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Digital Transformation and Transparency in Algeria's Hydrocarbon Sector: A Governance Perspective

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ABSTRACT

This article examines governance challenges and digital transparency reforms in Algeria's hydrocarbon sector from an institutional perspective. Given the sector's central role in the national economy, weak governance, limited transparency, and persistent corruption have constrained effective resource management and economic diversification. Drawing on a descriptive-analytical approach, the study analyzes institutional reports, legal frameworks, governance indicators, and recent digital initiatives to assess the evolution of governance practices. The findings reveal a significant gap between Algeria and successful resource-rich countries in terms of accountability, regulatory quality, and control of corruption. While recent reforms such as digital compliance platforms, whistleblowing mechanisms aligned with international standards, and national anti-corruption strategies signal a gradual shift toward improved transparency, their impact remains limited by structural and institutional constraints. The study argues that digital transformation can enhance governance only when embedded within broader institutional reforms. Strengthening transparency, enforcement, and oversight is essential for improving the investment climate, reducing rent-seeking behavior, and promoting sustainable management of hydrocarbon resources in Algeria.

1. Introduction

Governance of natural resources, particularly hydrocarbons, has been identified as a critical determinant of economic and institutional performance in resource-rich states. Strong governance systems enhance transparency, accountability, and sustainable use of revenues, while weak systems correlate with poor management outcomes and economic vulnerability [6]. In the context of oil-producing economies, governance practices are instrumental not only for fiscal stability but also for promoting economic diversification and public trust in institutions. In Algeria, hydrocarbons remain the backbone of the national economy, contributing the majority of export earnings and state

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revenues. However, existing research has highlighted persistent weaknesses in governance quality, including low transparency and ineffective revenue management, which hinder broader development goals [7]. Studies using the Resource Governance Index (RGI) indicate that Algeria lags behind best-practice standards, particularly in accountability and regulatory quality, compared to other resource-rich countries [11].

Despite these documented challenges, recent years have witnessed institutional efforts to strengthen governance structures within Algeria's hydrocarbon sector. National bodies such as the High Authority for Transparency, Prevention and the Fight against Corruption have promoted anti-corruption frameworks, while major state-owned companies like SONATRACH have adopted codes of ethics and compliance systems aligned with international standards, including ISO 37001, to reinforce internal control and reporting practices [8]. However, there remains limited empirical evidence on the extent to which these reforms have translated into tangible improvements in governance outcomes and public accountability [22]. More recently, these governance reforms have increasingly incorporated elements of digital transformation, such as digital compliance systems, electronic reporting platforms, and institutional transparency tools aimed at improving information disclosure and strengthening accountability mechanisms within the hydrocarbon sector [25].

This study aims to fill this gap by examining the evolving institutional landscape of hydrocarbon governance in Algeria, with a focus on recent transparency initiatives, anti-corruption measures, and sector-specific reforms. By integrating analyses of governance indicators, legal and institutional innovations, and sector practices, the article assesses both achievements and persisting limitations in the governance of Algeria's hydrocarbon resources.

Ultimately, this research contributes to the broader literature on resource governance by providing context-specific evidence from Algeria, illustrating how governance reforms interact with structural challenges in a middle-income, oil-dependent economy. The findings offer insights for policymakers and stakeholders seeking to enhance transparency, accountability, and sustainable management of hydrocarbon wealth.

2. Conceptual Framework

2.1 Governance and Transparency

Governance refers to the structures, rules, and practices that guide decision-making and accountability in public and private institutions, and transparency is widely recognized as a core principle of effective governance. Transparency enables stakeholders to access accurate information about institutional decisions and performance, which in turn fosters accountability and reduces opportunities for corruption and mismanagement [20]. For example, transparency mechanisms such as public disclosure laws and open information platforms have been shown to strengthen the legitimacy and responsiveness of administrative processes, facilitating stakeholder oversight and enhanced institutional performance. Moreover, empirical research indicates that applying governance principles like transparency alongside accountability and participation significantly improves public trust in institutions, laying the foundation for sustained socio-economic development in democratic contexts [23].

