



# Assessing Governance Frameworks for Effective Oversight of Upstream Petroleum Operations: Adopting Best Practices in Tanzania's Sector Governance

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## Abstract

Ineffective governance structures and regulatory practices have continued to affect transparency, accounts, and efficiency in Tanzania's upstream petroleum sector, which makes the sector prone to risks associated with compliance and challenges in governance. The study aims to evaluate the impact of governance structures and best practices to the oversight of the country's upstream petroleum sector. This study was guided by Agency Theory, which focuses on monitoring and accountabilities between regulators and operators, and Institutional Theory, which focuses on Legitimacy and Best Practices based on global standards. A cross-sectional research design and approach based on a quantitative strategy was used employed. 328-sample size were sought from various organizations in Tanzania. Semi-structured questionnaire instrument was used as data collection methods. GLM to control for regression was adopted for data analysis. The results show highly positive relationship between governance structures and oversight effectiveness in Tanzania's upstream petroleum sector with  $\rho$  of 0.747,  $p < 0.01$  and a highly positive relationship between Best Practices and oversight effectiveness in Tanzania's upstream petroleum sector with  $\rho$  of 0.686,  $p < 0.01$ . GLM tests showed both governance structures ( $\beta = 0.512$ ,  $p < 0.001$ ) and Best Practices ( $\beta = 0.427$ ,  $p < 0.001$ ) have positive influences on oversight effectiveness in Tanzania's upstream petroleum sector and explained a total joint percentage of 62%. Study concluded that effective governance structures and Best Practices have played a crucial role in oversight effectiveness in Tanzania's upstream petroleum sector. It recommends the improvement of the regulatory clarity, coordination of institutions, engagement of stakeholders, capacity enhancement, and technology-enabled monitoring of sustainable upstream petroleum governance in Tanzania.

*Keywords:* Governance frameworks, upstream petroleum sector, effective oversight, Tanzania

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## 1. Introduction

Across the world, oil and gas-producing countries remain fraught with management issues which affect sustainable development (Bishoge et al., 2018). In the Russian Federation, the Corruption Perceptions Index report of 2024 placed the country at position 154 among the 180 countries analyzed, with a score of only 22 points, defining serious problems of corruption and poor management (Transparency International, 2025). On the other hand, the continuity of the management problems within the oil and gas industry in the Pakistani administration is evident, being ranked 135th place in the world among the 180 countries in the 2024 Corruption Perceptions Index, which highlights lack of transparency and accountabilities, corruption, and poor management in curtailing the regulation of resources (Global Voices, 2025; The Express Tribune, 2025). In these cases, it can be seen that resource-rich countries face the same challenges in balancing resource extraction and proper control, despite being resource-endowed. Other African countries with natural resources also present similar problems. Despite the implementation of reforms in Nigeria, Africa's biggest oil producer, such as the Petroleum Industry Act, it has been bedeviled by corruption, leakages in revenue, and environmental mismanagement (Reuters, 2025). Angola also introduced reforms in its petroleum industry with the support of the World Bank; however, state capture and weak accountability mechanisms still remain at large (World Bank, 2024). These experiences indicate that governance gaps in petroleum industries are a continental problem that has impacted adversely on transparency and accountability for socio-economic developments.

The problem in Tanzania is also realistic, such as the governing institutions that oversee the upstream petroleum sector include the Ministry of Energy, Petroleum Upstream Regulatory Authority (PURA), and the Tanzania

Petroleum Development Corporation (TPDC). However, challenges such as a lack of transparency for licensing, under-disclosure of contracts, underenforcement of environmental and social impact studies remain (Malya & Mwangi, 2025; Natural Resource Governance Institute, 2021). Additionally, the Tanzanian oil and gas sector was ranked 55/100 in the Resource Governance Index for 2021, classified under “weak” performance, indicating that strong oversight remains a challenge despite the presence of governing institutions (NRGI, 2021). Notwithstanding all these reforms, institution building, improvement of transparency, and revenue disclosure, managing the Tanzanian upstream petroleum sector remains inadequate despite the measures. This gap remains a challenge of a lack of empirical mechanics between governing institutions such as regulatory translucency, roles, openness, and oversight towards implementing best practice methods such as involvement, comparison, and application (Malya & Mwangi, 2024, 2025; NRGI, 2021). The problem is solved through this research study that uses a cross-sectional quantitative research design approach for exploring the mechanics between governing mechanisms for best practice methods for effective management of the Tanzanian upstream petroleum sector. The research results present evidence for providing recommendations for improvement of management.

The general objective is to assess governance frameworks for effective oversight of upstream petroleum operations by adopting best practices in Tanzania’s sector governance. While specific objectives are: To examine the influence of governance frameworks on the effective oversight of upstream petroleum operations in Tanzania. And to assess the effect of adopting best practices in sector governance on the effective oversight of upstream petroleum operations in Tanzania.

