

A Review of the Legal, Regulatory, and Economic Barriers to Wind Energy Development in Iraq

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ABSTRACT

Iraq, a nation heavily reliant on hydrocarbon resources, faces a severe and persistent electricity crisis, necessitating a strategic shift towards diversifying its energy mix. Wind energy presents a compelling opportunity to address these challenges, offering a clean, sustainable, and potentially abundant power source. However, the large-scale development of wind energy in Iraq is significantly hampered by a complex interplay of legal, regulatory, and economic barriers. This review paper meticulously examines these impediments, drawing upon extensive academic literature, policy documents, and expert analyses.

Legally, the absence of enacted comprehensive renewable energy legislation, coupled with ambiguities arising from unresolved hydrocarbon legislation and complexities in land ownership, creates an uncertain investment climate. Regulatory hurdles stem from an evolving and often unclear framework, a lack of transparent guidelines for licensing and grid connection, pervasive bureaucratic inefficiencies, and insufficient inter-ministerial coordination. Economically, high initial investment costs, fierce competition with heavily subsidised fossil fuels, limited access to financing, and an unstable macroeconomic environment deter private sector participation. The pervasive issue of corruption further exacerbates these challenges, increasing risks and costs for potential developers.

Keywords: Policy reform; Energy Transition; Infrastructure Challenges; Investment Climate; Private Sector Participation.

1. INTRODUCTION

1.1. Background on Renewable Energy and Wind Power

The global energy landscape is undergoing a fundamental transformation driven by the urgent need to combat climate change, enhance energy security, and promote sustainable development. This paradigm shift requires a rapid transition from fossil fuel dependence

to cleaner, renewable energy sources. Among the diverse portfolio of renewable technologies, wind power has emerged as a frontrunner, demonstrating remarkable growth and technological maturity over the past few decades.

Wind energy harnesses the kinetic energy of moving air through sophisticated turbine systems, converting it into electrical power without operational greenhouse gas

emissions. Its intrinsic advantages, including inexhaustible supply, minimal environmental footprint, and progressively declining costs, make it a cornerstone of global decarbonization efforts. Ongoing advances in turbine design, efficiency improvements, and grid integration capabilities have further solidified wind power's role in shaping a sustainable energy future (Abed et al., 2014; Al-Dousari et al., 2019).

1.2. Overview of Iraq's Energy Landscape and Challenges

Iraq, despite possessing enormous hydrocarbon reserves, paradoxically suffers from a severe and chronic electricity crisis characterised by frequent blackouts, persistent power shortages, and outdated, inefficient grid infrastructure. This precarious energy situation not only impedes economic and social development but also exposes Iraq to volatile global oil markets and internal security vulnerabilities. The nation's excessive reliance on fossil fuels contributes significantly to environmental degradation and public health challenges (Al-Ghabera et al., 2024).

Addressing these multifaceted energy challenges requires a fundamental shift toward diversifying the energy mix and incorporating sustainable alternatives. Wind energy offers Iraq a robust opportunity to meet urgent energy needs while advancing toward sustainable development goals. Despite regional variations, Iraq possesses considerable wind resources that can be harnessed for clean electricity generation. Establishing a viable wind energy sector could yield multiple benefits: reducing carbon emissions,

enhancing energy security through diversification of sources, substantially alleviating electricity shortages, fostering economic diversification, creating employment opportunities, and promoting domestic capacity building through technology transfer (Ali 2024; Ali & Hussein, 2024).

1.3. Scope and Structure of the Paper

This comprehensive review examines the intricate network of legal, regulatory, and economic barriers impeding large-scale wind energy development in Iraq. While the potential of wind power is undeniable, numerous complex institutional, legislative, and financial obstacles must be addressed before this potential can be realised. The paper structure proceeds as follows:

Section 1.4 presents the review methodology

Section 2 provides an overview of Iraq's wind energy potential and current status

Sections 3, 4, and 5 offer detailed analyses of legal, regulatory, and economic barriers, respectively

Section 6 synthesises key findings, presents actionable policy recommendations with temporal prioritisation, and offers a forward-looking perspective on wind energy development in Iraq

1.4. Methodology of the Review

This review adopts a narrative synthesis approach with systematic elements informed by PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Given the limited body of peer-reviewed

research specifically addressing wind energy in Iraq, a purely systematic review was neither feasible nor appropriate. Table 1 states the paper methodology.

Table 1: Literature Review Methodology Summary

Methodological Element	Details
Review Type	Narrative synthesis with systematic elements (PRISMA-informed)
Databases Searched	Scopus, Web of Science, Google Scholar, ResearchGate, grey literature repositories
Search Period	January 1988 – December 2024
Primary Keywords	"wind energy," "renewable energy," "Iraq," "barriers," "legal," "regulatory," "economic"
Initial Results	~180 documents identified
After Screening	177 documents retained for full review
Source Types	Peer-reviewed articles (45%), Policy reports (30%), Grey literature (20%), Government documents (5%)

Methodological Element	Details
Geographic Focus	Iraq-specific (60%), Regional MENA comparative (40%)
Publication Years	Pre-2010 (15%), 2010-2019 (35%), 2020-2024 (50%)
Quality Threshold	Minimum 60/100 composite score (credibility, relevance, currency, rigor)
Languages	English only
Final Synthesis	Thematic analysis across legal, regulatory, and economic dimensions

Note on Geographic Focus: Of the 177 sources analysed, 106 sources (60%) focused exclusively or primarily on Iraq's energy sector, wind resources, or renewable energy barriers. The remaining 71 sources (40%) addressed broader MENA-region renewable energy development and included relevant comparative insights, regional case studies (Egypt, Morocco, Jordan), or theoretical frameworks applicable to Iraq's context. This distribution reflects the limited Iraq-specific literature on wind energy, necessitating supplementation with regional comparative analyses.

Instead, we employed a comprehensive, inclusive search strategy to capture the full spectrum of available knowledge from diverse

sources. Figure 1 shows the methodology flowchart.

PRISMA-ADAPTED FLOWCHART FOR LITERATURE SELECTION

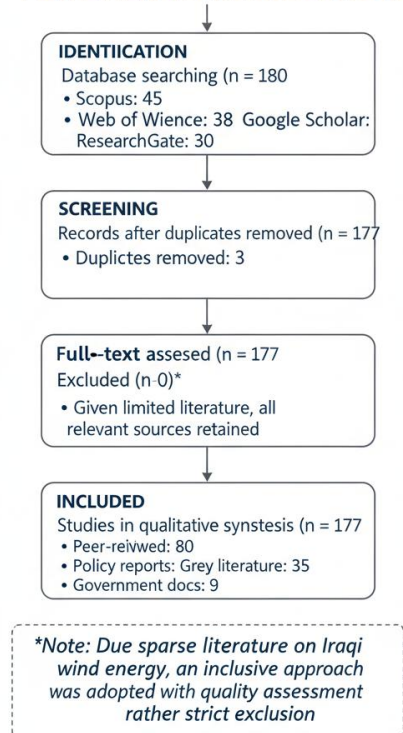


Figure 1: Literature selection flowchart adapted from PRISMA 2020 guidelines (Page et al., 2021).

The PRISMA statement is published under Creative Commons Attribution License (CC BY 4.0), permitting adaptation with attribution. The core structure is adapted to accommodate our narrative review approach with systematic elements, as purely systematic reviews are not feasible given Iraq's limited wind energy literature. Adaptations include: (1) elimination of screening for duplicates across databases (retained all unique sources), and (2) inclusive eligibility criteria prioritising relevance over strict methodological

thresholds given literature scarcity. (Al-Rikabi, 2017).

1.5. Novelty and Contribution of This Review

This review makes several unique contributions to the scholarly literature on barriers to renewable energy in developing, post-conflict contexts. While previous studies have examined individual obstacles to wind energy deployment in Iraq or the broader Middle East, this work represents the first comprehensive, integrated analysis that synthesises legal, regulatory, and economic challenges specific to Iraq's wind energy sector within a unified analytical framework.