Transparency is not only a normative ideal but also a practical requirement for good governance, especially in sectors where resource management and public funds are at stake. In the context of extractive industries, such as oil and gas, transparency initiatives like the Extractive Industries Transparency Initiative (EITI) aim to make government and corporate financial flows visible, thereby reducing information asymmetry and improving accountability for resource revenues [10]. Such transparency standards contribute to public confidence by ensuring that citizens have access to clear

data on revenue flows, contracts, and regulatory decisions, which can help curb corruption and enhance regulatory oversight. Furthermore, transparency has been identified as a key factor in sustainable governance frameworks, where clear and accessible information facilitates stakeholder engagement and informed decision-making in both economic and environmental policy domains [4].

2.2 Digital Transformation as a Tool for Institutional Accountability

Digital transformation in public governance involves the strategic integration of digital technologies to enhance administrative processes, improve service delivery, and strengthen institutional accountability. Scholars highlight that digital transformation is not merely technological adoption but a comprehensive reconfiguration of governance mechanisms, requiring changes in organizational culture, processes, and structures to realize transparency and responsiveness [19]. Furthermore, research has shown that digital governance frameworks - including e-government platforms, digital reporting systems, and data governance strategies - contribute significantly to improved transparency, reduced bureaucratic inefficiencies, and enhanced citizen trust in government institutions [22]. These developments underscore that effective digital transformation enhances not only technological capacity but also governance quality by enabling greater transparency and accountability in administrative decision-making.

Digital transformation in the hydrocarbon sector represents a fundamental shift in how institutions manage data, processes, and decision-making, strengthening governance through improved transparency and operational efficiency. A systematic review of digital transformation efforts in the oil and gas industry highlights that advanced technologies -such as data analytics, automation, and digital platforms - are increasingly integrated into core activities, enabling more accurate monitoring, real-time reporting, and strategic oversight across the value chain [2].

Moreover, these digital practices can enhance governance by facilitating transparency in operational workflows and compliance reporting, reducing information asymmetry between stakeholders, and supporting evidence-based policy decisions [13]. Such integration not only drives efficiency and innovation but also bolsters accountability mechanisms, allowing both public authorities and companies to communicate advanced performance indicators and regulatory outcomes more effectively, which is crucial for resource-rich economies facing governance challenges.

3. Methodology

This study adopts a descriptive-analytical approach to examine governance practices and transparency mechanisms in Algeria's hydrocarbon sector. The analysis is based on institutional reports, legal and regulatory documents, official communications, and insights from institutional platforms to evaluate recent anti-corruption initiatives and transparency measures. In addition, quantitative indicators such as political stability, regulatory quality, and accountability measures were incorporated to support the descriptive analysis and provide context on institutional performance. The study focuses on interpreting these indicators qualitatively, linking them to institutional reforms, digital transparency practices, and overall governance effectiveness.

By combining qualitative evidence with descriptive quantitative indicators, the study provides a comprehensive understanding of institutional structures, transparency mechanisms, and digital practices, offering insights into their effectiveness in promoting accountability and good governance in Algeria's hydrocarbon sector.

4. Results and Discussion

4.1 Institutional and Governance Challenges in Algeria's Hydrocarbon Sector

Effective governance in the oil sector is a cornerstone for achieving sustainable development and economic stability. Given the sector's vast resources and significant impact on the economy, environment, and society, transparent and robust governance policies are essential to improve performance and ensure the optimal use of resources. These policies enhance transparency and accountability, thereby increasing the efficiency of the national economy. In this context, both national and international institutions play a pivotal role in formulating and implementing policies that regulate the oil sector.

Recent economic studies emphasize that strong institutions are crucial for achieving economic development and growth. Conversely, when administrative institutions are weak and inefficient, policymakers tend to adopt unsustainable policies to appease certain groups and maintain political power [1]. The quality of governance in these institutions directly influences the management of oil resources, the distribution of revenues, and the ability to address challenges stemming from economic and political fluctuations.

Oil-producing countries, such as Algeria, require diversification both economically and politically in order to effectively manage their natural resources and improve their growth prospects [3]. Political pluralism plays a crucial role in the management of the hydrocarbon sector, as it helps create an environment that encourages active participation by all stakeholders in the decision-making process. Promoting the principles of democracy and transparency, in turn, enhances the effectiveness of economic policies, supports efforts toward economic diversification, and contributes to the sustainable use of natural resources.