## **2. Literature Review**

### **2.1. Theoretical Review**

#### **2.1.1. Agency Theory**

Agency Theory, as initially developed by Jensen and Meckling (1976), analyzes the relationship between principals (shareholders or public authorities) and agents (operators or managers) with regard to the challenges that stem from conflicting interests and information asymmetry. Agency Theory presumes that, for aligning the agent's interest with that of the principal, there has to be monitoring, formal rules, incentives, and accountability systems. Agency Theory guides the governance structures, as the variables of this study which is assessed by indicators such as regulatory transparency, institutional coordination and roles, systems of transparency and accountability, and monitoring and evaluation capability. In particular, these address the complexities that exist within the oil industry in Tanzania, which is governed by several institutions. Non-management and/or malperformance within the industry can be on the high side. Some literature has utilized the theory within the public and extractive sectors on the factors that improve performance through institutionalized governance frameworks (Hendrastuti & Harahap, 2023). The power of Agency Theory lies in the fact that theory provides a direct link between governance mechanisms and measurable outcomes, which provides a sound basis to clarify the petroleum industry dynamics. But theory has the disadvantage of only specifying formal rules and incentives, which might overlook external pressures and the overall institutional environment.

#### **2.1.2. Institutional Theory**

Institutional Theory, in an extension of DiMaggio and Powell (1983), claims that organizations adopt formal structures, norms, policies, and best practices to achieve legitimacy, adapt to social expectations, and enhance operational effectiveness. This theory emphasizes the variable of best practices adopted in this study, and theory is reflected in conformity to international standards, stakeholder engagement and inclusivity, capacity building and knowledge transfer, and technology and system use. These indicators fill gaps in Tanzania's upstream petroleum governance, where the use of globally accepted practices and inclusive processes can improve legitimacy as well as effectiveness in regulation. New applications of Institutional Theory within extractive industries have demonstrated the ability of conformity to global norms and best practices to enhance sectoral performance and institutional credibility (Brammer et al., 2012; X. Zhang et al., 2024). Institutional Theory has been very effective in dealing with the pressures of the outer environment in regard to organizational behavior. It complements Agency Theory because of its ability to capture concepts in a way rules are not able to. However, the drawback to Institutional Theory is that theory may ignore agency at the individual level.

While integrating the Agency Theory and Institutional Theory, the study offers a complete paradigm in which the role of governance structures and the adoption of best practices simultaneously determine the role of effective oversight in the upstream oil activities in the Republic of Tanzania. The Agency Theory explains the procedures of the governance structure within, the process of monitoring, as well as the process of being accountable, while the Institutional Theory explains the demands from the outside in regard to legitimacy, best practices, and the institution’s interaction with the stakeholders.

## 2.2. Empirical Review

### 2.2.1. Governance Frameworks

Governance frameworks of relevance to the upstream oil and gas industry play a vital role in ensuring transparency, accountability, certainty of regulation, and institutional coordination. Cross-national empirical evidence can be provided as to how such studies contribute to enhanced performance and sustainability. A study by Shah et al. (2022) built an oil and gas corporation's green governance structure that included sustainability practice, green board committees, and enterprise risk management and concluded that effective governance structures improve performance and bring competitive benefits. Similarly, Emeka-Okoli et al. (2024) examined the impact of corporate governance on CSR strategy and focused on the role of board oversight and stakeholder engagement in promoting sustainability and efficiency. Such research forming the basis, insights from Tanzania-specific research focus on country-level issues and opportunities. Gabagambi and Longopa (2022) examined the institutional and legal frameworks that control Tanzanian oil and gas resources, concluded overlapping powers and coordination problems between Zanzibar and Mainland Tanzania and suggested harmonization of legislation and autonomous institutions. A case study on Tanzania's local content policy and framework within the upstream gas industry was conducted by Chuwa (2024) to establish the efficacy of the policy and framework. This discussion highlights the imperative of having effective governance frameworks in Tanzania, with such frameworks underpinned by global frameworks and initiatives such as ISO 37000:2021 (i.e., Organization governance guidance, guiding principles and practices for effective governance), guidelines on the Corporate Governance of State-Owned Enterprises adopted by the Organisation for Economic Co-operation and Development (OECD Guidelines for the Corporate Governance of State-Owned Enterprises), and the Extractive Industries Transparency Initiative (EITI), all of which promote greater transparency and integrity within the resource extraction sector.

