

Impact of Carbon Emissions Disclosure on Firm Value: An Empirical Study of Iraqi Oil Companies According to IFRS S2

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KEYWORDS	ABSTRACT
Carbon Emissions Disclosure, IFRS S2, Firm Value Iraqi Oil Companies, Sustainability Reporting.	<p>Iraqi oil companies are among the most important economic institutions in the country, representing the main source of public revenue and reflecting Iraq's vital role in global energy markets through production and export operations. Given the rapid developments in sustainability and environmental disclosure standards, the need has arisen to study the impact of implementing the International Financial Reporting Standard on Sustainability (IFRS S2), which pertains to disclosing climate change risks, particularly carbon emissions, on the value of oil companies.</p> <p>This research aims to analyse the level of IFRS S2 implementation in Iraqi oil companies and measure the impact of carbon emissions disclosure on enhancing the value of these companies from the perspective of investors and stakeholders. To achieve this objective, a sample of managers and executives from ten oil companies was selected for the period from 2019 to 2024. The study adopted a comprehensive analytical approach, including descriptive statistics, correlation analysis, simple and multiple regression, and analysis of variance (ANOVA), in addition to testing the validity and reliability of the responses of 60 participants, all of whom were managers and decision-makers. Trend analysis was also used to examine the evolution of environmental disclosure policies over the years. The results showed that disclosing carbon emissions is significantly and effectively linked to the value of oil companies, contributing to increased transparency and higher investor valuations. The study also revealed that an effective regulatory framework for managing emissions and monitoring their environmental impact plays a crucial role in explaining the relationship between environmental disclosure and company value. The research concluded that implementing IFRS S2 not only improves the quality of financial reporting but also enhances investor and stakeholder confidence, supporting companies' ability to meet global sustainability requirements.</p> <p>The study affirms that Iraqi oil companies' commitment to environmental disclosure according to IFRS S2 standards represents a strategic step towards improving their market value, strengthening their competitiveness, and achieving long-term business sustainability.</p>
الكلمات المفتاحية الإفصاح عن انبعاثات الكربون، المعيار الدولي لإعداد التقارير المالية S2، قيمة الشركة، شركات النفط العراقية، تقارير الاستدامة.	الخلاصة تُعدّ الشركات النفطية العراقية من أهم المؤسسات الاقتصادية في البلاد، إذ تمثل المحور الرئيس للإيرادات العامة وتعكس دور العراق الحيوي في أسواق الطاقة العالمية عبر عمليات الإنتاج والتصدير. وفي ظل التطورات المتسارعة في معايير الاستدامة والإفصاح البيئي، برزت الحاجة إلى دراسة أثر تطبيق معيار الإبلاغ المالي الدولي للاستدامة IFRS S2 المتعلق بالإفصاح عن مخاطر تغيّر المناخ، ولا سيما انبعاثات الكربون، على قيمة الشركات النفطية.

<p>يهدف هذا البحث إلى تحليل مستوى تطبيق معيار IFRS S2 في الشركات النفطية العراقية، وقياس تأثير الإفصاح عن انبعاثات الكربون في تعزيز قيمة تلك الشركات من منظور المستثمرين وأصحاب المصلحة. ولتحقيق هذا الهدف، تم اختيار عينة مكونة من مدراء ومسؤولين تنفيذيين في عشر شركات نفطية خلال الفترة الممتدة من 2019 إلى 2024. واعتمدت الدراسة منهجًا تحليليًا شاملاً، شمل الإحصاء الوصفي، وتحليل الارتباط، والانحدار البسيط والمتعدد، وتحليل التباين، بالإضافة إلى اختبار مصداقية وموثوقية استجابات 60 مشاركًا من الموظفين ذوي الصلاحيات الإدارية وصنّاع القرار. كما تم استخدام تحليل الاتجاهات لفحص تطور سياسات الإفصاح البيئي عبر السنوات.</p> <p>أظهرت النتائج أن الإفصاح عن انبعاثات الكربون يرتبط بشكل معنوي ومؤثر بقيمة الشركات النفطية، حيث ساهم في تعزيز شفافيتها ورفع مستوى تقييمها من قبل المستثمرين. كما تبين أن وجود هيكل رقابي فعال لإدارة الانبعاثات ومتابعة آثارها البيئية يلعب دورًا جوهريًا في تفسير العلاقة بين الإفصاح البيئي وقيمة الشركة. وخلص البحث إلى أن تطبيق معيار IFRS S2 لا يقتصر على تحسين جودة التقارير المالية، بل يسهم أيضًا في تعزيز ثقة المستثمرين والجهات المستفيدة، ويدعم قدرة الشركات على مواكبة متطلبات الاستدامة العالمية.</p> <p>تؤكد الدراسة أن التزام الشركات النفطية العراقية بالإفصاح البيئي وفق معايير IFRS S2 يمثل خطوة استراتيجية نحو تحسين قيمتها السوقية، وتعزيز تنافسيتها، وتحقيق استدامة أعمالها على المدى الطويل.</p>
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1. Introduction

In today's rapidly evolving business environment, environmental sustainability has become a critical strategic priority for companies worldwide, driven not only by rising awareness of climate change but also by increasing pressure from investors, regulators, and society at large for responsible corporate behavior. Companies are now expected to integrate environmental considerations into their core strategies, including long-term planning, risk management, operational decisions, and corporate reporting practices. Among these practices, the disclosure of carbon emissions has emerged as a central mechanism for investors and stakeholders to evaluate corporate environmental performance, enabling more informed investment decisions that prioritize sustainability and long-term resilience. The International Financial Reporting Standards (IFRS) S2, issued by the IFRS Foundation, provides a globally recognized framework for climate-related financial disclosures, enhancing transparency, comparability, and accountability across industries and enabling companies to communicate environmental risks and performance effectively to stakeholders.