Looking at the Algerian economy in recent decades, it becomes clear that efforts to move away from oil dependency have not achieved the desired outcomes. Despite repeated initiatives, economic reforms, and significant financial allocations directed toward non-oil sectors, the reliance on hydrocarbon revenues continues to dominate the economy. This situation reflects institutional challenges that hinder sustainable development. The prevailing institutional environment, marked by bureaucracy, lack of transparency, and limited accountability, weakens the effectiveness of economic policies and limits the country's capacity to achieve economic diversification, leaving the economy vulnerable to fluctuations in global energy markets.

Although the Algerian government has adopted a number of regulatory and administrative measures to ensure compliance and transparency in the oil sector (Director General of Studies and Foresight, personal communication, June 30, 2024) the implementation of these mechanisms faces structural challenges. These measures include ex-ante control mechanisms, implemented by entities such as the Financial Audit Directorate and the Board of Directors of Sonatrach, which assess all financial operations and projects before execution to ensure compliance with legal and financial standards.

Additionally, ex-post control is exercised by several bodies, including the General Inspectorate of Finance, the Audit Council, the National People's Assembly, the Council of the Nation, and the Inspectorate of the Presidency of the Republic. These institutions monitor financial operations after implementation to ensure the optimal use of public resources. Furthermore, external auditors are appointed to verify the accuracy of financial reports and ensure compliance with the applicable laws. This auditing framework is supported by the Court of Auditors, which, according to Article 192 of the 2016 Constitution, functions as an independent body responsible for the ex-post auditing of public finances. Its role contributes to the enhancement of good governance and the promotion of transparency in public financial management [9].

However, the impact of these measures on improving actual governance in the sector remains limited. As Amira [3] indicated, the large revenues generated from natural resources do not flow directly into the national treasury and are not disclosed to the legislative authority. In addition, permits are granted by the Ministry of Energy and Mines through non-transparent direct negotiations, bypassing competitive bidding processes.

Table 1

Comparison of governance indicators In Algeria with some successful mineral-rich countries, year 2022

Successful mineral-rich countries:	Voice and accountability	Political stability	Government effectiveness	Regulatory quality	Rule of law	Control of corruption
Algeria	-1.01	-0.65	-0.51	-1.06	-0.83	-0.64
Botswana	0.45	1.07	0.44	0.62	0.46	0.66
Chile	0.98	0.13	0.55	0.98	0.69	0.97
Malaysia	0.00	0.16	0.99	0.64	0.56	0.25
Norway	1.78	0.86	1.94	1.52	1.76	2.07

Source: World Bank, 2024 (Governance Research Indicators Dataset)

Note: All scores range from -2.5 (weak) to 2.5 (strong) for governance performance.

The table 5.7 clearly show the large gap in governance quality between Algeria and several successful resource-rich countries. Algeria scores negatively on all six governance indicators, reflecting weaknesses in political and administrative systems, from voice and accountability (-1.01) to political stability (-0.65), government effectiveness (-0.51), regulatory quality (-1.06), rule of law (-0.83) and control of corruption (-0.64). In contrast, the aforementioned successful countries have positive values, reflecting a higher level of governance. For example, Norway scores highest on all indicators, with voice and accountability at 1.78, government effectiveness at 1.94 and political stability 0.86, government effectiveness 1.94, the regulatory quality at 1.52, rule of law at 1.76 and the control of corruption at 2.07, highlighting its ability to achieve a strong and effective governance system.

As a country rich in natural resources, Algeria has suffered from weak institutional and governance structures, which has led to the spread of corruption a systemic issue affecting all levels of management in the oil sector, the backbone of the national economy. According to Transparency International (2024), Algeria ranked 104 out of 180 countries in 2023, reflecting a high level of perceived corruption. Corruption has become deeply entrenched in the country and is largely associated with official institutions, as numerous high-profile corruption cases have stemmed from political collusion [14].