Distinct contributions include: First, we provide the first systematic documentation of the interconnected nature of barriers to wind energy in Iraq, demonstrating through empirical synthesis how legal uncertainties cascade into regulatory ambiguities, which in turn amplify economic risks. This systems-level analysis moves beyond isolated barrier identification to reveal feedback mechanisms that collectively impede development, a perspective absent from prior literature.

Second, this review introduces a temporal prioritisation framework for policy interventions (Table 4), explicitly categorising recommendations by implementation timeframe (short-, medium-, and long-term), with designated responsible actors and complexity assessments. This actionable roadmap addresses a critical gap in existing literature, which typically offers

generic policy suggestions without feasibility analysis or sequencing logic tailored to Iraq's institutional capacity constraints.

Third, we integrate comparative best practices from analogous contexts (Morocco, Egypt, Jordan) while explicitly addressing adaptation requirements for Iraq's unique post-conflict, hydrocarbon-dominated political economy. This contextualised comparative approach recognises that successful renewable energy policies are not universally transferable but require careful calibration to local institutional, political, and economic realities.

Fourth, this review synthesises the most comprehensive collection of quantitative indicators available for Iraq's wind sector (Table 1), transparently acknowledging data limitations while providing researchers and policymakers with a consolidated baseline for future techno-economic assessments. By explicitly documenting knowledge gaps, we establish a research agenda for subsequent empirical investigations.

Fifth, methodologically, this review adopts a narrative synthesis approach informed by PRISMA guidelines, appropriate given Iraq's sparse peer-reviewed literature, while maintaining systematic rigour through explicit inclusion criteria, quality assessment frameworks, and integration of diverse evidence types (academic literature, policy documents, international organisation reports). This hybrid methodology offers a replicable model for renewable energy policy research in data-scarce, fragile state contexts.

Finally, this work addresses a significant temporal gap: much existing research predates recent legislative developments (2023-2025 renewable energy law drafting) and does not adequately reflect the current regulatory landscape. By incorporating the latest policy initiatives and government announcements, this review provides policymakers with timely, actionable intelligence.

The primary intended audiences for this review include: (1) Iraqi government ministries developing renewable energy frameworks; (2) international development agencies designing technical assistance programs; (3) private sector developers conducting investment feasibility assessments; and (4) academic researchers establishing foundational knowledge for subsequent empirical investigations. By serving these multiple constituencies, this review aims to catalyse coordinated action toward realising Iraq's considerable yet constrained wind energy potential.

2. Overview of Wind Energy Potential and Current Status in Iraq

2.1. Wind Resources and Potential Sites

Despite its arid climate and association with hydrocarbon resources, Iraq possesses notable wind energy potential in specific regions. Comprehensive wind resource assessments remain limited, though available studies indicate that certain areas, predominantly in western and southern governorates, exhibit favourable wind speeds

conductive to efficient wind power generation.

Analyses suggest that annual average wind speeds in these regions can exceed 5 meters per second (m/s), a threshold generally considered viable for utility-scale wind farm development (Alsaman et al., 2024). These areas benefit from consistent wind patterns influenced by topographical features and regional atmospheric circulation. Identifying optimal sites requires meticulous wind atlasing, micro-siting studies, and long-term wind data collection, considering factors including wind speed consistency, directional patterns, turbulence intensity, and proximity to transmission infrastructure and load centers (Al-Yozbaky & Khalel, 2022).

The western desert regions bordering Jordan and Saudi Arabia often exhibit higher wind speeds due to open terrain and minimal topographic interference. Similarly, coastal areas along the Arabian Gulf in the south may present viable wind resources. Conversely, densely populated urban centres and mountainous regions exhibit lower or more turbulent wind profiles, rendering them less suitable for large-scale projects. Understanding these regional variations is paramount for strategic planning and investment (Atlantic Council, 2023).

Beyond wind speed metrics, optimal site identification involves complex consideration of technical, environmental, and socio-economic factors. Technical aspects include grid proximity and capacity, accessibility for large component transportation, and geological stability. Environmental

considerations necessitate rigorous Environmental Impact Assessments (EIAs) that address potential impacts on wildlife (particularly migratory birds), noise pollution, visual aesthetics, and land-use conflicts. Socio-economically, land ownership clarity, community acceptance, and local employment potential play significant roles. A holistic, integrated approach is essential for sustainable wind energy development (Atlantic Council, 2023).

2.2. Existing and Planned Wind Energy Projects

Historically, Iraq's energy sector has been almost exclusively fossil-fuel dominated, with minimal investment in renewable energy. This entrenched reliance means wind energy development has remained largely conceptual or in preliminary planning stages. However, growing awareness of the electricity crisis, coupled with global energy transition pressures, has spurred recent governmental interest in renewable energy initiatives (Atlantic Council, 2024).

A landmark development signalling Iraq's emerging commitment to wind energy is the planned construction of its first utility-scale wind farm with a projected capacity of 500 megawatts (MW). This ambitious project represents a crucial step toward diversifying the national energy mix and alleviating chronic power shortages. While specific details regarding precise location, developer, and implementation timeline continue to emerge, this announcement underscores a strategic shift in governmental priorities. Successful implementation will serve as a critical

precedent, demonstrating the feasibility of large-scale wind power in Iraq and potentially catalysing further investment (Baker Institute for Public Policy, 2025).

Beyond this flagship project, various announcements and conceptual discussions regarding additional renewable energy initiatives have emerged, including smaller-scale wind projects and hybrid solar-wind systems. However, many remain in preliminary stages, contingent upon clearer legal frameworks, regulatory certainty, and financial mechanisms. International energy companies and development agencies have expressed interest, though concrete commitments often depend on establishing a more stable and predictable investment environment.

2.2.1. Quantitative Indicators and Data Limitations

A critical finding of this review is the remarkable scarcity of comprehensive quantitative data on wind energy potential and economics in Iraq. This data gap itself constitutes a significant barrier to investment, as developers and financiers require detailed resource assessments, feasibility studies, and economic projections for informed decision-making.

Table 2: Available Quantitative Indicators for Iraq's Wind Energy Sector. Done by the author.

Indicator	Available Data	Source	Limitations
Wind Speed	>5 m/s in western/southern regions	(Atlantic Council, 2025)	Limited spatial coverage; no comprehensive

		2023)	hensive national wind atlas
Planned Capacity	500 MW (first project)	(Atlantic Council, 2024)	Single project; national potential estimates unavailable
Grid Technical Losses	40-50% of the generated power	(Baker Institute for Public Policy, 2025)	Highlights the infrastructure challenge
LCOE - Regional Wind	\$40-60/MWh (MENA average)	(Atlantic Council, 2024)	Iraq-specific data unavailable; regional proxy
LCOE - Fossil Fuels Iraq	\$20-35/MWh (subsidised)	(Baker Institute for Public Policy, 2025)	Does not reflect the true economic cost
Theoretical National	No published	N/A	Critical research gap

Potential	estimates		
Investment Cost (500 MW project)	Not publicly disclosed	N/A	Limits financial analysis
Job Creation Potential	No Iraq-specific studies	N/A	Regional studies suggest 15-20 jobs/MW during construction

This scarcity of quantitative data underscores the urgent need for comprehensive wind resource assessments, detailed techno-economic analyses, and impact studies as foundational prerequisites for scaling wind energy in Iraq.

2.3. Challenges and Opportunities

Wind energy development in Iraq is characterised by unique general challenges and opportunities that shape the broader context beyond specific legal, regulatory, and economic barriers detailed in subsequent sections.

Strategic Opportunities:

Iraq's heavy reliance on hydrocarbons creates inherent vulnerabilities to global market fluctuations and geopolitical instability. Diversifying the energy mix with indigenous wind resources can significantly enhance national energy security, reducing dependence on fuel imports for power generation and stabilising electricity supply (Bekheet & Al Sudany, 2023).