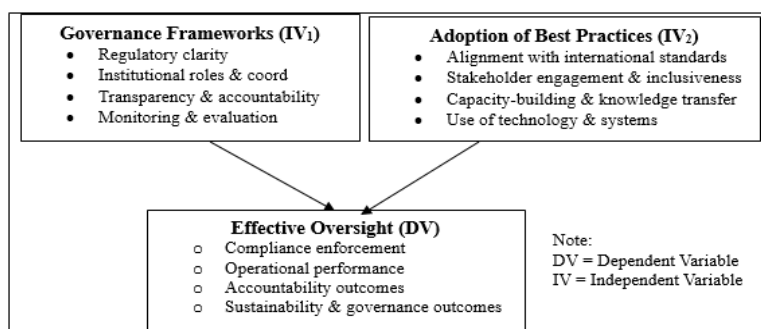
### 2.2.2. Adoption of Best Practices

Best practice implementation will help in ensuring that organizational activities conform to accepted best practice, as well as concurring with globalization, best practice, and sustainability principles. Globally, literature shows that institutional pressure, as well as managers' attitudes, have a significant impact on best practice implementation, especially in incorporating sustainable best practice. Abedin et al. (2024) conducted a study on managers' attitudes on sustainable best practice implementation in the oil & gas industry, specifically on the importance of being mindful of different institutional & managerial perspectives. Zhang et al. (2024) explained the substantial impact of institutional pressures & market pressures on green transformation, especially in terms of institutional logics on organizational behavior. Chuwa and Perfect-Mrema, (2024) evaluated local content policies in the Tanzania upstream gas sector and concluded that, in Tanzania's case, the existence of policies is complemented by weaknesses in enforcement and capacity, thus undermining the proper application of best practices. The complementarities observed here show that engagement, alignment with the best practices in international organizations, capacity-building, and technology use are very important in the upstream petroleum sector in Tanzania for the proper application of best practices in this sector. Global Best Practices and frameworks, such as: ISO 9001:2015 – Quality Management Systems – that can be applied by organizations generally with the purpose to improve customer satisfaction and legal compliance. ISO 14001:2015 – Environmental Management Systems – that can help organizations to improve environmental performance by assessing activities' impact on the environment. ISO 45001:2018 – Occupational Health & Safety Management Systems – with the purpose to provide healthy & safe workplaces. The Global Reporting Initiative – guide to help organizations in following the principles on operational efficiency, sustainability, and best practices in reporting.

## 2.3. Conceptual Framework

The conceptual model assumes that Governance Frameworks and Best Practice Adoption have a positive impact on Effective Oversight. Governance Frameworks are quantitative variables that examine regulations, institutions, coordination, transparency, accountability, monitoring, and evaluation, making the process structured, accountable, and clear. Best Practice Adoption is quantified based on measures of ability to adapt to global standards, inclusiveness, capacity building, knowledge, and use of technology, yielding results for higher efficiency and sustainability.

Overall, the outcome measure, is quantified by measurement against compliance enforcement, operations performance, accountability outcomes, and governance sustainability. Agency Theory and Institutional Theory are embedded in the model to explain how practices and governance determine good sector oversight.



**Figure 1:** conceptual framework

### 3. Methodology

This study employed cross-sectional research design and a quantitative approach to investigate the impact of governance arrangements and best practice adoption towards effective control in Tanzania's upstream petroleum sector (Creswell & Creswell, 2018; Kothari, 2016; Lelissa, 2018). The study was conducted in Dar es Salaam City, where offices of the Ministry of Energy, Tanzania Petroleum Development Corporation (TPDC), and the Petroleum Upstream Regulatory Authority (PURA) are located. Since the exact number of workers directly involved in upstream petroleum operations and regulation of governance cannot be determined, a sample size was computed using Slovin's formula with an error margin of 5% (Slovin, 1960):

$$n = \frac{1}{(e^2)} = \frac{1}{(0.052)} = 400 \tag{1}$$

Purposive sampling technique was used to select respondents involved directly in decision-making, policy enforcement, and regulatory duties so that the gathered information would reflect informed insights about governance and practice of operations. Data were collected using structured questionnaires to measure the independent variables (i.e., governance structures and best practice adoption) and the dependent variable, effective monitoring. As data were non-normality distribution thereafter the study adopted Generalized Linear Models (GLM) to examine the effect of governance frameworks and adoption of best practices on effective oversight. GLM extends traditional linear regression by allowing the dependent variable to follow different distributions (such as, normal distribution) rather than assuming strict normality of residuals The regression equation is stated as:

$$EO = \beta_0 + \beta_1GF + \beta_2ABP + \varepsilon, \tag{2}$$

where EO represents effective oversight, GF governance frameworks, ABP adoption of best practices,  $\beta_0$  the intercept,  $\beta_1$  and  $\beta_2$  the coefficients, and  $\varepsilon$  the error term.

For validity, the questionnaire was reviewed by governance of the petroleum sector experts to ensure that all the items accurately measure the variables of interest like governance frameworks, adoption of best practices, and effective oversight. Expert review ensures content validity and that the questions are clear, relevant, and make sense to the respondents. construct validity was assessed using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity. The analysis indicated a KMO measure of 0.880, which represented a sampling adequacy that was suitable for carrying out factor analysis. The Sphericity Test of Bartlett Test was also significant, with a likelihood ratio test of 6252.026, freedom of 66, and p-value less than 0.001, showing that the correlation matrix was not a unit matrix (Table 1). This confirmed that factor analysis could be done and that evidence existed that items in this tool comprehended relevant governance structures, best practice, and best practice implementation construct concepts correctly.

**Table 1:** KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.880
Bartlett's Test of Sphericity	Approx. Chi-Square 6252.026
	df 66
	Sig. 0.000

Reliability was determined through internal consistency using Cronbach's Alpha. The overall Cronbach's Alpha was 0.969, and the standardized Cronbach's Alpha was 0.970 for the 32 items. These figures were above the common threshold of 0.7. Therefore, this is seen as excellent reliability and points to the fact that the items consistently measure the intended variables as shown in Table 2. Therefore, the data collected from respondents are considered both valid and reliable for subsequent statistical analysis.

**Table 2:** Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.969	0.970	32

The data obtained was analyzed using descriptive statistics to produce tables of demographic factors and data variability by employing SPSS Version 26. The inferential statistic Spearman rank correlation was used to determine relationships within variables, while multiple regression analysis was used to determine the influence of governance forms in relation to the adoption of best practices towards optimal control. The assumption tests for normality, multicollinearity, homoscedasticity, and autocorrelation were checked in regression analysis to confirm the validity of results. The level of significance to determine hypotheses was set at 5% in regression analysis.