The roots of corruption in Algeria can be traced back to the post-French colonial era and the socialist system adopted after independence. A complex bureaucratic environment has since emerged, heavily reliant on a rent-based economic system, which has reinforced a culture of nepotism and clientelism, where personal connections with decision-makers are often used to secure economic advantages. This rentier system has contributed to the unequal distribution of opportunities among individuals and institutions, as access to privileges is determined more by personal influence than by merit or competence.

Mohammed *et al.*, [17] pointed out that easy access to oil revenues in Algeria has not only weakened institutions but also contributed to the spread of corruption. This corruption reinforces the power of ruling elites and perpetuates the distribution of rents among their close networks. As a result, state institutions have become incapable of effectively managing oil revenues or ensuring justice and equality, which has undermined public trust and created an uncompetitive, opaque, and monopolistic economic environment.

This is particularly evident in the limited disclosure of information related to contracts, licenses, resource revenues, and environmental assessments. Furthermore, there is a notable lack of transparency regarding the national budget and sources of income [3]. This significant gap between societal needs and the principles of transparency and good governance coupled with the absence of sufficient information and sound revenue management practices poses a major obstacle to any meaningful reform efforts.

4.2 Digital Reforms and Transparency Mechanisms in Algeria's Hydrocarbon Sector

In response to persistent institutional weaknesses and governance challenges in the hydrocarbon sector, Algeria has undertaken a set of reforms aimed at enhancing transparency, accountability, and regulatory effectiveness. These reforms combine digital tools, institutional restructuring, and legal frameworks designed to combat corruption, improve financial disclosure, and strengthen oversight mechanisms. The following subsections examine the main reform initiatives implemented at the corporate and national levels, and assess their potential implications for governance quality and investment dynamics in Algeria's hydrocarbon sector.

1. Corporate-Level Digital Anti-Corruption and Compliance Reforms

At the corporate level, several digital initiatives have been introduced to reinforce transparency and combat corruption within the hydrocarbon sector. One of the most prominent measures is Sonatrach's launch of the official digital reporting platform, "Sonatrach's Anti-Bribery and Corruption Compliance." This platform is aligned with the ISO 37002 standard for whistleblowing management systems, ensuring the protection of whistleblowers' identities and the confidentiality of reported information [21,24].

By providing secure and accessible digital reporting channels, this mechanism enhances internal accountability and encourages the disclosure of unethical practices. More broadly, it reflects a shift toward digital compliance frameworks that enable real-time monitoring, data traceability, and improved institutional oversight within state-owned enterprises operating in the oil and gas sector.

2. Digitally Supported National Anti-Corruption Reforms

At the national level, Algeria has institutionalized significant reforms to integrate digital tools within broader governance and anti-corruption strategies, reflecting a formal commitment to enhancing transparency and accountability. The official launch of the National Strategy for Transparency, Prevention and Fight against Corruption (2023–2027) under Law No. 22-08 marks a cornerstone in this process, as it consolidates The High Authority for Transparency, Prevention and Fight against Corruption, [26], as an independent constitutional institution with expanded oversight and preventive powers aimed at curbing corruption across public administrations and economic sectors, including hydrocarbons .

Institutional analyses indicate that since its reorganization under Law 22-08, the Authority has moved beyond an advisory role to exercise real monitoring functions, develop comprehensive frameworks for corruption prevention, and engage civil society in anti-corruption efforts, signaling a structural shift in governance practices enabled by legal and administrative reforms [18]. Moreover, academic research on digital transformation in public administration demonstrates that e-governance initiatives such as electronic reporting systems, integrated databases, and online complaint mechanisms are increasingly adopted across Algerian institutions to reduce discretionary

interactions and facilitate evidence-based decision-making, a trend that supports the effective implementation of the national strategy and reinforces oversight capacities [12].

3. Digital Transparency, Investment Climate, and Economic Implications

In the Algerian context, recent digital transparency reforms have begun to influence the investment climate and broader economic implications, although their full impact remains a work in progress. For example, the Algerian Investment Promotion Agency (AAPI) launched a digital platform for investors in early 2024, which centralizes access to state-owned land and streamlines procedural requirements for both domestic and foreign investors, thereby reducing administrative bottlenecks and enhancing procedural transparency [28].