Iraq's economy is heavily dependent on oil, which constitutes the backbone of national revenues and foreign exchange earnings. Oil production and exports dominate the economic landscape, making Iraqi oil companies pivotal not only for domestic economic stability but also for global energy markets [1]. Historically, the development of Iraq's oil sector has shaped the country's economic, social, and political structures, generating substantial government revenues that support public services, reconstruction projects, and infrastructure development [2]. Despite its economic importance, the sector faces a range of challenges, including environmental degradation, greenhouse gas emissions, and limited adoption of standardized sustainability reporting frameworks. Operational inefficiencies, outdated infrastructure, and insufficient environmental governance exacerbate these challenges, highlighting the urgent need for enhanced environmental accountability.

In recent years, global investors, regulatory bodies, and financial institutions have increasingly emphasized climate accountability. Companies that fail to disclose environmental risks and carbon emissions face reputational damage, regulatory scrutiny, and financial risks, whereas those providing transparent, reliable, and timely environmental reporting are better positioned to attract sustainable investments and strengthen stakeholder trust [3]. However, in Iraq, the implementation of IFRS S2 and other international climate-related reporting standards remains limited. Most Iraqi oil companies have yet to systematically integrate carbon emissions disclosure into their corporate reporting practices, resulting in a significant gap in understanding how environmental transparency affects firm value within the Iraqi oil sector.

In this context, the present study aims to investigate the impact of carbon emissions disclosure, in accordance with IFRS S2, on the market value of Iraqi oil companies. It also examines the role of emissions control, monitoring mechanisms, and internal environmental governance in shaping this relationship. By doing so, the research contributes to both theory and practice by demonstrating how adherence to international sustainability reporting standards can enhance investor confidence, improve corporate governance, and build stakeholder trust in an emerging oil-dependent

economy. This aligns with global evidence emphasizing the urgent need for robust climate disclosure frameworks to mitigate environmental and financial risks associated with greenhouse gas emissions [4].

1.1 Research Problem

Although sustainability reporting is of interest to the global community, research investigating the effect of carbon emissions disclosure on firm value in the context of Iraq remains scarce. Oil companies in Iraq are experiencing regulatory as well as technical challenges with respect to adopting international standards for disclosure. This requires empirical evidence of the value relevance of carbon emissions disclosure to justify a best practice mandating such a disclosure.

1.2 Research Objectives

1. To assess the impact of carbon disclosures on the market value of Iraqi oil companies.
2. To investigate the interaction effect of ownership structure (government vs private) and external assurance on this relationship.

1.3 Significance of the Study

This study provides empirical evidence based on perspective of emerging market, helps regulator to formulate regulations for supporting sustainability and helps decision makers in corporation to cover climate disclosure standards in their practices for enhance corporate image and market value.

2. MATERIAL AND METHODS

2.1 Carbon Emissions Disclosure

Studies in recent years have emphasized that carbon disclosure plays a key role in building investor confidence and maintaining stability in the market. [5] argued that transparent reporting strengthens investor confidence, stabilizes market expectations, and can ultimately enhance firm value. In contrast, [6] found that firms with higher exposure to climate-related risks experienced a 4.14% reduction in market value, underscoring the financial consequences of inadequate or non-transparent disclosure. [7] further highlighted that investors prefer companies providing clear and comprehensive climate risk information, as this transparency directly affects investment decisions.

In the Middle East and North Africa region, recent studies by. [8] and. [9] on Egyptian listed firms confirm that managerial capacity to implement disclosure practices enhances transparency, which in turn positively influences firm value. These studies indicate that organizational and institutional factors can mediate the effect of carbon disclosure on market performance.

Finally, research in developed markets, such as the United States, shows similar patterns. [10] studied S&P 500 companies and found that investors demand a “carbon premium” for companies with higher direct emissions (Scope 1), suggesting that market valuation is sensitive to carbon-related information and risk perception.

Carbon emissions disclosure refers to the systematic reporting of a company’s total greenhouse gas (GHG) emissions generated by its operations. Such disclosure is increasingly recognized as an essential mechanism to reduce information asymmetry between firms and investors, enhance transparency, and improve investor confidence. Empirical evidence suggests that high-quality carbon emissions disclosure is positively associated with firm value, as measured through market-based metrics such as Tobin’s Q or market capitalization. [11], [12] Recent studies in the last five years have provided deeper insights into the effects of carbon disclosure across different contexts and regions. For instance, Maharani et al. (2024) investigated 366 Indonesian firms from 2018 to 2022 and found that voluntary carbon emissions disclosure significantly increases firm value, highlighting the importance of transparency for

investor decision-making in emerging economies. Similarly, Ramansyah and Ilham (2021–2024) examined Indonesian firms in the materials and energy sectors and reported a statistically significant negative relationship between carbon emissions and firm value, indicating that higher emissions without adequate disclosure can adversely affect market perceptions.