## 4. Findings and Discussion

The study used a systematic distribution approach for the preparation and distribution of questionnaires to the respondents through, among other sources, internet applications such as email. The respondents for the study included personnel directly in upstream petroleum and oversight in governance at the Ministry of Energy, TPDC, and PURA. Of the 400 questionnaires, 328 were returned, indicating a rate of 82% while 72 (18%) were not returned or returned in parts due to unwillingness by some respondents or in parts; it has been noted that such a rate is sufficient for statistical analysis (Baruch & Holtom, 2008). This serves to give confidence in the reliability of data collected for further analysis.

### 4.1. Descriptive Statistics

#### 4.1.1. Governance Frameworks

Table 3 shows data on the Tanzanian upstream sector governance framework in the petroleum sector. On the issue of clarity in those frameworks, the data indicate a low performance level in this area, as the respondents indicated that the frameworks on petroleum legislation were unclear ( $M = 2.32$ ,  $SD = 1.28$ ) and were not properly implemented ( $M = 2.55$ ,  $SD = 1.26$ ). The contract terms were a better performance area on this question, although not strong enough to reach the required standard of a mean score of 3.00, being moderately okay in terms of transparency and enforcement ( $M = 2.80$ ,  $SD = 1.51$ ). On institutional coordination and arrangements, the respondents had a low level of understanding on the clarity of institutional arrangements on this question ( $M = 2.58$ ,  $SD = 1.39$ ) and exhibited equality in the sharing of responsibility monitoring on this question ( $M = 2.86$ ,  $SD = 1.45$ ). On coordination between the Ministry, TPDC, and PURA, the respondents exhibited a moderately better performance level on this question ( $M = 2.98$ ,  $SD = 1.40$ ) in recognizing that, although cooperation exists, duplication in coordination continues to exist in this case. The high standard deviations on these results show that the scores are moderately dispersed, explanatory in part by the view that cooperation exists in this sector, hence duplication in this sector continues to exist. On monitoring and evaluation capacity, the data show low performance in this area too in earning points. The data show that contract disclosure systems in the petroleum sector are in place, although moderately poorly done in terms of transparency on this question ( $M = 2.75$ ,  $SD = 1.30$ ) in this study when respondents indicated that monitoring on compliance was moderately regular on this question in this study ( $M = 2.95$ ,  $SD = 1.18$ ). On detectability and prevention systems by this sector to this question on corruption in this sector, the data show high performance on this question in this study when respondents found systems meant to detect this on punishment on this question to moderately high on this question in. Consistently, in transparency and accountability systems, inspections and audits remained weak ( $M = 2.93$ ,  $SD = 1.28$ ), with resource adequacy in institutions ( $M = 3.10$ ,  $SD = 1.14$ ) and use of monitoring reports to enhance governance ( $M = 3.19$ ,  $SD = 1.24$ ) improving slightly. The range of standard deviations here, between 1.14 and 1.32, illustrates high dispersion, meaning that while some respondents show development, others show little impact.

Overall, the results confirm that government structures in Tanzania's upstream petroleum activities exist in form but are feeble in application and enforcement and need to be strengthened with greater regulatory clarity, institutional coordination, and monitoring ability.

**Table 3: Governance Frameworks (n=328)**

Regulatory clarity	N	Min	Max	Mean	Std Dev
Petroleum laws and regulations affecting upstream operations are clear and easy to understand	328	1.00	5.00	2.3232	1.27520
Legal frameworks for upstream operations are consistently applied	328	1.00	5.00	2.5457	1.26263
Contract terms for petroleum operations are transparent and enforceable	328	1.00	5.00	2.8018	1.50648
<b>Institutional roles &amp; coordination</b>					
Roles of Ministry, TPDC, and PURA in upstream oversight are well defined	328	1.00	5.00	2.5823	1.39218
Coordination among institutions (Ministry, TPDC, PURA) is effective	328	1.00	5.00	2.9787	1.40429
Responsibilities for oversight are evenly distributed among relevant institutions	328	1.00	5.00	2.8567	1.44657
<b>Monitoring &amp; evaluation capacity</b>					

Procedures for public disclosure of petroleum contracts and revenues exist	328	1.00	5.00	2.7500	1.29867
Oversight institutions regularly report on compliance and operational performance	328	1.00	5.00	2.9512	1.17988
Mechanisms exist to detect and punish corruption in upstream operations	328	1.00	5.00	3.1280	1.31635
<b>Transparency &amp; accountability systems</b>					
Audits and inspections of upstream activities are frequent and effective	328	1.00	5.00	2.9299	1.27956
Institutions have adequate resources and staff for monitoring upstream operations	328	1.00	5.00	3.1006	1.13558
Monitoring reports are used to improve sector governance and compliance	328	1.00	5.00	3.1860	1.23859

