these challenges and proposes an integrated approach to PSC entitlement management and SCM in Malaysia's upstream oil and gas sector, aiming to enhance entitlement and operational efficiency.

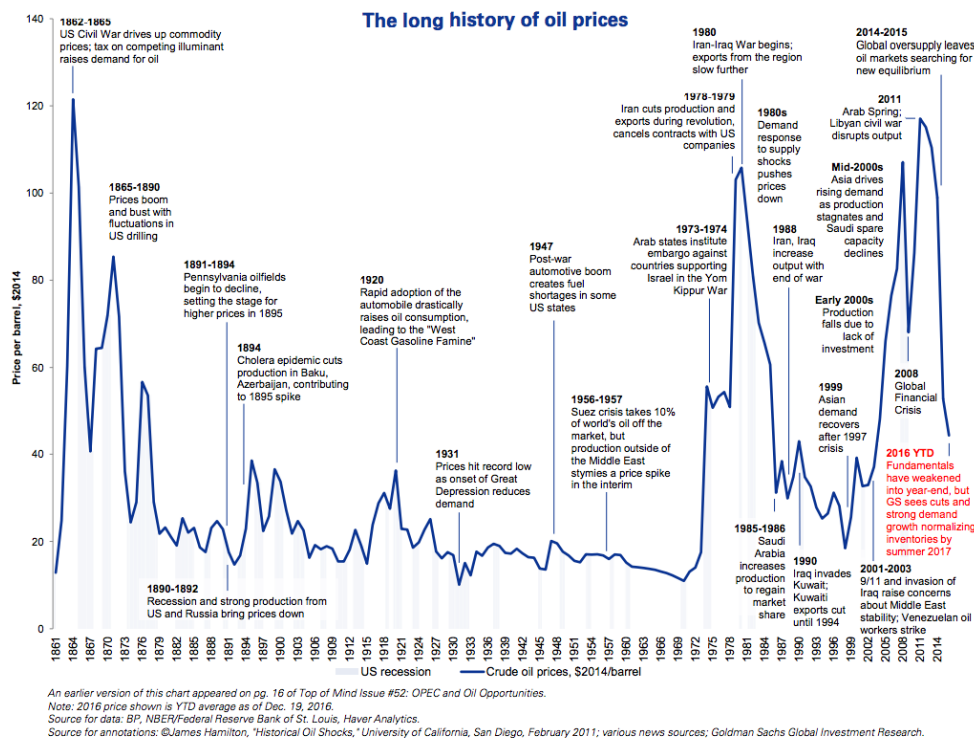
## **1.1 Background of the Study**

### **1.1.1 Overview of the Upstream Oil and Gas Industry**

The global oil and gas industry remains one of the most influential sectors, powering economies and playing a pivotal role in international relations. As of 2020, oil and gas accounted for approximately 53% of global energy need (IEA, 2020). This fuels industries, transportation, and residential energy consumption globally, making the

sector vital for economic activity across both developed and developing nations. United States, Saudi Arabia, Russia, and the Organization of the Petroleum Exporting Countries (OPEC), control 80% portions of the world’s oil supply, dictating prices and production levels through various agreements and policies (EIA, 2023). Notably, five countries – United States, Russia, Saudi Arabia, Canada and Iraq – account for 51% of global crude oil production, as per the US Energy Information Administration (WEF, 2024). These nations, together with leading multinational oil companies, significantly shape the global economy and geopolitics. However, the industry faces substantial challenges, including volatile geopolitical tensions within these oil producing countries and growing environmental scrutiny, both of which impact oil prices and market stability (WEF, 2024).

**Figure 1.1: History of Oil Price & Key Events**



Source: World Economic Forum (2016), 155 years of oil prices - in one chart

As shown in **Figure 1.1** fluctuations in oil prices are driven by a combination of factors, including global conflicts, supply chain disruptions, and shifting demand patterns particularly within these major oil producing countries (EIA, 2023). As oil prices become more volatile, it becomes increasingly difficult to ensure affordable energy access for all, particularly in developing regions where energy infrastructure is more vulnerable to price shocks. Consequently, one of the primary goals for major oil producers is to promote price stability, not only to safeguard their own economic interests but also to ensure the global availability and affordability of energy (Pereira et al., 2020).