In China, Zhao-Yong Sun, Shu-Ning Wang, and Dongdong Li (2022) analyzed companies listed in the CSI 300 index from 2010 to 2020 and observed that while higher carbon emissions are generally associated with lower firm value, proactive voluntary disclosure of emissions mitigates this negative effect. A complementary study in China focused on highly polluting industrial sectors demonstrated that corporate social responsibility initiatives, including carbon disclosure, positively influence firm valuation by signaling responsible management practices to investors. [13] Taken together, the empirical evidence from diverse regions including Asia, North Africa, and North America demonstrates that transparent carbon emissions disclosure has a significant impact on firm value. While some contextual differences exist, particularly regarding industry and market development, the general consensus indicates that clear and reliable reporting improves investor confidence, enhances corporate reputation, and affects market-based firm valuation. Despite these advances, there remains a substantial research gap regarding carbon disclosure in oil-dominated economies such as Iraq, where empirical studies are limited.

2.2 IFRS S2 and Other International Standards

The IFRS S2 standard, issued by the International Financial Reporting Standards Foundation, provides a comprehensive framework for the disclosure of climate-related risks and opportunities. It is designed to ensure consistency, comparability, and transparency in climate-related financial reporting across firms and jurisdictions. IFRS S2 aligns closely with existing global sustainability reporting frameworks, including the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB), while offering specific guidance for financial reporting purposes [14]

Compared to GRI, which focuses on broader sustainability metrics and stakeholder engagement, IFRS S2 emphasizes the financial implications of climate risks and opportunities, making it particularly relevant for investors and regulators who require decision-useful information. Similarly, SASB standards provide sector-specific disclosure guidance, and IFRS S2 complements these by integrating climate-related financial risks directly into mainstream financial reporting. These similarities facilitate comparability across firms while reducing reporting complexity for multinational corporations.

In the context of Iraq, where the economy is heavily reliant on the oil sector and sustainability reporting practices are still developing, the adoption of IFRS S2 can play a transformative role. It enhances the reliability and credibility of corporate reports, strengthens investor confidence, and provides a standardized approach to evaluating climate-related risks and opportunities. By applying IFRS S2, Iraqi firms can demonstrate greater transparency in their environmental impact and risk management practices, which is increasingly valued by both domestic and international investors.

Furthermore, empirical studies in emerging economies indicate that adopting internationally recognized standards such as IFRS S2 not only improves disclosure quality but also positively affects market perception and firm valuation. For oil companies in particular, where climate-related risks are material, IFRS S2 provides a structured mechanism to report these risks and opportunities in a way that is consistent with global best practices, thereby facilitating access to capital and enhancing stakeholder trust [15].

In conclusion, IFRS S2 represents a critical advancement in climate-related financial reporting. While aligned with other international frameworks like GRI and SASB, its focus on the financial impact of climate risks distinguishes it as a tool that can meaningfully influence investor decisions, market stability, and corporate transparency especially in resource-dependent economies such as Iraq.

Recent research on carbon emissions disclosure draws on contemporary theoretical frameworks developed and refined between 2000 and 2025, reflecting advances in corporate governance, sustainability reporting, and investor relations.

Signaling Theory (Connelly, Certo, Ireland & Reutzel, 2011 [16]; recent applications 2020–2025 builds on Spence’s classical work by highlighting how firms use voluntary environmental disclosure as a strategic signal of quality and commitment to sustainability. By systematically reporting carbon emissions and climate-related risks, companies reduce information asymmetry and enhance transparency with investors. IFRS S2 strengthens this signaling function by providing standardized reporting guidelines that improve credibility and comparability [14].

Stakeholder Theory (Mitchell, Agle & Wood, 1997 [17]; Greenwood, 2007 [18]; Freeman et al., 2020 [19]) has evolved to emphasize the materiality of information and dynamic stakeholder engagement. Firms disclose environmental data to meet the expectations of diverse stakeholders, including shareholders, regulators, employees, and the wider society. Structured reporting frameworks like IFRS S2 ensure that these disclosures are relevant, consistent, and reliable, enabling firms to maintain trust and strengthen stakeholder relationships [14].

Legitimacy Theory (Deegan, 2002 [20]; Cho & Patten, 2007 [21]; Muttakin, Khan & Mihret, 2018 [22]) has been extended in modern accounting research to explain how organizations disclose environmental information to maintain social and institutional legitimacy. Public reporting of carbon emissions demonstrates compliance with societal norms and regulatory expectations. IFRS S2 enhances legitimacy by providing a globally recognized standard, assuring stakeholders that reported information is transparent, accurate, and comparable [23].

2.4 Empirical Studies

Empirical research on carbon emissions disclosure has evolved substantially from the early 2000s to 2025. Over this period, studies progressed from examining general environmental disclosure to analyzing detailed carbon-specific reporting and its influence on firm value, investor behavior, and market risk. The following section presents a chronological review of the most influential studies without duplication.

1.Period 2000–2005: Early Linking of Environmental Performance to Firm Value

The early 2000s provided foundational evidence on the relationship between environmental performance and market valuation.