#### 4.1.2. Adoption of Best Practices

Table 4 shows the findings on upstream petroleum best practices adoption. In terms of conformity with international standards, there is moderate adoption, according to findings. Institutions scored low in adhering strictly to global best practices in extractive processes such as EITI ( $M = 2.81$ ,  $SD = 1.25$ ), but high on considering global best practices in policy design ( $M = 3.01$ ,  $SD = 1.12$ ) and model benchmarking against global best ( $M = 3.19$ ,  $SD = 1.25$ ). The implication of these results is that while Tanzania's petroleum institutions are aware of global frameworks, their practice alignment is only partial. A similar standard deviation for standards emphasizes divergent perceptions amongst the respondents, likely because of divergent practices within institutions. Involving stakeholders in engagement and participation, in moderate performance, is seen in the following results. Consultation with stakeholders in industries, CSOs, and society received sub-average marks ( $M = 2.85$ ,  $SD = 1.27$ ), while encouraging public comment ( $M = 3.05$ ,  $SD = 1.09$ ) and stakeholder engagement for increased transparency ( $M = 3.23$ ,  $SD = 1.22$ ) received slightly better marks. It indicates some level of engagement, yet it is unorganized and institutionalized, hence less participative in decision-making. Capacity-building/Dissemination of knowledge is yet to develop since staff training is minimal ( $M = 2.70$ ,  $SD = 1.41$ ) and external utilization of knowledge is limited to a small extent ( $M = 2.86$ ,  $SD = 1.31$ ). Documentation and learning lessons for past failed experiences was slightly better ( $M = 3.06$ ,  $SD = 1.44$ ) though highly varying.

**Table 4: Adoption of Best Practices**

Alignment with international standards	N	Min	Max	Mean	Std Dev
Our institution follows international extractive governance standards (e.g., EITI)	328	1.00	5.00	2.8110	1.25164
Global best practices are considered when designing oversight policies	328	1.00	5.00	3.0122	1.11694
Benchmarking against international petroleum governance models occurs regularly	328	1.00	5.00	3.1890	1.25164
<b>Stakeholder engagement &amp; inclusiveness</b>					
Relevant stakeholders (communities, CSOs, industry) are consulted in upstream decisions	328	1.00	5.00	2.8537	1.26706
Public feedback is incorporated into oversight strategies	328	1.00	5.00	3.0549	1.09351
Stakeholder participation improves transparency and accountability	328	1.00	5.00	3.2256	1.22075
<b>Capacity-building &amp; knowledge transfer</b>					
Staff receive training to adopt international best practices	328	1.00	5.00	2.7043	1.41455
Knowledge from other countries' petroleum governance models is applied	328	1.00	5.00	2.8628	1.30727
Lessons from past operational challenges are systematically documented and used	328	1.00	5.00	3.0640	1.44169
<b>Use of technology &amp; systems</b>					
Digital systems (e.g., contract databases, monitoring software) are used for oversight	328	1.00	5.00	3.0122	1.29449
Technology adoption improves efficiency of monitoring and compliance enforcement	328	1.00	5.00	3.2104	1.14203
Upstream operational data is systematically collected, analyzed, and acted upon	328	1.00	5.00	3.3689	1.23452

Finally, technology and systems utilization performed comparatively better than other facets. Institutional oversight pointed towards the use of electronic systems for monitoring ( $M = 3.01$ ,  $SD = 1.29$ ), and technology perceived to improve compliance verification ( $M = 3.21$ ,  $SD = 1.14$ ) and systematic collection and analysis of operations rated as most highly ( $M = 3.37$ ,  $SD = 1.23$ ). This shows that, while digital acquisition is not at its best yet, it is a good direction in which to move to maximize efficiency and transparency. The standard deviations in this category, between 1.14 and 1.29, suggest some variation but generally less broad than the others, suggesting higher agreement regarding technology's contribution to governance improvements.

### 4.1.3. Effective Oversight

Table 5 illustrates findings on effective oversight in Tanzania's upstream petroleum sector. On compliance enforcement, moderate findings were reported in enforcing compliance. Respondents assigned relatively low scores on early detection of non-compliance cases ( $M = 2.96$ ,  $SD = 1.43$ ), but efficacy of sanctioning violations was slightly higher ( $M = 3.13$ ,  $SD = 1.53$ ). The high standard deviations show high variability in respondents' experiences, revealing irregular enforcement by institutions. These findings reinforce that although there are enforcement instruments, delays and inconsistent application weaken deterrence against non-compliance.

**Table 5: Effective Oversight**

Compliance enforcement	N	Min	Max	Mean	Std Dev
Non-compliance cases in upstream operations are detected promptly	328	1.00	5.00	2.9604	1.42550
Violations of petroleum regulations are sanctioned effectively	328	1.00	5.00	3.1341	1.53262
<b>Operational performance</b>					
Oversight has improved safety and environmental performance of upstream operations	328	1.00	5.00	3.4085	1.27461
Operational inefficiencies are identified and corrected through monitoring	328	1.00	5.00	3.5549	1.36918
<b>Accountability outcomes</b>					
Oversight has reduced financial leakages in the sector	328	1.00	5.00	3.5732	1.24179
Institutions are held accountable for their decisions and actions	328	1.00	5.00	3.7165	1.29292
<b>Sustainability &amp; governance outcomes</b>					
Oversight practices contribute to sustainable management of upstream petroleum resources	328	1.00	5.00	3.5091	1.24882
Stakeholder trust in sector governance has improved due to effective oversight	328	1.00	5.00	3.7134	1.29580