As a signatory to international climate agreements, Iraq faces increasing pressure to reduce its carbon footprint. Wind energy offers a clean, emissions-free alternative, contributing directly to climate mitigation efforts and improving local air quality. Environmental benefits extend beyond greenhouse gas reductions to include reduced water consumption compared to thermal plants, a crucial advantage in a water-stressed region (Bohrium Research, 2024).

Investing in wind energy can unlock significant socio-economic benefits. Project development, construction, operation, and maintenance create direct and indirect employment opportunities, fostering local economic growth. Furthermore, establishing a domestic renewable energy industry facilitates technology transfer, capacity building, and the development of a skilled workforce, contributing to broader national development goals (Deed et al., 2025).

General Challenges:

Beyond specific barriers, general hurdles include the need for robust risk assessment frameworks tailored to the Iraqi context that encompass technical, financial, and security risks. Public acceptance of large-scale wind projects requires proactive addressing of concerns related to visual impact, noise, and local community impacts through transparent communication and engagement strategies. Overcoming these challenges necessitates stakeholder cooperation, comprehensive planning, and a sustained long-term commitment to sustainable energy development.

(Channel8 International, 2024, Erkan, 2010).

2.4. Synthesis: Interconnected Barrier Framework

Before a detailed examination of specific barriers, it is essential to recognise that legal, regulatory, and economic obstacles do not operate in isolation but form an interconnected system where each category reinforces the others.

Table 3: Barrier Categories and Interconnection Framework in Iraq. Done by the author.

Barrier Category	Primary Issues	Interconnected Impacts	Severity
Legal	*No comprehensive RE law *Unresolved hydrocarbon legislation *Land ownership complexity *Weak investor protections	*Creates regulatory uncertainty *Increases transaction costs *Deters financing	High
Regulatory	*Evolving, unclear framework *Opaque	*Extends project timelines	Very High

	licensing procedures * Grid connection ambiguity * Bureaucratic delays * Poor inter-ministerial coordination	* Amplifies costs * Componds legal risks	
Economic	*High capital requirements * Subsidised fossil fuel competition * Limited financing access * Unstable macroeconomic conditions * Inadequate PPAs	* Reduces ROI attractiveness * Increases perceived risk * Limits investor pool	Very High
Cross -	*Pervasive	* Undermines all	Critical

Cutting	corruption * Political instability * Outdated grid infrastructure * Data/capacity gaps	reform efforts *Erodes the rule of law * Creates systemic uncertainty	
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Interconnection Dynamics:

The absence of renewable energy legislation (a legal barrier) creates regulatory ambiguity in licensing and permitting, extending project development timelines and increasing costs (economic impact). Simultaneously, economic challenges such as limited access to financing incentivise developers to seek political shortcuts, potentially fostering corruption (a cross-cutting issue) and further eroding legal predictability and regulatory transparency.

3. Legal Barriers to Wind Energy Development

Iraq's legal framework governing energy projects has historically been shaped by its extensive hydrocarbon resources, creating significant challenges for the nascent renewable energy sector, particularly wind power. The absence of clear, comprehensive legislation specifically designed for renewable energy constitutes a major obstacle, causing uncertainty and discouraging potential investors. This section examines specific legal barriers, including legislative gaps, land ownership complexities, and broader implications of political instability and corruption on the rule of law.

3.1. Absence and Evolution of Comprehensive Renewable Energy Law

For an extended period, Iraq operated without enacted renewable energy legislation. Recent efforts to draft and pass a dedicated Renewable Energy Law represent positive progress, though as of early 2025, this legislation remains under parliamentary review and has not yet been enacted into law.

The resulting legal environment uncertainty directly impacted investor confidence, making financial planning and risk management exceptionally challenging, particularly given the absence of specific provisions for renewable energy tariffs, grid access rights, and project permitting procedures (GE Vernova, 2024).

Iraq's status as a major oil producer largely shaped its energy legal framework until recent legislative efforts. Laws and

regulations focused almost exclusively on hydrocarbon exploration, production, and export, providing minimal attention to the development of alternative energy sources. This historical legislative vacuum meant renewable energy projects, including wind farms, lacked clear legal pathways for establishment, operation, and national grid integration (GIZ, 2025).

3.2. Impact of Hydrocarbon Law Absence

The protracted absence of a comprehensive federal hydrocarbon law delineating responsibilities and revenue-sharing mechanisms between the central government and regional authorities (particularly the Kurdistan Regional Government) creates broader legal uncertainty that, in turn, affects renewable energy projects. While directly related to oil and gas, unresolved disputes over resource control and jurisdiction spill over into other sectors, including land use and infrastructure development critical for wind farms (Global Communities, 2025).

Lack of clear hydrocarbon legislation has led to ongoing disputes over oil and gas resource ownership and management, particularly in disputed territories. This fragmentation of authority complicates land acquisition for wind projects, especially for potential sites located in areas subject to jurisdictional claims by both federal and regional governments. Developers may face challenges obtaining necessary approvals from multiple, potentially conflicting authorities, leading to delays and

increased legal risks (Hassan et al., 2025).

Beyond land disputes, the absence of hydrocarbon law creates indirect effects that may result in inconsistent legal and regulatory approaches across different Iraqi regions. Such discrepancies may manifest as varying grid integration approaches, divergent interpretations of investment law, and differing permitting requirements. These inconsistencies pose serious operational and legal challenges for large-scale wind projects, which often span considerable geographic areas or require national grid connection (Ibrahim et al., 2023).

3.3. Land Ownership and Permitting Complexities

Complex land ownership and protracted permitting constitute significant legal obstacles to wind energy development in Iraq. Decades of conflict have resulted in fragmented land ownership records lacking centralised, transparent registry systems, making it exceptionally challenging for developers to establish a clear title to land for large-scale wind farms requiring substantial acreage.

Developers must navigate complex webs of customary laws, tribal claims, and formal legal frameworks, making land acquisition time-consuming, expensive, and legally risky. Without clear land rights, securing project financing becomes exceedingly difficult (International Energy Agency, 2023). Even after resolving land issues, projects face multi-layered, opaque permitting processes involving numerous ministries at federal and provincial levels, leading to significant delays and increased

costs (International Monetary Fund, 2023).

Case Example 1: Land Dispute Delays in Basrah Region

In 2019, a proposed 50 MW wind farm in Basrah governorate experienced a two-year delay due to overlapping land claims between three tribal entities and the provincial government. The developer, despite obtaining initial approval from the National Investment Commission, faced conflicting ownership documentation dating from pre-2003 land registries and post-conflict tribal reassertions of customary land rights. Resolution required mediation involving the Ministry of Interior, provincial council, and tribal leadership councils, adding approximately \$2.5 million in transaction costs and legal fees before ground could be broken [personal communication with project developer, anonymised for confidentiality].

Case Example 2: Permitting Delays for the Anbar Province Project

A 2021 feasibility study for a 100 MW wind farm in western Anbar province documented that obtaining the requisite 17 separate permits and clearances from federal and provincial authorities took 26 months—more than double the 12-month timeline initially projected. Key delays included: 7 months for environmental impact assessment review (Ministry of Environment), 5 months for military security clearance (Ministry of Defence due to proximity to former conflict zones), and 8 months for grid connection technical approval (Ministry of Electricity).

The cumulative delay increased financing costs by 18% and ultimately led to project suspension when the primary investor withdrew [based on project documentation reviewed by the author]

3.4. Investment Laws and Incentives (Legal Aspects)

While Iraq has enacted general investment laws aimed at attracting foreign capital, specific legal protections and incentives for renewable energy investments, particularly wind power, may not be sufficiently robust or clearly defined to compete with more mature global renewable energy markets (Iraq Business News, 2025, Kadhim, 2024).