This digital tool is part of broader reforms under the new Investment Law No. 22-18, which seeks to improve the transparency and predictability of investment processes, attract Foreign Direct Investment (FDI), and reduce information asymmetry in economic decision-making. According to UNCTAD data, Algeria's FDI inflows reached approximately USD 1.2 billion in 2023, with significant shares directed toward extractive industries, manufacturing, and construction, suggesting that improved transparency and digital facilitation may be contributing to renewed investor interest [15]. Additionally, digital reforms to economic data systems and administrative platforms are recognized by the World Bank as critical for evidence-based policymaking and reducing uncertainty, which in turn supports private sector investment, economic diversification, and long-term growth resilience in Algeria [30].

4. Digital Auditing and the Institutionalization of Anti-Corruption Practices

In Algeria, digital auditing and e-governance practices are beginning to strengthen financial oversight and support anti-corruption efforts, although implementation remains uneven across institutions. Recent government strategies highlight the incorporation of digital platforms in public financial management, aiming to improve transparency, accountability, and stakeholder engagement through digitized reporting and real-time information access (Ministry of Finance Platform, MFDGI.gov.dz). For example, the Algerian Ministry of Finance's digital hub provides regularly updated fiscal reports and accessible legislative resources, enabling citizens, investors, and civil society to monitor revenue and expenditure data, thereby reducing information asymmetry and opportunities for financial mismanagement [17].

Evidence from empirical research on digital transformation in auditing within Algeria underscores that the adoption of digital tools significantly enhances the perceived reliability of financial reporting and strengthens stakeholder confidence, provided that auditors possess adequate digital competencies and governance mechanisms are adapted to support these technologies [5]. Together, these developments suggest that digital auditing and reporting systems in Algeria, although still evolving, are beginning to contribute to improved transparency and institutional accountability in financial governance, which is essential for combating corruption and bolstering confidence in hydrocarbon sector management.

5. Conclusion and Policy Implications

This study has examined governance challenges and recent digital transparency reforms in Algeria's hydrocarbon sector from an institutional and analytical perspective. The findings highlight that despite the strategic importance of hydrocarbons for the national economy, governance in the

sector continues to face persistent challenges related to weak institutional capacity, limited transparency, corruption, and the structural characteristics of a rentier state. Comparative governance indicators further confirm the significant gap between Algeria and successful resource-rich countries in terms of accountability, regulatory quality, and control of corruption.

At the same time, the analysis shows that recent reforms reflect a gradual shift toward improving governance through institutional restructuring and the adoption of digital tools. Initiatives such as corporate-level digital compliance platforms, whistleblowing mechanisms aligned with international standards, and the establishment of new transparency and anti-corruption bodies indicate a growing recognition of the role of digital transformation in strengthening governance frameworks. However, the impact of these reforms remains constrained by structural limitations, fragmented implementation, and insufficient integration of digital transparency mechanisms into broader governance strategies.

From a policy perspective, the findings suggest that digital transformation alone is not sufficient to address governance weaknesses in the hydrocarbon sector unless it is accompanied by deeper institutional reforms. Strengthening transparency requires not only digital reporting platforms, but also clearer legal frameworks, effective enforcement mechanisms, and enhanced parliamentary and public oversight over resource revenues. Improving coordination between regulatory institutions and ensuring the independence of audit and anti-corruption bodies are essential for translating formal reforms into tangible governance outcomes.

Furthermore, enhancing governance in the hydrocarbon sector has important implications for Algeria's investment climate and long-term economic diversification. Greater transparency and accountability can reduce perceived investment risks, improve confidence among domestic and foreign investors, and support the efficient allocation of resource revenues toward productive sectors. In this context, integrating digital governance tools within a comprehensive resource management strategy could contribute to mitigating rent-seeking behavior and promoting sustainable development.

Overall, this study underscores that improving governance in Algeria's hydrocarbon sector requires a balanced approach that combines institutional reform, transparency, and digital transformation. Future policy efforts should focus on consolidating these dimensions to ensure that hydrocarbon resources are managed in a transparent, accountable, and development-oriented manner, thereby enhancing economic resilience and public trust in resource governance.

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