In terms of operational performance, oversight was reported to improve safety and environmental quality ( $M = 3.41$ ,  $SD = 1.27$ ) and to enable the identification and correcting of inefficiencies ( $M = 3.55$ ,  $SD = 1.37$ ). Both measures are above the 3.00 midpoint, showing that oversight institutions are positively influencing operational practices, but variability exists. For accountability outcomes, control was observed to reduce financial leakages ( $M = 3.57$ ,  $SD = 1.24$ ) and render institutions accountable for their acts ( $M = 3.72$ ,  $SD = 1.29$ ). These are some of the highest outcomes, indicating improvement regarding enhancement of transparency and institutional accountability. In a similar manner, regarding sustainability and governance outcomes, the respondents agreed that oversight influences sustainable resource use ( $M = 3.51$ ,  $SD = 1.25$ ) and enhancement of stakeholder confidence ( $M = 3.71$ ,  $SD = 1.30$ ). In general, evidence indicates that, despite the fact that oversight has been making giant steps regarding improvement in the realms of accountability, sustainability, and operations performance, loopholes exist regarding the enforcement of compliance, particularly regarding the early detection and punitive measures of violation of rules. A possible interpretation of the fairly high standard deviations above the measures cited would regard the varying degrees of effectiveness perception, which are likely to be associated with varying practices at the institutional levels as well as their possible familiarization regarding the oversight mechanisms. This would suggest that, regarding the enhancement of optimal effectiveness, the governance of upstream petroleum in the Tanzanian context should note the amplification of enhancement at the levels of enforcement while utilizing the improvement regards accountability and confidence enhancement.

### 4.2. Normality Distribution Test

Table 6 presents the results of the Kolmogorov-Smirnov and Shapiro-Wilk tests for all variables: regulatory clarity, institutional roles, transparency, monitoring, alignment with international standards, stakeholder engagement, use of technology, enforcement of compliance, operational performance, sustainability, capacity building, and accountability. All the variables possess significance values (Sig.) less than 0.05 for both tests, which suggests a rejection of the null hypothesis of normal distribution. For instance, regulatory clarity had a Shapiro-Wilk value of 0.907 and  $p = 0.000$ , whereas accountability results had 0.840 and  $p = 0.000$ . The figures attest that none of the study variables were normally distributed.

**Table 6: Tests of Normality**

Variables	Kolmogorov-Smirnov		Shapiro-Wilk			
	Statistic	df	Sig.	Statistic	df	Sig.
Regulatory clarity	0.148	328	0.000	0.907	328	0.000
Institutional roles & coordination	0.150	328	0.000	0.911	328	0.000
Transparency & accountability systems	0.185	328	0.000	0.914	328	0.000
Monitoring & evaluation capacity	0.213	328	0.000	0.914	328	0.000
Alignment with international standards	0.200	328	0.000	0.910	328	0.000
Stakeholder engagement & inclusiveness	0.191	328	0.000	0.921	328	0.000
Use of technology & systems	0.201	328	0.000	0.888	328	0.000
Compliance enforcement	0.198	328	0.000	0.872	328	0.000
Operational performance	0.176	328	0.000	0.889	328	0.000
Sustainability & governance outcomes	0.273	328	0.000	0.855	328	0.000
Capacity-building & knowledge transfer	0.132	328	0.000	0.918	328	0.000
Accountability outcomes	0.294	328	0.000	0.840	328	0.000

a. Lilliefors Significance Correction

The non-normality reflects the data is skewed or has kurtosis values different from a Gaussian curve. In that case, the application of parametric tests will lead to false conclusions because they assume normally distributed data (Ghasemi & Zahediasl, 2012). The research thus adopting non-parametric statistical analysis, such as Spearman rank correlation, is more accommodating of non-normality in data. Furthermore, that two tests, Kolmogorov-Smirnov and Shapiro-Wilk, are employed makes their findings more robust. While Shapiro-Wilk is more powerful for small to medium samples, Kolmogorov-Smirnov provides a general test for large samples (Razali & Wah, 2011). With 328 samples, both reported bring methodological robustness, validating continued use of non-parametric analysis for subsequent tests.

### 4.3. Correlations Analysis

Table 7 shows Spearman rank correlation coefficients for the study variables. The results show a very strong, positive, and statistically significant rank correlation between governance frameworks and effective control ( $\rho = 0.747$ ,  $p < 0.01$ ). This implies that clearer regulatory systems, well-defined institutional functions, effective coordination, and effective monitoring and accountability mechanisms are strongly related to better upstream petroleum operations control. Again, the adoption of best practices is positively related to good oversight,  $\rho = 0.686$ ,  $p < 0.01$ . This indicates that conformity with global standards, participation of stakeholders, capacity development, and technology use add significantly towards effectiveness in oversight. Intercorrelations between the independent variables among themselves,  $\rho = 0.823$ ,  $p < 0.01$ , show the reality that best practices and governance infrastructures are correlated and further strengthen the argument that good operational practices are related to effective governance.

**Table 7: Correlations**

		Effective Oversight	Governance Frameworks	Adoption of Best Practices
Spearman's rho	Effective Oversight	1.000	0.747**	0.686**
	Correlation Coefficient			
	Sig. (2-tailed)	.	0.000	0.000
	N	328	328	328
Governance Frameworks	Effective Oversight	0.747**	1.000	0.823**
	Correlation Coefficient			
	Sig. (2-tailed)	0.000	.	0.000
	N	328	328	328
Adoption of Best Practices	Effective Oversight	0.686**	0.823**	1.000
	Correlation Coefficient			
	Sig. (2-tailed)	0.000	0.000	.
	N	328	328	328

\*\* . Correlation is significant at the 0.01 level (2-tailed).