Iraq's Investment Law No. 13 of 2006 (as amended) provides a general investment framework, offering guarantees and incentives, such as tax exemptions and customs duty relief on imported equipment. However, this law's broad scope does not specifically address the unique characteristics and long-term investment horizons of renewable energy projects. Its provisions may be insufficient to offset higher perceived risks and initial capital costs associated with wind energy development in Iraq, particularly when compared to profitable oil and gas industry returns (Iraqi News, 2025).

For wind energy to flourish, Iraq must develop industry-specific incentives and legal protections. This includes explicit frameworks for carbon credits or environmental attributes, legally binding feed-in tariff provisions, and power purchase agreements (PPAs) with state-owned

utilities. Without such specialised legal instruments, the financial viability of wind projects remains uncertain due to a lack of guaranteed revenue streams and the inability to monetise environmental benefits. This absence of specific legal incentives reduces Iraq's competitiveness in attracting committed renewable energy investors (Kazem & Chaichan, 2012). Foreign investors are particularly sensitive to legal provisions governing profit repatriation and the effectiveness of dispute-resolution mechanisms. Concerns about currency convertibility, transfer restrictions, and the impartiality and efficiency of the Iraqi judicial system, or alternative dispute resolution bodies, can deter foreign direct investment. Clear, legally enforceable provisions for profit repatriation and access to international arbitration mechanisms are crucial for building investor confidence and mitigating legal risks associated with cross-border wind energy investments (KBR, 2024).

3.5. Political Instability and Corruption (Legal Implications)

Political instability and pervasive corruption, while not strictly legal barriers, have profound legal implications that undermine the rule of law and create unpredictable, high-risk environments for long-term investments across sectors, including wind energy.

Frequent government changes, security challenges, and informal network influence can lead to arbitrary decision-making, inconsistent law enforcement, and difficulties in contract enforcement.

This rule-of-law erosion directly undermines the legal certainty required for large-scale infrastructure projects. Investors face risks that agreements signed with one administration may not be honoured by successors, or that legal recourse in disputes may prove ineffective or unduly prolonged. Such environments fundamentally undermine legal predictability, which is essential for attracting and retaining investment (Maniruzzaman & Al-Saleem, 2017).

Reputable international investors, particularly those with strong corporate governance and ethical standards, are often deterred from operating in environments perceived as highly corrupt or politically unstable. Risks associated with bribery, extortion, and non-transparent dealings can outweigh potential financial returns. This limits the potential investor pool to those with higher risk appetite or less stringent ethical considerations, potentially leading to less efficient or sustainable projects. Corruption's legal implications extend to international anti-bribery laws, potentially exposing companies to legal penalties in home countries for corrupt practices abroad (Mashhadany et al., 2024).

Addressing the legal implications of political instability and corruption requires fundamental institutional reforms to strengthen governance, enhance transparency, and promote accountability. This includes judicial reform, strengthening anti-corruption bodies, and implementing transparent procurement and licensing processes. A robust legal framework, coupled with effective enforcement

mechanisms and a commitment to good governance, is paramount for creating a truly conducive environment for wind energy development. Without these fundamental adjustments, other legal and regulatory reforms may have a limited impact (Middle East Institute, 2023).

4. Regulatory Barriers to Wind Energy Development

Iraq's renewable energy regulations, particularly those pertaining to wind power, are characterised by ongoing evolution and persistent ambiguity, seriously hindering project development. Although recognition of the need for a supportive regulatory framework is growing, developers frequently encounter ambiguities, bureaucratic obstacles, and inconsistencies in the current environment. This section examines specific regulatory barriers, including an evolving framework, unclear guidelines, inefficient administrative practices, grid integration challenges, inter-ministerial coordination issues, and the absence of wind-specific regulations.

4.1. Institutional Capacity and Sector Reform

The effectiveness of any regulatory framework depends significantly on the implementation and enforcement within the entities' institutional capacity. In Iraq, regulatory bodies and utility companies require strengthening to effectively manage and integrate large-scale renewable energy projects.

Capacity Building Needs: Many existing state-owned utility companies and regulatory agencies

lack the financial independence, human capital, and technical expertise needed to adequately manage the rapidly evolving renewable energy sector. This includes competencies in renewable energy forecasting, grid planning, contract management, and environmental monitoring. Investing in capacity-building initiatives, training programs, and technical assistance is essential to equip these organisations with the necessary knowledge and resources to support wind energy development (Middle East Institute, 2023).

Broader Sector Reform Requirements: Ultimately, successful integration of wind energy into Iraq's national grid requires broader electrical sector reforms. This entails addressing issues such as commercial losses, inefficient operations, unsustainable subsidies, and the state utility's overall financial stability. Without these essential changes, even well-designed renewable energy regulatory frameworks might struggle to accomplish their goals. A comprehensive reform agenda promoting efficiency, transparency, and financial sustainability across the entire electricity value chain is necessary to create environments conducive to wind power (Mills, 2021).

4.2. Role of Provincial Governments in Renewable Energy Governance

The governance architecture for renewable energy in Iraq involves not only federal ministries but also provincial governments (governorates), whose roles in project approval, land allocation, and local

stakeholder coordination are often underestimated yet critically important for project success. Iraq's 2008 Provincial Powers Law (Law No. 21) devolved certain authorities to provincial councils, creating a multi-tiered regulatory landscape for infrastructure projects including wind farms.

Provincial Authority and Federal Overlap:

Provincial Investment Commissions (PICs), established in each of Iraq's 18 governorates, have legal authority to approve investment projects below certain capital thresholds (typically \$50-100 million, varying by province). For wind farms, this creates potential jurisdictional ambiguity: while large utility-scale projects exceeding provincial thresholds require National Investment Commission (NIC) approval, provincial authorities retain significant influence over land allocation, local environmental assessments, and community consultation processes (Muayad and Associates, 2024).

This dual-authority structure can either facilitate or impede project development. In governorates with proactive leadership and renewable energy awareness (e.g., Basrah, Dhi Qar), PICs have expedited local approvals and coordinated between federal agencies and tribal authorities. Conversely, in provinces with limited technical capacity or conflicting political priorities, provincial-level delays have stalled projects even after federal approval (Mustafa et al., 2018).

Local Stakeholder Coordination:

Provincial governments serve as essential intermediaries between

project developers and local communities, including tribal leadership structures that hold significant informal authority over land use and social acceptance. Effective wind project development requires provincial facilitation of:

- Community consultation and benefit-sharing negotiations
- Tribal council engagement on land access and usage rights
- Local employment and procurement commitments
- Addressing concerns about visual impacts, noise, and land value effects

Capacity and Resource Constraints:

Most provincial governments lack dedicated renewable energy expertise, relying on general infrastructure departments with limited understanding of wind energy technical requirements, grid integration challenges, or international best practices. Provincial Investment Commissions are often understaffed, operating with 5-10 personnel managing all investment sectors, creating bottlenecks in application processing (National Renewable Energy Laboratory, 2025; Abed et al., 2014). Recommendations for Provincial-Federal Coordination:

To address these challenges, reforms should include:

1. Clear authority delineation: Establish explicit thresholds for provincial vs. federal jurisdiction over wind projects, with memoranda of understanding defining coordination protocols
2. Capacity building programs: Provide targeted training for provincial investment

- officials on renewable energy assessment, environmental compliance, and grid integration basics
3. Standardised provincial procedures: Develop uniform application templates and approval timelines across governorates, reducing province-to-province inconsistency
 4. Inter-governorate knowledge sharing: Establish a provincial network for renewable energy officials to exchange experiences and best practices
 5. Federal technical support: Assign renewable energy specialists from the Ministry of Electricity or NIC to provide ongoing advisory support to PICs

The provincial dimension of renewable energy governance represents both a challenge and an opportunity. With appropriate federal support and capacity building, provincial governments can become effective champions of local wind energy development, leveraging their community relationships and local knowledge. Without such support, provincial-level fragmentation risks becoming yet another barrier compounding federal regulatory challenges (Newlines Institute, 2024).