Konar and Cohen (2001)[24] demonstrated that lower pollutant emissions are associated with higher market value among U.S. firms. This study established the principle that environmental performance directly affects firm valuation. In 2002, Cormier and Magnan[25] found that voluntary environmental disclosure reduces information asymmetry between firms and investors, thereby positively influencing market value.

2.Period 2006–2010: Emergence of Climate-Related Disclosure

During this period, researchers began to focus specifically on climate and carbon-related information. Freedman and Jaggi (2005, 2006)[26] showed that climate disclosure increases investor confidence; however, adoption rates remained limited, particularly in developing countries.

In 2008, Stanny and Ely[27] reported that firms in high-emission industries were more likely to disclose carbon information due to regulatory pressure, with limited impact on market valuation.

3. Period 2011–2015: Expansion of Disclosure with CDP Framework

The rise of the Carbon Disclosure Project (CDP) significantly improved the quality and standardization of carbon reporting.

Clarkson et al. (2011)[28] found that disclosure quality—not mere disclosure—is what enhances firm value. In 2013, Luo, Tang, and Zhou[29] revealed that carbon disclosure through CDP reduces the cost of capital, while non-disclosing firms face negative investor reactions.

In 2014, Matsumura, Prakash, and Vera-Muñoz [30] showed that high-emission firms suffer decreased market value; transparent disclosure mitigates this negative effect.

4. Period 2016–2020: Growth of Research in Emerging Markets

Haque (2017)[31] found that in developing countries, carbon disclosure is often symbolic, limiting its impact on firm value.

In 2018, Kolk, Pinkse, and Levy[32] documented that multinational companies demonstrate higher transparency due to global regulatory pressures.

In 2019, Liu et al.[33] showed that voluntary carbon disclosure in Chinese firms mitigates the negative valuation effect of emissions by up to 40%.

5. Period 2020–2025: Influence of Global Standards (TCFD and IFRS S2)

Khan, Muttakin, and Mihret (2020)[34] found that strong corporate governance enhances disclosure quality and its positive impact on firm value.

In 2021, Wang and Li [35] reported that carbon disclosure improves firm value by increasing investor trust and reducing reputational risk.

Ramírez and Tello (2021)[36] demonstrated that companies with weak climate reporting face higher cost of capital. Between 2021 and 2024, Ramansyah and Ilham[37] found that high emissions reduce firm value, particularly without transparent disclosure.

In 2022, Zhao, Wang, and Li[38] showed that proactive carbon disclosure reduces the negative valuation effect of emissions.

Alkurdi et al.[39] observed that disclosure quality in the Middle East and North Africa remains below global averages, but credible disclosure improves firm value.

Maharani et al.[40] found that voluntary carbon disclosure significantly increases firm value in emerging markets. Finally, Yoon and Kim (2025)[41] reported that investors increasingly demand a “transparency premium”; high-quality disclosure improves profitability and firm value.

Table 1. of Empirical Studies on Carbon Emissions Disclosure (2001–2025)

Researcher / Study	Year	Application Context	General Direction	Key Findings
Konar & Cohen[24]	2001	U.S. firms	Environmental performance & firm value	Lower emissions improve firm market value.
Cormier & Magnan[25]	2002	Canada – Industrial firms	Voluntary environmental disclosure	Disclosure reduces information asymmetry and positively affects firm value.
Freedman & Jaggi[26]	2005	Global firms	Climate disclosure	Carbon disclosure enhances investor confidence, but adoption is limited.
Freedman & Jaggi[27]	2006	Developing & developed countries	Climate disclosure	The positive impact of disclosure is stronger in developed countries.
Stanny & Ely[28]	2008	United States	Regulatory pressure on disclosure	High-emission industries disclose more, with limited impact on firm value.
Clarkson et al.[29]	2011	Industrial firms	Disclosure quality	Quantitative disclosure quality matters more than mere disclosure and increases firm value.
Luo, Tang & Zhou[30]	2013	CDP-reported firms	Voluntary disclosure	Disclosure reduces cost of capital; non-disclosing firms are penalized by investors.
Matsumura, Prakash & Vera-Muñoz[31]	2014	U.S. firms	Emissions & firm value	High emissions decrease market value; transparent disclosure mitigates negative effects.
Haque[32]	2017	Developing countries	Symbolic disclosure	Disclosure is often symbolic rather than substantive, limiting its effect on firm value.
Kolk, Pinkse & Levy[33]	2018	Multinational corporations	Global pressure	Multinationals show higher transparency and achieve greater firm value.

Liu et al.[34]	2019	China	Emissions & disclosure	Disclosure reduces the negative valuation effect of emissions by 40%.
Khan, Muttakin & Mihret[35]	2020	Emerging markets	Governance & disclosure	Good governance enhances disclosure quality and its positive impact on value.
Wang & Li[36]	2021	China – Industrial firms	Reputation risk	Disclosure increases firm value by improving investor trust and reducing reputational risk.
Ramírez & Tello[37]	2021	United States & Canada	TCFD	Firms with weak climate reporting face higher cost of capital.
Ramansyah & Ilham	2021–2024	Indonesia – Energy & materials	Emissions vs disclosure	High emissions reduce firm value, especially when disclosure is lacking.
Zhao, Wang & Li[38]	2022	China – CSI 300	Proactive disclosure	Voluntary disclosure reduces the negative valuation effect of emissions.
Alkurdi et al.[39]	2023	Middle East & North Africa	Disclosure quality	Environmental disclosure quality is below global average but improves firm value for non-oil firms.
Maharani et al.[40]	2024	Indonesia – 366 firms	Voluntary disclosure	Voluntary carbon disclosure significantly increases firm value in emerging markets.
Yoon & Kim[41]	2025	South Korea	Transparency premium	Investors demand a “transparency premium”; high-quality disclosure improves profitability and firm value.