With the significance of oil and gas to the global energy mix, the security of supply becomes critical to every nation. As oil and gas remain key sources of energy, particularly for transportation, industry, and electricity generation, disruptions in their supply can have severe economic and social consequences. Global events, such as geopolitical tensions, natural disasters, and technical failures, can affect oil and gas supply chains, leading to price volatility and shortages. Ensuring energy security involves securing reliable access to affordable energy, mitigating supply risks, and enhancing the resilience of energy infrastructure. According to the International Energy Agency (IEA, 2023), energy security is fundamental to ensuring that nations can maintain a stable supply of energy while meeting growing demand, particularly in the face of shifting global energy dynamics and the ongoing transition to renewable sources.

Moreover, the global push toward cleaner energy sources, coupled with the urgent need to address climate change, is prompting the oil and gas sector to rethink its role in the future energy mix. Investments in renewable energy, carbon capture technologies, and sustainability initiatives are now central to many oil companies'

strategies as they navigate the energy transition (McKinsey & Company, 2024). At the same time, evolving regulatory frameworks and government policies worldwide are exerting increasing pressure on these companies to reduce their carbon footprints and adhere to more stringent environmental standards (PwC, 2023; NETR 2023). As the industry faces growing social and political opposition, with heightened demands for stricter regulations and stronger commitments to emission reductions, the challenge of balancing profitability with environmental sustainability becomes even more complex.

These pressures create a dynamic and challenging landscape, where companies must manage the delicate balance between ensuring energy security, achieving environmental sustainability, and maintaining energy equity through global compliance and access to affordable energy. This is the energy trilemma facing the industry today (Carr et al., 2024). In this evolving context, national oil companies and private sector players are reassessing their strategies to enhance operational efficiency, optimize resource management, and secure their future competitiveness (Pereira et al., 2020). The integration of new technologies, digitalization, and sustainable business strategies are becoming increasingly vital to ensure long-term viability (Anaba et al., 2024). The shift towards a more collaborative and risk-sharing approach through frameworks such as Production Sharing Contracts (PSCs) has gained traction to streamline operations, reduce costs, and maximize resource utilization.

Against this global backdrop, Malaysia, as a significant oil and gas producer in Southeast Asia, finds itself navigating these challenges and opportunities. Malaysia's oil and gas industry remains central to its economic stability and energy security, but like the global industry, it faces pressures related to resource depletion, environmental sustainability, and the need for technological innovation (PwC, 2023; NETR 2023)<sup>4</sup>.

### **1.1.2 Upstream Oil and Gas Industry in Malaysia**

The oil and gas industry is the cornerstone of Malaysia's economy, contributing around 20% to the nation's GDP, part of a broader energy sector contribution of 28% (PwC, 2023). Malaysia also plays a pivotal role in the Southeast Asian oil and gas industry, positioning itself as one of the region's leading energy producers and exporters. According to the U.S. Energy Information Administration (EIA, 2023), Malaysia is the second-highest producer of petroleum and other liquids in Southeast Asia and the fifth-highest exporter of liquefied natural gas (LNG) globally in 2023. According to the 2024 Statistical Review of World Energy by Energy Institute, Malaysia's oil production reached 565,000 barrels per day (bbl/d) in 2023, making it the fifth-largest producer in the Asia Pacific region. The natural gas production was approximately 81.07 billion cubic meters (Bcm), maintaining its position as the third-largest natural gas producer in the Asia Pacific region. Additionally, with LNG exports totaling 36.3 billion cubic meters (Bcm), Malaysia ranked as the second-largest LNG exporter in the region

According to the U.S. Energy Information Administration (EIA, 2024) in the Country Analysis Brief: Malaysia (November 12, 2024 update), Malaysia's probable and proven petroleum reserves were estimated at 6.9 billion barrels of oil equivalent (boe), with approximately 61% of these reserves located in Sarawak, 18.8% in Sabah, and the remaining 20.2% in Peninsular Malaysia. These reserves can last up to 15 years (NST, 2023)<sup>5</sup>

Petroleum Nasional Berhad (PETRONAS) was incorporated in 1974 under the Petroleum Development Act (PDA) 1974, which established its dual role as both operator and regulator within Malaysia's oil and gas sector (Bhattacharya & Hutchinson, 2022). PETRONAS sets and enforces standards for upstream activities,