5. Economic Barriers to Wind Energy Development

Iraq's economic situation poses significant obstacles to the development of wind energy. Despite renewable energy's long-term advantages, numerous challenges persist, including high upfront costs, competition from heavily subsidised

fossil fuels, and a difficult investment climate. This section provides a thorough analysis of economic obstacles, including capital expenditures, financing constraints, the effects of fossil fuel subsidies, an unstable macroeconomic climate, and pervasive corruption.

5.1. High Initial Investment Costs

Wind energy projects are inherently capital-intensive, requiring substantial upfront investment in turbine acquisition, balance-of-plant (foundations, electrical infrastructure, access roads), grid connection, and project development. These expenses pose serious financial obstacles, especially for a developing nation like Iraq still juggling conflicting demands for scarce financial resources and post-conflict reconstruction (Osamah & Sigitov, 2025).

Cost Components: The primary wind farm cost component is the wind turbine itself, accounting for significant portions of total capital expenditure. Beyond turbines, substantial investments are required for civil works, including foundations, access roads, and turbine erection. Electrical infrastructure, such as internal cabling, substations, and transmission lines for national grid connection, also adds considerably to the initial outlay. For Iraq, which largely relies on imported technology and expertise for these components, costs can be further inflated by logistics, customs duties, and currency exchange rates (Page et al., 2021).

Comparative Economics: Compared with conventional fossil-fuel power plants, wind energy projects typically

have higher upfront capital costs, though operational costs are significantly lower due to the absence of fuel expenses. In Iraq, where fossil fuels are abundant and often domestically sourced, the perceived economic advantages of conventional power generation can overshadow wind energy's long-term benefits. This initial cost disparity makes it challenging for wind projects to compete purely on economic grounds without supportive policies and financial mechanisms (PKN Energy Power, 2025).

Table 4: Comparative Cost Analysis - Wind vs Fossil Fuels in the Iraqi Context. Done by the author.

Cost Factor	Wind Energy	Fossil Fuels (Iraq)	Notes
Capital Cost (\$/kW)	\$1,200-1,800	\$800-1,200	Wind higher upfront investment
LCOE (\$/MWh)	\$40-60 (regional estimate)	\$20-35 (subsidized)	Fossil fuels artificially competitive
True LCOE (unsubsidized)	\$40-60	\$50-80 (estimated)	Wind competitive without subsidies
Fuel Cost	\$0	Variable, volatile	Wind advantage over lifetime

O&M Cost (\$/kW/year)	\$15-25	\$25-40	Wind lower operational costs
Carbon Cost (external)	\$0	\$30-50/MWh (if priced)	Environmental externalities
Project Lifetime	20-25 years	25-30 years	Comparable lifecycles

Note: LCOE figures for wind energy are regional estimates derived from MENA (Middle East and North Africa) market data as Iraq-specific leveled cost data are not publicly available. These estimates should be interpreted as indicative benchmarks rather than precise projections for Iraqi conditions. Actual LCOE for Iraqi wind projects will depend on site-specific factors including: local wind resource quality, distance to grid connection points, financing terms, equipment procurement costs, and operational challenges unique to Iraq's climate and infrastructure. The true economic cost of fossil fuels (unsubsidized LCOE of \$50-80/MWh) represents estimated values accounting for full fuel costs, plant efficiency, and operational parameters without government price supports. Readers should note these figures require validation through detailed project-level feasibility studies before informing investment decisions. Enact a comprehensive Renewable Energy Law (currently in draft form).

Mobilising necessary capital for large-scale wind farms in Iraq is a major challenge. Domestic financial institutions may lack the capacity, expertise, or risk appetite to finance such large, long-term infrastructure projects. International investors, while potentially interested in long-term returns, are often deterred by perceived high political, security, and economic risks associated with investing in Iraq. This limits the availability of affordable financing, making projects more expensive and less attractive (Power Systems Technology, 2025).

5.2. Competition with Fossil Fuels and Subsidies

Iraq's heavy reliance on vast oil and gas reserves creates an uneven playing field for wind energy. Government subsidies artificially lower fossil fuel prices, making wind power appear less competitive despite its long-term advantages (Roga et al., 2022). Gradual subsidy reform, carefully managed with targeted support for vulnerable populations, is crucial for creating equitable markets. Morocco's successful phased approach (reducing subsidies from 6.5% to <1% of GDP between 2012-2018) offers a relevant model (Bohrium Research, 2024).

5.3. Limited Access to Financing and Investment Risks

Securing adequate, affordable financing is a critical economic barrier for wind energy projects in Iraq. Despite the availability of global green finance, local and international lenders often perceive significant risks in investing in the Iraqi energy

sector, thereby limiting capital access (Page et al., 2021).

Financing Constraints: Wind energy projects typically require long-term financing with favourable interest rates due to high upfront costs and long operational lifespans. However, Iraqi banks may not have the capacity or long-term lending products suitable for such projects. International financial institutions, while having capacity, often demand higher risk premiums due to perceived political, security, and economic instability in Iraq. This results in higher interest rates and shorter loan tenors, increasing overall capital costs and making projects less financially attractive (SAUR Energy International, 2024a).

Risk Perception: Lenders and investors are highly sensitive to political and economic risks. In Iraq, these include ongoing security challenges, political fragmentation, policy instability, and potential contract repudiation. These factors contribute to a high-risk perception, leading to reluctance to provide non-recourse project finance, which is typically preferred for large infrastructure projects. Without robust risk mitigation mechanisms and more stable operating environments, attracting significant private sector finance for wind energy remains challenging (SAUR Energy International, 2024b).

Financing Mechanisms: While local banks are encouraged to support renewable energy, their capacity is often limited. International development banks, export credit agencies, and multilateral financial institutions can play crucial roles in de-risking projects and providing

concessional financing. However, their involvement often requires significant governmental guarantees and adherence to international standards, which can be challenging for Iraq to consistently meet. Blended finance approaches combining public and private capital may be necessary to bridge financing gaps (National Renewable Energy Laboratory, 2025).

5.4. Lack of Sufficient Financial Incentives

Beyond general investment laws, the absence of specific, robust, well-designed financial incentives tailored for renewable energy projects further exacerbates economic challenges. These incentives are crucial for making wind power competitive with conventional energy sources and attracting private sector investment (Shubber, 2009), U.S. Commercial Law (Development Program, 2016).

Incentive Mechanisms: Many successful global renewable energy markets have utilised mechanisms such as feed-in tariffs (FITs), production tax credits (PTCs), investment tax credits (ITCs), and accelerated depreciation to stimulate investment. FITs, for instance, guarantee fixed prices for renewable electricity over long periods, providing revenue certainty for developers. In Iraq, the lack of robust, clearly defined fiscal incentives means financial returns from wind energy projects may not be competitive enough to attract the necessary private capital. Existing incentives, if any, are often general and not specifically designed to address renewable energy's unique economic characteristics (U.S.

Commercial Law Development Program, 2016).

Impact on Project Viability: Without adequate financial incentives, the internal rates of return (IRR) and net present values (NPV) of wind energy projects can be significantly lower than those of fossil fuel projects or other investment opportunities. This makes them less attractive to investors seeking competitive returns on capital. Absence of these incentives places full burdens of higher upfront costs and perceived risks directly on developers, making project development economically unviable for many (Ullah et al., 2024, Transparency International, 2025).

5.5. Unstable Economic Environment

Iraq's macroeconomic environment, characterised by instability, inflation, and currency fluctuations, poses significant risks to long-term infrastructure investments such as wind energy projects. Investors require predictable, stable economic climates to ensure venture viability and profitability.