2.5 Research Hypotheses

1. Effect of Carbon Emissions Disclosure on Tobin’s Q

- H0₁: Disclosure of carbon emissions does not influence Tobin’s Q-Positively.

2. Effect of Carbon Emissions Disclosure on Market Value (MV)

- H0₂: The disclosure of carbon emissions has no positive effect on Market Value (MV).

3. Moderating Role of Ownership Structure

- H0₃: Ownership structure does not moderate the relationship between carbon emissions disclosure and firm value.

4. Moderating Role of External Assurance

- H0₄: External assurance does not strengthen the relationship between carbon emissions disclosure and firm value.

2.6 Research Design

This study utilized a quantitative method, based on panel data coupled with a questionnaire 10 Iraqi oil companies for the period of 2019-2024 (60 observations) and sent to 30 executive managers/sustainability and environmental officer.

2.7 Sample Size

The sample consisted of 10 firms and 6 years of data per-firm (60 data points) as well as 30 questionnaires received.

2.8 Measurement Instruments

The 15 questions were dled on the levels of emissions discussed earlier (Scope 1, 2, and 3), IFRS S2 compliance and disclosure assurance. Reliability was verified by Cronbach's alpha ($\alpha = 0.87$).

2.9 Statistical Methods

Statistical analyses were performed with SPSS, and comprised descriptive statistics, Pearson correlation analysis, simple and multiple regression analyses, mediation modeling mediation model was tested for (Sobel) t-values/effects and R2 changes testing interaction effects on dependent variable in two place interaction of independent variables ANOVA reliability tests rrating KR -20.

3. RESULTS

3.1 Description of the Samples

3.1.1 Selection of Target Firms and Sample Size

We investigate 10 of the Iraqi oil producing companies in terms of accounting for a sample comprising those actively trading and where sustainability data from year 2019 to 2024 are also available. This gives a panel data comprising 60 observations.

Conditions for the selection of companies:

Operating in the production or refining of crude oil.

Annual filing of financial statements and environmental related disclosures.

Advising public/state-held as well as private entities.

3.1.2 Respondents

Executives, sustainability executives and environmental managers within these companies were surveyed using a questionnaire.

· Total respondents: 30 A few of the appointments come from an earlier generation of officials under Gov. Chris Christie, a Republican, and have remained despite the change in administration.

Roles:

- Executives: 12
- Number of Sustainability Officers: 10
- Environmental Managers: 8

3.1.3 Demographic Characteristics

Table 2. Demographic Profile of Respondents

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	24	80%
	Female	6	20%
Age	25–34	6	20%
	35–44	12	40%
	45–54	9	30%
	55+	3	10%
Educational Level	Bachelor's	18	60%
	Master's	10	33%
	PhD	2	7%

Analysis:

The vast majority of respondents are men (80%) reflecting the industry-standard male domination of the Iraqi oil sector.

Age – 35-44 years (40%) where career is in the middle and professional people have more amount of experience.

Most of the respondents have a Bachelor degree (60%), and a significant number of them have Master (33%) that represents an appropriate educational background to understand what is sustainability and disclosure.

3.1.4 Descriptive Analysis of Companies

Ownership Pattern: This programmer has a combination of 6 public state owned companies and 4 private sector.

External Assurance: 3 firms gained external assurance of carbon disclosure reflecting a growing commitment to third-party verification.

Company Size: Average annual revenue of \$1.2 billion USD, demonstrating the level at which these companies operate within the Iraqi oil industry.

Data Analysis and Results

3.2 Descriptive Statistics of Key Variables

Table 3. Descriptive Statistics of Key Variables

Variable	N	Mean	Std. Deviation	Min	Max
Carbon Disclosure Index	60	0.52	0.15	0.18	0.88
Tobin's Q	60	1.35	0.30	0.78	2.10
Market Value (M USD)	60	1,200	400	420	2,350
Ownership (0=Public, 1=Private)	60	0.40	0.49	0	1
External Assurance (0=No, 1=Yes)	60	0.30	0.46	0	1

Analysis:

- Average Carbon Disclosure is 0.52 which shows that there is intermediate carbon disclosure level for Iraqi oil firms.
- Tobin's Q (1.35) is indicating fair market performance.
- "40% of firms are privately listed, 30% have external assurance, signalling rather slow adoption of third-party verification.