These results show the pragmatism that both independent variables are highly related to good oversight, but the measurement of the value of any one factor's contribution by Simple Correlation alone will not do. Hence, in order to provide a more specific estimation on the observed effects, this study continued to collect more data using Generalized Linear Model analysis (GLM). Though GLM is resistant to non-normality, tests on linearity, multicollinearity, and homogeneity were undertaken to validate the model's results. The test on linearity revealed that

the relationships between the two independent variables and good oversight were generally in a linear fashion. The test on multicollinearity using Variance Inflation Factor (VIF) was concerned with the high association between the two frameworks, specifically between Governance Frameworks and Best Practices.

#### 4.4. Regression Analysis

##### 4.4.1. Omnibus Test of Model Effects

The omnibus test result displayed in Table 8 shows that both of the independent variables, which in this study were the models of governance as well as best practice implementation, have a significant impact on the oversight aspect in the upstream oil and gas industry in Tanzania ( $p < 0.001$ ). In more detail, the Wald Chi-Square at 111.3 for the models of governance and 74.6 for best practice implementation reveal significant contributions in both variables to the overall model. This result supports the importance of cooperation, comparison, and openness in regulations to improve oversight measures.

**Table 1: Omnibus Test of Model Effects**

Source	Wald Chi-Square	df	Sig.
Governance Frameworks (IV1)	111.3	1	0.000
Best Practices (IV2)	74.6	1	0.000
Overall Model	185.9	2	0.000

Second, with a Chi-Square value of 185.9 and a p-value of 0.000, it is evident that the presence of both predictor variables significantly enhances the ability to explain the null model's outcome. In essence, both governance factors and best practices combine to explain a significant proportion of the variation in good oversight. These findings prove that reforms aimed at improving the level of transparency, accountability, and stakeholder engagement are key to ensuring effective governance in the upstream Petroleum sector.

##### 4.4.2. Model Fit Statistics

Table 9 gives the generalized linear model (GLM) model fit statistics. An A -2 Log Likelihood of 452.23 means that the fit model is substantially different from a null (baseline) model, and thus is a better explanatory model. An AIC of 468.21 provides an approximation of parsimony in the model, balancing fit with complexity. Decreasing AIC values are supposed to reflect better model fit, and this study suggests that the selected predictors (governance models and best practice adoption) are strong in accounting for variation in effective oversight.

**Table 2: Model Fit Statistics**

Statistic	Value
-2 Log Likelihood	452.23
Akaike Information Criterion (AIC)	468.21
Pseudo R <sup>2</sup> (Nagelkerke)	0.62

A Nagelkerke Pseudo R<sup>2</sup> of 0.62 also reflects the stability of the model, in that approximately 62% of variance in effective oversight is accounted for by the independent variables. This is a big social science effect size in institutional and governance studies, where explained variances are usually low. These results validate that governance best practices and models are not only statistically significant (as in Table 8) but also practically significant, with excellent predictability power in explaining oversight performance in Tanzania's upstream petroleum sector.

##### 4.4.3. Generalized Linear Model (GLM) Parameter Estimates

Table 10 depicts the parameter estimates of the generalized linear model (GLM). The constant (0.524,  $p < 0.001$ ) is the base level of oversight effectiveness where all the predictors are held constant. There is a very strong positive effect with an unstandardized coefficient of 0.612 and a Beta of 0.512 on the governance frameworks, which implies that regulatory issues, coordination, transparency, and monitoring enhancements play a very significant role in improving oversight effectiveness. The large Wald Chi-Square statistic of 10.55 and p-value of 0.001 confirms that governance frameworks are one of the most influential predictors of outcomes in oversight practices.

Similarly, the implementation of international standards, engagement with stakeholders, building of capacities, and adoption of technology all positively contribute towards institutional oversight performance. The corresponding best practice, after applying best practice methods, is indicated to have the largest positive influence towards institutional oversight performance, with a coefficient of 0.471, representing a beta value of 0.427. The significance of the best practice is evident by the Wald Chi-Square value of 7.48, with a significance level of  $p < 0.001$ . These results suggest that for effective oversight of the Tanzanian upstream petroleum sector, a combination of appropriate governance structure and implementation of global best practice is necessary.

**Table 10: Generalized Linear Model Parameter Estimates**

Model	Unstandardized Coefficients		Standardized Coefficients	Wald $\chi^2$ / tSig. (p)	
	B	Std. Error	Beta		
a(Constant)	0.524	0.112		4.67	0.000
Governance Frameworks	0.612	0.058	0.512	10.55	0.000
Adoption of Best Practices	0.471	0.063	0.427	7.48	0.000

a. Dependent Variable: Effective Oversight (DV)

#### 4.4.4. Model Equation

From the equation 2 the generalized linear model for predicting Effective Oversight (EO) is expressed as:

$$EO = 0.524 + 0.612(GF) + 0.471(BP) \quad (3)$$

The constant of 0.524 represents the default level of effective oversight in the absence of governance frameworks and best practices or where they are set to zero. The coefficient of governance frameworks is 0.612 shows that with every unit increase in governance frameworks (such as enhancement in regulation clarity, institutional collaboration, and monitoring capability), the level of effective oversight will improve by 0.612 units, all other things being equal. Similarly, the coefficient of best practices is 0.471 suggests that with every unit increase in embracing global standards, stakeholder participation, or technology use, the level of effective oversight will improve by 0.471 units, all other things being equal. A comparative analysis of the standardized coefficients shows that governance structures ( $\beta = 0.512$ ) are relatively more important than adopting best practices ( $\beta = 0.427$ ). This points to the significance that although both are important variables, the importance of governance structures is greater in improving the effectiveness of oversight.