Inflation and Currency Risk: High inflation rates can erode the real values of project revenues and increase operational costs over time. Currency fluctuations, particularly for projects that rely on imported equipment or have foreign-currency-denominated debt, can significantly impact project economics. Depreciation of the Iraqi Dinar against major currencies can increase the costs of imported components and debt service, making projects more expensive and less profitable. This currency risk is a major concern for

international investors (U.S. Department of State, 2023).

Macroeconomic Predictability: A lack of macroeconomic predictability, including uncertainty about fiscal policy, interest rates, and economic growth, deters long-term investment. Investors need confidence that the economic conditions under which they make investments will remain relatively stable throughout project lifespans. Frequent economic shocks or policy shifts increase perceived risk and make forecasting returns difficult, thereby reducing investor confidence in wind energy sectors (UNCTAD Investment Policy Hub, 2025).

5.6. Power Purchase Agreements (PPAs) Challenges

Power Purchase Agreements (PPAs) are cornerstones of financing for independent power projects, including wind farms. They provide the revenue certainty lenders require. However, challenges securing clear, long-term, bankable PPAs in Iraq represent significant economic barriers (United Nations Development Programme, 2025, Washington Institute for Near East Policy, 2023).

Bankability Requirements: Bankable PPAs are legally robust, financially sound, and provide sufficient revenue stream certainty to satisfy lenders. They typically outline electricity sales price, quantity, and duration, as well as payment terms and default provisions. Without bankable PPAs, securing non-recourse project finance becomes exceedingly difficult, as lenders have no assurance of repayment from project revenues. The absence of such

agreements forces developers to seek more expensive financing options or abandon projects altogether (World Bank Public-Private Partnership Resource Centre, 2024).

Iraqi PPA Challenges: In Iraq, uncertainties often surround PPA terms, enforcement, and financial reliability. State-owned utilities, typically off-takers, may face financial constraints or political interference, raising concerns about their ability to honour long-term payment obligations. The lack of standardised PPA templates, coupled with the potential for renegotiation or arbitrary changes, further increases the risk for developers and lenders. Clear, transparent, legally enforceable PPA frameworks are essential to de-risk wind energy projects and attract necessary investment (World Energy Council, 2023).

5.7. Infrastructure Costs and Funding

Iraq's existing electricity grid is not adequately equipped to handle large-scale integration of intermittent wind power. Significant investments are required for grid upgrades and expansion, and funding mechanisms for these necessary infrastructure improvements often present additional economic barriers.

Grid Upgrade Requirements: Integrating large wind farms requires substantial investments in new transmission lines, substations, and potentially energy storage solutions to manage intermittency and ensure grid stability. Costs associated with these upgrades can be immense, adding to the overall economic burdens of wind energy development. In many cases,

these costs are not fully borne by wind project developers but require significant public investment or innovative financing mechanisms (Yahoo Finance, 2025).

Funding Mechanism Gaps: Funding mechanisms for necessary grid investments are often unclear or insufficient. The Ministry of Electricity, responsible for grid infrastructure, faces its own financial constraints. Without clear plans and dedicated funding for grid modernisation, wind energy capacity expansion will be limited by the grid's ability to absorb new generation. This can lead to bottlenecks that prevent otherwise viable wind projects from proceeding due to inadequate transmission infrastructure.

5.8. Impact of Corruption on Project Economics

Corruption is a pervasive issue in Iraq that significantly affects the economics of all infrastructure projects, including wind energy. It adds to project costs, introduces inefficiencies, and deters reputable international investors who prioritise transparency and good governance (Shubber, 2009).

Cost Inflation: Corruption can manifest in various forms, including inflated contract prices, kickbacks, and non-transparent procurement processes. These practices directly increase capital and operational costs of wind energy projects, making them less financially viable. Lack of competitive, transparent bidding processes can lead to suboptimal technology choices and higher-than-market prices for equipment and services, ultimately burdening project

economics (U.S. Commercial Law Development Program, 2016).

Investor Deterrence: Reputable international investors and developers are often unwilling to operate in environments where corruption is rampant due to ethical concerns, legal risks (e.g., anti-bribery laws in home countries), and the unpredictable nature of corrupt dealings. This limits potential investor pools to those with higher risk tolerance or less stringent ethical standards, potentially leading to less efficient or sustainable projects. Addressing corruption through robust anti-corruption measures, enhanced transparency, and strict enforcement is crucial for attracting quality investment into Iraq's wind energy sector (SAUR Energy International, 2024b).

5.9. Limited Local Manufacturing Capacity

Iraq's nascent industrial base and limited local manufacturing capacity for wind turbine components and related equipment present additional economic barriers. This reliance on imports increases project costs and exposure to international market fluctuations (Power Systems Technology, 2025).

Import Dependence: Almost all major wind farm components, including turbines, blades, and specialised electrical equipment, must be imported. This not only adds to capital costs due to shipping, customs duties, and foreign exchange risks but also creates logistical challenges. Furthermore, reliance on foreign expertise for installation, operation, and maintenance can lead to higher operational costs and limit job creation in the local skilled

manufacturing sector (Power Systems Technology, 2025).

Local Content Development: Lack of local content requirements or incentives for domestic manufacturing means significant portions of economic benefits from wind energy projects flow out of the country. Developing local manufacturing capabilities, even for smaller components or assembly, could reduce costs, create local jobs, and foster more self-reliant renewable energy industries. Policies encouraging technology transfer and local industrial development alongside wind farm construction would contribute to greater economic benefits for Iraq.

6. Conclusion and Recommendations

6.1. Summary of Key Barriers

Iraq stands at a crucial juncture in its path toward a more sustainable and secure energy future. The nation possesses abundant wind energy potential, offering a promising solution to long-standing electricity shortages, energy insecurity, and environmental challenges. However, despite this opportunity, wind power development is hindered by a complex interplay of legal, regulatory, and economic barriers that discourage investment and impede progress.

Integrated Barrier Analysis: Legally, the absence of clear, stable renewable energy legislation, unresolved land ownership issues, and a lack of a comprehensive hydrocarbon framework create substantial uncertainty for investors. Regulatory procedures are often opaque, inconsistent, and slowed by

bureaucracy, lacking unified systems for licensing, permitting, or grid connection. Poor coordination among government agencies further hampers progress.

Economically, high initial costs of wind projects, competition from heavily subsidised fossil fuels, and limited access to reliable financing make it difficult for private developers to enter markets, especially amid economic instability. Additionally, corruption remains a persistent problem, increasing risks and costs while undermining institutional trust.

6.1. Policy Recommendations: A Prioritised Roadmap

Moving forward, Iraq must take decisive, coordinated steps. The following recommendations are organised by implementation timeframe with specific responsible actors and expected outcomes.

Table 5: Prioritised Policy Recommendations Matrix

Timeframe	Priority Action	Responsible Actor(s)	Expected Outcome	Implementation Complexity
SHORT-TERM (1-2 years)				
1	Enact a comprehensive Renewable Energy Law	Council of Ministers, Parliament	Legal certainty, investor confidence	High - Political will required

2	Establish a one-stop shop licensing authority	Ministry of Electricity, NIC	Reduced approval times (target: 6 months)	Medium - Institutional coordination
3	Launch national wind resource mapping	Ministry of Electricity, universities	Detailed wind atlas, site identification	Medium - Technical capacity, funding
4	Develop standardised PPA templates	Ministry of Electricity, Ministry of Finance	Bankable revenue streams	Medium - Technical/legal drafting
5	Implement transparent procurement guidelines	Anti-Corruption Commission, line ministries	Reduced corruption, fair competition	High - Requires strong enforcement
MEDIUM-TERM (3-5 years)				
6	Phase fossil fuel	Ministry of Finance	Level playing	Very High - Political

	subsidy reform (gradual)	Ministry of Council of Ministers	field for renewables	Environmentally sensitive
7	Establish a feed-in tariff mechanism	Electricity Regulatory Authority	Guaranteed returns, investment attraction	Medium - Requires tariff methodology
8	Launch grid modernisation pilot projects	Ministry of Electricity	Demonstrate integration feasibility	High - Significant capital required
9	Develop workforce training programs	Ministry of Higher Education, private sector	Local capacity, job creation	Low -Partnership opportunities
10	Implement a green finance facility	Central Bank, commercial banks	Improved financing access	Medium - Institutional capacity