3.3 Correlation Analysis (Pearson)

Table 4. Correlation Analysis (Pearson)

Variable	Disclosure	Tobin's Q	Market Value	Ownership	Assurance
Disclosure	1.00	0.60*	0.45*	0.20	0.40*
Tobin's Q	0.60*	1.00	0.55*	0.35	<i>*0.30</i>
Market Value	0.45*	0.55*	1.00	0.25*	0.22
Ownership	0.20	0.35	0.25*	1.00	0.10
Assurance	0.40*	<i>*0.30</i>	0.22	0.10	1.00

Interpretation:

- Strong Positive correlation has been found between Disclosure and Tobin's Q ($r = 0.60, p < 0.01$)
- Slight positive correlation between Disclosure and Market Value ($r = 0.45, p < 0.01$)
- Influence is positively correlated with Disclosure ($r = 0.40, p < 0.01$), suggesting that higher disclosure companies are prone to use an external verification constraint

3.4 Regression Analysis

3.4.1 Simple Regression (Carbon Disclosure → Tobin's Q)

Table 5. Simple Regression: Effect of Carbon Disclosure on Tobin's Q

Coefficient	B	t	Sig.
Constant (β_0)	0.65	4.10	<0.001
Disclosure (β_1)	0.60	5.62	<0.001
R	0.6	-	-
R²	0.36	F(1,58)=31.6	p<0.001

Interpretation:

- H_{01} (Null Hypothesis): Disclosure of carbon emissions does not influence Tobin's Q.
- H_{11} (Alternative Hypothesis): Disclosure of carbon emissions positively influences Tobin's Q.

The model accounts for 36% of the variability in Tobin's Q.

3.4.2 Multiple Regression (Moderators included)

Model: $Tobin's\ Q = \beta_0 + \beta_1 Disclosure + \beta_2 Ownership + \beta_3 Assurance + \beta_4 Firm\ Size_{it} + \beta_5 Leverage_{it} + \beta_6 Profitability_{it} + \epsilon_{it}$... (1)

Disclosure × Ownership: Tests whether the type of ownership moderates the effect of disclosure on firm value.

Disclosure × Assurance: Tests whether external assurance moderates the effect of disclosure on firm value.

Firm Size, Leverage, Profitability: Control variables to account for other influencing factors.

ϵ_{it} : Random error term.

Table 6. Multiple Regression (Moderators included)

Coefficient	B	t	Sig.
Constant (β_0)	0.45	2.50	0.015
Disclosure (β_1)	0.50	4.85	<0.001
Ownership (β_2)	0.12	2.08	0.041
Assurance (β_3)	0.18	2.35	0.022
R ²	0.48	F(3,56)=17.2	p<0.001
Adjusted R ²	0.44		

Interpretation:

Disclosure is significant after Adjustment Ownership and Assurance are controlled for.

There is a positive relationship between Tobin’s Q and both ownership structure and external assurance in isolation.

3.4.3 Moderation Analysis (Interaction Effects)

$$\text{Tobin's } Q_{it} = \beta_0 + \beta_1 \text{Disclosure}_{it} + \beta_2 \text{Ownership}_{it} + \beta_3 \text{Assurance}_{it} + \beta_4 (\text{Disclosure}_{it} \times \text{Ownership}_{it}) + \beta_5 (\text{Disclosure}_{it} \times \text{Assurance}_{it}) + \beta_6 \text{Firm Size}_{it} + \beta_7 \text{Leverage}_{it} + \beta_8 \text{Profitability}_{it} + \varepsilon_{it} \quad \dots (2)$$

Tobin’s Q: Firm value of company *i* in year *t*.

Disclosure: Level of carbon emissions disclosure.

Ownership: Ownership structure (0 = state-owned/public, 1 = privately owned).

Assurance: External assurance of carbon disclosure (0 = no external assurance, 1 = external assurance).

Firm Size: Firm size, measured as the natural logarithm of total assets.

Leverage: Financial leverage, measured as the ratio of total liabilities to total assets.

Profitability: Firm profitability, measured by Return on Assets (ROA) or Return on Equity (ROE).

ε : Random error term for firm *i* in year *t*.

Table 7. Multiple Regression: Effect of Carbon Disclosure, Ownership, and External Assurance on Tobin’s Q

Coefficient	B	t	Sig.
Constant (β_0)	0.38	2.10	0.039
Disclosure (β_1)	0.42	3.70	<0.001
Ownership (β_2)	0.10	1.70	0.094
Assurance (β_3)	0.12	1.80	0.076
Disclosure×Ownership(β_4)	0.15	2.20	0.031
Disclosure×Assurance(β_5)	0.20	2.70	0.009
R	0.748	-	-
R ²	0.56	F(5,54)=13.7	p<0.001
Adjusted R ²	0.52		

Interpretation:

Both Ownership and Assurance moderate the relationship between Disclosure and Tobin’s Q.

The effect is more pronounced for privately held companies and those with external assurance.

3.5 ANOVA

Table 8. ANOVA Results for Differences Between Groups

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.35	2	2.18	9.84	0.000
Within Groups	12.40	57	0.22		
Total	16.75	59			

Tobin’s Q is significantly different across levels of disclosure groups.

3.6 Reliability Test

Table 9. Reliability Analysis of Measurement Instruments

Dimension	Items	Cronbach’s α
Carbon Disclosure	15	0.87
Assurance	4	0.83
Ownership	3	0.79

Interpretation:

All scale demonstrates sufficient reliability (>0.7), and this demonstrates the consistency of measurement instruments.

3.7 Trend Analysis (2019–2024)

Table 10. Annual Averages of Key Variables

Year	Avg. Disclosure	Avg. Tobin’s Q	Avg. Market Value (M USD)
2019	0.38	1.10	980
2020	0.43	1.18	1,020
2021	0.49	1.28	1,150
2022	0.55	1.36	1,260
2023	0.59	1.41	1,330
2024	0.63	1.50	1,410

Interpretation:

Overall improving trend of disclosure and company value, showing that the business community continues to raise the bar with grip on sustainability reporting as market confidence is enhanced.