#### 4.5. Discussion of the Findings

##### 4.5.1. Governance Frameworks' Role in Effective Oversight

The results show that there is a positive relationship between governance frameworks and oversight in upstream petroleum operations in Tanzania. The results from the GLM support this hypothesis, showing a significant positive relationship ( $B = 0.612$ ,  $\beta = 0.512$ ,  $p < 0.001$ ). This indicates that issues such as clearly defined regulations, roles, coordination, transparency, and monitoring in institutions of governance influence compliance, functioning, and accountability positively in upstream petroleum operations in Tanzania. According to empirical data demonstrated by Shah et al. (2022), clear governance in oil and gas companies has a significant influence on their functioning and competitive edge, supporting these findings. Where there are institutions governing, but they are poorly enforced, there will be a negative impact on oversight in upstream petroleum operations in Tanzania. Global standards on governance, such as ISO 37000:2021, OECD Guidelines on Corporate Governance of State-Owned Enterprises, and Extractive Industries Transparency Initiative, show clearly defined roles in governance, accountability, and oversight, thus supporting these results and Agency Theory's emphasis on alignment between agent and principal objectives in upstream petroleum operations in Tanzania.

##### 4.5.2. Effect of Best Practices Adoption on Effective Oversight

The results show that the application of best practices has a positive influence on effective monitoring of upstream petroleum operations. Evidence validates this as it is supported by a positive significant relationship ( $B = 0.471$ ,  $\beta = 0.427$ ,  $p < 0.001$ ). This can be interpreted as the application of global norms, engagement with stakeholders, building capacity, and the use of technology directly resulting in improved monitoring outcomes. Internationally validated studies, as presented in Abedin et al. (2024) and Zhang et al. (2024), indicate that the application of sustainable practices remains significantly pressured and motivated by institutional forces as well as managerial values, thus ensuring the augmented legitimacy and performance of operations. Domestically validated studies, as presented in Chuwa and Perfect-Mrema (2024), provide proof on how lack of enforcement and capacity can jeopardize the effective application of best practices, thus emphasizing the requirement for adequate governance pillars to be in place for initiatives of this nature to take flight. Internationally recognized norms include ISO: 9001:2015, ISO: 14001:2015, ISO: 45001:2018, and the Global Reporting Index (GRI), which primarily outline the operations of quality management, environmental sustainability, workplace health and safety, and transparent reporting procedures, all of which strictly comply with the principles of Institutional Theory, requiring external legitimacy and compliance with set norms.

#### 5. Conclusion

The research aims to investigate the extent to which governance structures and best practices exist for effective regulatory control of the upstream petroleum sector in Tanzania. Results of the research show that governance structures are very important for ensuring effective regulatory control. In this regard, the elements of regulatory

transparency, well-defined roles of institutions, coordination among institutions, openness, and effective monitoring and evaluation tools were found essential for improved compliance, effectiveness, and accountability in the sector. This satisfies the first specific objective of the research in the context that effective regulatory control can be guaranteed only under effective governance structures in the upstream petroleum sector of Tanzania. Moreover, the application of best practices was also found to have positive and significant impacts on effective regulatory control, thus satisfying the second specific objective of this research. The application of best practices, compliance with the best practices of the international community, engagement of proactive actors, capacity-building actions, and the application of technology are all factors that play significant roles in enhancing transparency and accountability, as well as improved efficiency. The research, therefore, satisfies the objective of narrowing the research gap in the context that it presents quantitative knowledge regarding the adequacy of governance structures and best practices for effective control. The research findings can be used as guidelines for policymakers, the governing institution, as well as petroleum actors to improve institutional governance, promote transparency, and facilitate the sustainable management of the country's petroleum resources in the upstream petroleum sector of Tanzania.

From the study findings, several strategic interventions can be put in place to make governance in Tanzania's upstream petroleum sector more effective. The governance structures must be supported by petroleum laws that are clearly articulated, functional roles of institutions must be clearly defined, and collaboration between the Ministry of Energy, TPDC, and PURA must be improved. The monitoring process must be done in order to curb maladministration and improve compliance levels. The petroleum actors must adopt best practices that meet global standards. This must include involvement of stakeholders in decision-making, proper capacity building of employees, and implementation of digital technology to monitor levels of compliance and success levels in carrying out their operations. Benchmarking global petroleum governance structures in order to adopt their best practices can help bring local practices in line with global best practices, thus enhancing transparency, legitimacy, and sustainability in decision-making. The policy implications of this study include that Tanzania must align petroleum laws and functions of the different institutions in order to eliminate overlaps in functions, thus improving collaboration in regulation. The policies must ensure that there is observance to global standards in governance levels and operation standards, and that investment in employees' capacity building and digital monitoring systems is a priority. This will provide a cohesive regulatory framework that marries appropriate in-house frameworks with universally recognized best practices, thus facilitating sustainable resource management, accountability, and success in Tanzania's upstream petroleum sector.

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