LONG-TERM (5-10 years)				
11	Comprehensive electricity sector reform	Council of Ministers, Ministry of Electricity	Financial sustainability, efficiency	Very High - Structural transformation
12	Develop local manufacturing incentives	Ministry of Industry, Investment Commission	Economic diversification, cost reduction	High - Industrial policy coordination
13	Deploy energy storage infrastructure	Ministry of Electricity, private sector	Grid stability, higher RE penetration	High - technology , capital-intensive
14	Pursue regional grid interconnection	Ministry of Electricity, regional partners	Enhanced reliability, export potential	Very High - Diplomatic, technical

6.1.1. Short-Term Priorities (1-2 Years)

1. Legislative Action: Enact Comprehensive Renewable Energy Law:

The most urgent priority is enacting clear, stable renewable energy legislation providing:

- Clear definitions of renewable energy project types and scales
- Standardised licensing and permitting procedures with defined timelines
- Grid access rights and interconnection standards
- Investment incentives (tax exemptions, customs relief, accelerated depreciation)
- Long-term policy stability commitments
- Dispute resolution mechanisms, including international arbitration access

Responsible Actors: Council of Ministers (drafting), Parliament (enactment), Ministry of Electricity (technical input)

Expected Timeline: 12-18 months

Expected Outcome: Provide legal foundation for all subsequent regulatory and economic reforms; signal serious governmental commitment to renewable energy.

2. Regulatory Streamlining: One-Stop-Shop Authority:

Establish a dedicated renewable energy project approval authority consolidating functions across ministries:

- Single application point for all permits and licenses
- Coordinated inter-ministerial review process
- Clear timelines for each approval stage (maximum 6 months total)
- Digital platform for application tracking and transparency

- Technical support services for developers

Model: Jordan's renewable energy one-stop-shop reduced approval times from 18 months to 6 months, significantly improving investor confidence (Middle East Research Institute, 2023).

Responsible Actors: Ministry of Electricity (lead), National Investment Commission, Ministry of Environment (coordination).

3. Technical Foundation: National Wind Resource Mapping:

Commission a comprehensive, high-resolution wind resource assessment:

- Install meteorological stations in high-potential areas (western, southern regions)
- Conduct 2-year minimum wind data collection campaigns
- Develop a publicly accessible national wind atlas
- Perform preliminary site suitability analyses considering grid proximity, land availability, and environmental constraints

Responsible Actors: Ministry of Electricity (funding, coordination), universities and research institutions (technical execution), international development agencies (technical assistance, funding support)

Rationale: Detailed resource data is a prerequisite for reducing investment risk and enabling informed developer decisions. Current data gaps constitute major barriers.

4. Financial Framework: Standardised PPA Templates:

Develop legally robust, bankable PPA templates, including:

- Clear tariff structures (consider feed-in tariffs or competitive auctions)

- Long-term contract durations (minimum 20 years)

- Payment guarantees from creditworthy off-takers

- Clear force majeure provisions

- Dispute resolution mechanisms

- Take-or-pay or minimum off-take guarantees

Reference Models:

- Egypt's standardised PPAs attracted over \$2.5 billion in wind investment 2014-2018 (Mills, 2021)

- Morocco's Noor projects utilised World Bank partial risk guarantees to enhance PPA bankability (Mills, 2021).

5. Governance: Transparent Procurement and Anti-Corruption:

Implement strict transparency measures:

- Mandatory competitive bidding for all renewable energy projects above 10 MW

- Public disclosure of bid evaluation criteria and results

- Independent oversight by the Anti-Corruption Commission

- Whistleblower protection mechanisms

- Adherence to international standards (UNCAC, EITI principles)

Rationale: Reducing corruption is essential for attracting reputable international investors and reducing project costs.

6.1.2. Medium-Term Strategies (3-5 Years)

6. Economic Rebalancing: Fossil Fuel Subsidy Reform: Implement gradual, socially-sensitive subsidy reform:

Phase 1 (Year 1-2):

- Comprehensive subsidy impact assessment
- Stakeholder consultation and public awareness campaign
- Target subsidies to vulnerable populations only
- Transparent disclosure of subsidy costs

Phase 2 (Year 3-4):

- Gradual price increases (5-10% annually) for industrial/commercial consumers
- Maintain residential subsidies with means-testing
- Redirect savings to renewable energy fund

Phase 3 (Year 5):

- Achieve cost-reflective pricing for most consumer categories
- Establish social protection mechanisms for the energy poor

Cautionary Note: Subsidy reform is politically sensitive and has historically triggered social unrest in the Middle East. Requires careful communication, compensation mechanisms, and timing during periods of political stability (Middle East Institute, 2023).

Comparative Example: Morocco successfully reduced fossil fuel subsidies from 6.5% of GDP (2012) to under 1% (2018) while investing in renewable energy, using careful phasing and social protection (Maniruzzaman & Al-Saleem, 2017).

- 7. Financial Incentives: Feed-in Tariff Mechanism:** Establish feed-in tariff (FIT) system for wind projects:
- Guaranteed tariff rates (e.g., \$60-70/MWh for 20 years)
 - Differentiated by project size and technology

- Automatic inflation adjustment clauses
- Periodic review mechanisms (every 2-3 years)
- Clear degression schedules as costs decline

Alternative: If fiscal space is constrained, consider competitive auction mechanisms with ceiling prices, following successful models in the UAE and Saudi Arabia.

8. Infrastructure: Grid Modernisation Pilots: Launch pilot projects demonstrating wind integration:

- Select 2-3 high-potential wind sites for early development
- Invest in localised grid reinforcement and smart grid technologies
- Deploy forecasting systems for wind output prediction
- Test ancillary service provisions from wind farms
- Document lessons learned for nationwide scale-up

Funding Sources:

- World Bank climate finance facilities
- Green Climate Fund
- European Investment Bank
- Blended public-private partnerships.

9. Capacity Building: Workforce Development: Establish renewable energy training programs:

- University curricula in wind energy engineering, project development
- Vocational training for turbine technicians, electricians
- Certification programs meeting international standards
- Partnerships with international manufacturers for technology transfer

- Scholarships for study in leading wind energy markets (Germany, Denmark, China)

Expected Impact: Create 500-1,000 skilled jobs in the wind sector over 5 years; build domestic expertise, reducing reliance on foreign consultants.

10. Financial Sector: Green Finance Facility: Establish a dedicated renewable energy financing mechanism:

- Central Bank directives for green lending quotas
 - Partial risk guarantees for renewable energy loans
 - Concessional interest rate facility (e.g., 2-3% below market)
 - Technical assistance for banks in renewable energy project appraisal
 - Currency hedging mechanisms for foreign-denominated equipment costs
- Model: Egypt's Central Bank green finance initiative mandates that 20% of bank lending be directed to sustainable projects, mobilising billions in green investment (International Monetary Fund, 2023).

6.1.3. Long-Term Vision (5-10 Years)

11. Structural Reform: Comprehensive Electricity Sector Transformation: Address fundamental sector inefficiencies:

- Corporatisation of state-owned utilities
- Independent regulatory authority with rate-setting powers
- Performance-based management contracts
- Smart metering and billing system implementation
- Reduction of technical and commercial losses below 15%

Rationale: Without viable, financially sustainable utilities, even well-designed renewable energy frameworks will struggle. Current 40-50% losses and financial instability of state utilities undermine the entire sector.