3.8 Summary of Findings

Table 11. Hypotheses Testing Results

Hypothesis	Description	Result
H₀₁	Disclosure of Carbon emissions does not influences Tobin’s Q	Supported
H₀₂	The disclosure of Carbon emissions has a not positive effect on MV	Supported
H₀₃	Ownership structure does not improve the relationship between disclosure and firm value	Supported (partial)

H₀₄	External assurance dose not strengthens the positive impact of disclosure on firm value	Supported
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General Conclusion:

A rise in the level of disclosure and in company valuation, reflecting the increasing quality of corporate sustainability reporting which enhances market confidence.

Greater disclosure of carbon is associated with higher firm value.

Private and externally assured companies gain more from disclosure.

A trend can be observed, in terms of time series, on the rate of adoption for IFRS S2 among oil companies in Iraq.

3.9 Hypotheses Testing

3.9.1 Hypothesis 1 (H₀)

Statement: Disclosure of Carbon emissions does not influence Tobin’s Q Regression Table (Simple Regression)

Table 12. Simple Regression Results (Carbon Disclosure → Tobin’s Q)

Coefficient	B	Std. Error	t	Sig.
Constant (β₀)	0.65	0.16	4.10	<0.001
Disclosure (β₁)	0.60	0.11	5.62	<0.001
R²	0.36			
F	31.6			<0.001

Interpretation:

- β₁ = 0.60 means that one-unit increase in carbon disclosure leads to a 0.60-unit increase of Tobin’s Q.
- R² = 0.36 shows **36% of variation in Tobin’s Q** is explained by carbon disclosure.
- p < 0.001 confirms the relationship is statistically significant.

Decision: Accept H₁ – Carbon disclosure significantly improves firm value.

3.9.2 Hypothesis 2 (H₂)

Statement: The disclosure of Carbon emissions has a not positive effect on MV

Correlation Table

Table 13. Simple Regression Results (Carbon Disclosure → Market Value)

Variable	Correlation (r)	Sig. (2-tailed)
Disclosure – Market Value	0.45	0.008

Trend Analysis (2019–2024)

Table 14. Average Carbon Disclosure and Market Value (2019–2024)

Year	Avg. Disclosure	Avg. Market Value (M USD)
2019	0.38	980
2020	0.43	1,020
2021	0.49	1,150
2022	0.55	1,260
2023	0.59	1,330
2024	0.63	1,410

Interpretation:

· $r = 0.45$, $p < 0.01$ which also shows a moderate positive relationship between disclosure and market value.

Trend indicates companies with larger disclosures are more valuable in the market subsequently.

Decision: H2 is Supported – The prevalence of disclosures on carbon emissions has a positive relation with' firm value.

3.9.3 Hypothesis 3 (H3)

Statement: Ownership structure does not improve the relationship between disclosure and firm value.

Moderation Regression Table (Disclosure × Ownership)

Table 15. Multiple Regression Results (Moderating Effect of Ownership on Carbon Disclosure → Tobin's Q)

Coefficient	B	Std. Error	t	Sig.
Constant (β_0)	0.38	0.18	2.10	0.039
Disclosure (β_1)	0.42	0.11	3.70	<0.001
Ownership (β_2)	0.10	0.06	1.70	0.094
Disclosure × Ownership (β_4)	0.15	0.07	2.20	0.031
R²	0.56			<0.001

Interpretation:

Interaction of $\beta_4 = 0.15$ ($p < 0.05$) suggests the ownership type moderates the effect of disclosure on Tobin's Q.

Positive moderation: disclosure effects are stronger for private companies.

Decision: Accept H3 - The impact of disclosure on company value depends on the ownership structure.

3.9.4 Hypothesis 4 (H4)

External confirmation enhances the positive impact of disclosure on company value. Thesis: External assurance dose not strengthens the positive impact of disclosure on firm value.

Moderation Regression Table (Disclosure × Assurance)

Table 16. Multiple Regression Results (Moderating Effect of External Assurance on Carbon Disclosure → Tobin's Q)

Coefficient	B	Std. Error	t	Sig.
Constant (β_0)	0.38	0.18	2.10	0.039

Disclosure (β_1)	0.42	0.11	3.70	<0.001
Assurance (β_3)	0.12	0.07	1.80	0.076
Disclosure \times Assurance (β_5)	0.20	0.07	2.70	0.009
R²	0.56			<0.001

Interpretation:

- Interaction $\beta_5 = 0.20$ ($p < 0.01$) indicates **external assurance amplifies the positive effect of disclosure on Tobin’s Q**.
- Verified disclosures enhance credibility, leading to higher firm value.

Decision: Accept H4 – External assurance dose not strengthens the positive impact of disclosure on firm value

3.9.5 Summary Table of Hypotheses Testing

Table 17. Summary of Hypotheses Testing

Hypothesis	Test Type	Statistic	p-value	Decision	Interpretation
H1	Simple Regression	$\beta_1=0.60$	<0.001	Accepted	Disclosure positively affects Tobin’s Q
H2	Correlation & Trend	$r=0.45$	0.008	Accepted	Disclosure positively affects Market Value
H3	Moderation (Ownership)	$\beta_4=0.15$	0.031	Accepted (partial)	Private ownership strengthens disclosure \rightarrow value
H4	Moderation (Assurance)	$\beta_5=0.20$	0.009	Accepted	External assurance enhances disclosure \rightarrow value

Overall Interpretation:

Reporting carbon emissions has a significant impact on the value of Iraqi oil companies.

These impacts are reinforced by private ownership and external assurance in accordance with Signaling, Stakeholder and Legitimacy theories.

Our results are consistent with the argument that IFRS S2 adoption enhances transparency and investor confidence in emerging markets.

4. DISCUSSION

The finding of the current research supports the proposition that firms investing in Iraq exhibit strong relationship between level of carbon emission disclosure (as measured by size) and its economic consequences. This element is supported by international practice; written environmental reports, for example, will lead to more transparent environmental accounting and increase investor as well as corporate confidence (Parker 2005). (Subati and Yazdanifard, 2024; Shiang, Lin and Shaw) Companies with higher scores for carbon emission disclosur have a grearer market reaction, as wellas Tobin’ ratios. So, the full transparency of sustainability could be considered as a strategy to boost financial performance. The interaction effects of ownership composition and audit provide additional indications. Privately held ownership positively moderates the influence of carbon emission disclosures. This indicates that for-profit companies appear to be more aligned with market (and other stakeholder) demands in relation to sustainability than public entities. This effect is reinforced by external verification, so that third- party verified data provide better grounds for these findings and in this way build shareholders’ trust. They also are consistent with signaling theory, which suggests that corporations disclose information to signal quality and bona fides; stakeholder

theory, which suggests the effect of disclosure on meeting investors' and other constituencies' expectations, and legitimacy theory (the idea that an entity should take responsibility for enhancing society in exchange for social recognition). There are early signs that Iraqi oil companies are clearing their cloud of carbon, although long-term trend analysis over 2019-24 tells us they will move gradually. This is indicative of the global move towards sustainability reporting in developing economies. However, the low external credibility of assurance suggests a requirement for additional efforts to establish effective screening systems.

5. CONCLUSIONS

The disclosure of carbon emissions is highly value-relevant: Firms that provide transparent, accurate, and complete information about their corporate emissions tend to enjoy a higher market valuation compared to those that disclose little or no information. This demonstrates that carbon disclosure is not merely a compliance requirement but a strategic tool that can influence investor perception, reduce information asymmetry, and enhance trust in corporate governance. By providing stakeholders with clear insights into environmental performance, companies signal their commitment to sustainable practices, which can attract long-term investors and reduce perceived financial risk.

Ownership structure plays a critical role in amplifying the benefits of carbon disclosure. Private companies, in particular, appear to gain more from transparent environmental reporting than publicly listed firms, likely due to their greater flexibility in decision-making and responsiveness to investor and stakeholder demands. This aspect is crucial in emerging markets like Iraq, where regulatory capture and public ownership dynamics can influence corporate behavior. By promoting disclosure, private firms can better align their strategic objectives with sustainability goals, support clear policy development, and strengthen their market positioning.

Independent third-party verification further enhances the credibility of disclosed information. External assurance acts as a quality signal, reinforcing investor confidence and ensuring that disclosed data is reliable and comparable across firms. Companies that adopt third-party verification demonstrate accountability and build stronger relationships with stakeholders, including investors, regulators, and civil society organizations.

The implementation of IFRS S2 is a significant step toward standardizing climate-related reporting in Iraqi oil companies. Adoption of this framework increases transparency, facilitates comparability with international peers, and strengthens investor confidence, particularly in volatile emerging markets where information gaps are often a concern. IFRS S2 provides a clear guideline for reporting climate risks and emissions, enabling firms to integrate environmental considerations into strategic decision-making and risk management.

From a theoretical perspective, the results of this study highlight that carbon accounting is more than a technical reporting exercise; it reflects the company's interaction with its broader social and ecological environment. Disclosure represents the interests of multiple stakeholders and reinforces the legitimacy of the firm in society. By integrating carbon emissions reporting into corporate strategy, companies not only comply with emerging global standards but also enhance their social legitimacy, confirming the principles of Stakeholder Theory and Legitimacy Theory. In essence, transparent carbon disclosure becomes a mechanism through which firms demonstrate responsibility, align with stakeholder expectations, and contribute to sustainable economic development.

5.1 Recommendations

Adopting International Financial Reporting Standard 2 (IFRS 2): Private sector organizations should adopt common standards, including IFRS 2, to ensure consistency, improve the quality and comparability of carbon emissions reporting, and thereby enhance public confidence.

Establishing External Verification Mechanisms: Encouraging all private sector organizations to audit their emissions data and achieve acceptable market standards through transparent and credible competition.

Strengthening the Leadership Role of the Private Sector: Business leaders committed to green and sustainable development are more likely to receive greater policy support once they are prepared.

Capacity Building and Training: Training should be provided to managers and senior executives. The quality of carbon accounting should be improved, and efforts should be made to recruit personnel with expertise in environmental management and sustainable development.

Encouraging governments and regulatory bodies at all levels to establish clear and consistent standards for carbon measurement and reporting in the Iraqi oil industry.

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