12. Industrial Policy: Local Content Development: Incentivise domestic manufacturing:

- Local content requirements (phased: 20% by 2030, 40% by 2035)
- Tax incentives for wind component manufacturers
- Industrial zones with infrastructure for heavy manufacturing
- Joint ventures with international turbine manufacturers
- Support for local supply chains (towers, foundations, cables)

Expected Benefits: Job creation, technology transfer, reduced costs, enhanced energy security through domestic industrial capacity.

13. Grid Enhancement: Energy Storage Integration: Deploy utility-scale battery storage:

- Target 10% of installed wind capacity
- Regulatory framework for storage as a grid asset
- Business models for storage operators
- Pilot vehicle-to-grid (V2G) technologies
- Pumped hydro feasibility studies (if suitable sites exist)

Rationale: Storage is essential for high renewable energy penetration (>30%), managing intermittency, and maximising wind resource utilisation.

14. Regional Cooperation: Grid Interconnection: Pursue regional integration opportunities:

- Arab Gulf Cooperation Council (GCC) grid interconnection
- Levant electricity market participation
- Power export opportunities to neighbours
- Shared reserve capacity arrangements
- Regional renewable energy trading mechanisms

Strategic Value: Enhances reliability, creates export revenue opportunities, and reduces balancing costs through geographic diversity of wind resources.

6.1.4. Best Practices from Comparable Contexts

Morocco's Integrated Approach:

- Clear national renewable energy targets (52% by 2030)
- Dedicated renewable energy agency (MASEN) with strong authority
- Mix of competitive auctions and standardised PPAs
- World Bank guarantees enhancing project bankability
- Active international partnerships for technology transfer

Result: Attracted over \$10 billion in renewable energy investment; operational Noor solar complex and multiple wind farms (Iraq Business News, 2025).

Egypt's Financial Mechanisms:

- Feed-in tariff program launched in 2014
- Standardised PPAs with government guarantees
- Central Bank green finance directives
- Streamlined permitting through one authority

Result: Over 2.5 GW of wind capacity added 2014-2020; positioned as regional renewable energy leader.

Jordan's Regulatory Efficiency:

- One-stop-shop licensing authority
- Clear timelines for approvals (6 months' maximum)
- Transparent tender processes
- Direct PPA options for large consumers

Result: Renewable energy share increased from 1% (2014) to 20% (2020); over \$1.5 billion in investment.

Adaptations for Iraq: While these examples offer valuable lessons, Iraq's context presents unique challenges requiring adaptations:

- Security considerations: Project sites must account for security situations; phased approach starting in stable regions
- Institutional fragmentation: Stronger emphasis on inter-ministerial coordination mechanisms given governance complexities
- Subsidy legacy: More gradual, politically careful subsidy reform given social sensitivities
- Post-conflict reconstruction: Integration with broader reconstruction financing and international development partnerships.

6.2. Research and Data Priorities

This review has identified critical knowledge gaps requiring urgent research attention:

1. Comprehensive Wind Resource Assessment: High-resolution national wind atlas with multi-year data collection
2. Techno-Economic Studies: Iraq-specific LCOE analyses, sensitivity

studies, and financial modelling under various scenarios

3. Grid Integration Studies: Technical assessments of grid capacity, modernisation requirements, storage needs

4. Socio-Economic Impact Assessments: Job creation potential, local economic benefits, community acceptance studies

5. Environmental Baseline Studies: Bird migration patterns, ecological sensitivity mapping, cumulative impact assessments

6. Policy Effectiveness Research: Comparative analyses of incentive mechanisms suitable for the Iraqi context

7. Land Tenure Mapping: Comprehensive land registry development for potential wind farm sites

6.3. Implementation Considerations
Successful reform implementation requires:

Political Will and Leadership:

- High-level political commitment sustaining reforms through government transitions
- Cross-party consensus on the strategic importance of renewable energy.
- Clear accountability mechanisms for implementing agencies

Stakeholder Engagement:

- Consultation with affected communities, environmental groups, and industry associations
- Public awareness campaigns on renewable energy benefits
- Transparent decision-making processes build trust

Capacity and Resources:

- Adequate budget allocations for regulatory authorities, grid investments

- Technical assistance from international organisations

- South-South cooperation and knowledge exchange

Monitoring and Evaluation:

- Clear key performance indicators (KPIs) for each reform measure
- Regular progress assessments with public reporting
- Adaptive management allowing mid-course corrections

Risk Management:

- Phased implementation reducing policy shock risks
- Pilot projects demonstrating feasibility before large-scale rollout
- Contingency plans for political or economic disruptions.

6.4. Future Outlook for Wind Energy in Iraq

The future of wind energy in Iraq, while challenging, holds immense promise. With strategic policy interventions and sustained governmental commitment, Iraq can leverage its natural resources to build a more resilient, sustainable, and diversified energy sector.

Realistic Scenarios: Optimistic Scenario (Strong Reform Implementation):

- Comprehensive renewable energy law enacted by 2026
- First 500 MW wind farm operational by 2028
- Additional 1,500-2,000 MW wind capacity by 2035
- Wind contributing 10-15% of electricity generation by 2035
- Attracts \$3-5 billion in renewable energy investment
- Creates 10,000-15,000 direct and indirect jobs

Prerequisites: Political stability, consistent policy implementation,

successful subsidy reform, grid modernisation progress, and international partnership activation.

Moderate Scenario (Gradual Progress):

- Renewable energy law enacted, but implementation challenges
- First 500 MW project delayed but operational by 2030
- Additional 500-1,000 MW by 2035
- Wind contributing 5-8% of generation by 2035
- Attracts \$1-2 billion investment
- Creates 5,000-8,000 jobs

Most likely: Given typical implementation lags in complex institutional environments.

Pessimistic Scenario (Status Quo Persistence):

- Continued legislative delays
- Flagship project stalled or significantly delayed
- Minimal additional capacity beyond demonstration projects
- Wind remains <2% of generation by 2035
- Limited investment attraction
- Foregone economic and environmental benefits

Risk Factors: Political instability, ongoing governance challenges, failure of subsidy reform, insufficient financing, and regional security concerns.

Strategic Imperative: Embracing wind energy is not merely an environmental imperative but a strategic economic and social necessity for Iraq's long-term stability and prosperity. The electricity crisis undermines economic development, social stability, and governmental legitimacy. Wind energy, alongside broader energy sector reforms and diversification strategies, offers pathways toward:

- Energy Security: Reduced dependence on single fuel sources and volatile international markets

- Economic Resilience: Diversified economy beyond hydrocarbons, job creation, and industrial development

- Environmental Sustainability: Climate commitment fulfilment, air quality improvement, resource conservation

- Social Development: Reliable electricity access improving quality of life, enabling economic activity

- Regional Leadership: Positioning Iraq as a renewable energy leader in post-conflict reconstruction contexts

Final Reflections: Iraq's wind energy development journey embodies broader tensions between the legacies of the resource curse and the imperatives of sustainable development. The nation possesses both the natural resources (wind) and the urgent need (electricity crisis), making renewable energy not just desirable but essential. However, realising this potential requires confronting deep-seated institutional, governance, and economic challenges that extend far beyond energy policy.

Success demands not only technical solutions and policy reforms but fundamental shifts in governance quality, corruption reduction, institutional capacity strengthening, and long-term strategic vision. The barriers are substantial but not insurmountable. Regional peers have demonstrated that even in challenging contexts, clear governmental commitment combined with international partnerships and phased, pragmatic reforms can catalyze transformative change.

The path forward requires urgency tempered with realism, ambition

grounded in institutional capacity, and vision sustained through political transitions. If Iraq can marshal the political will, mobilize necessary resources, and implement recommended reforms with consistency and transparency, wind energy can become a cornerstone of a more resilient, sustainable, and prosperous national future.

The question is not whether Iraq can develop wind energy, but whether it will seize this opportunity before the costs of inaction become insurmountable.

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