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International Experiences in the Field of Investing in Natural Gas and the Possibility of its Benefiting in Iraq

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Abstract

This research conducted a qualitative study by analysing the experiences of the selected countries of Qatar, Iran, Saudi Arabia, Russia, and Algeria in developing their natural gas sector. The goal was to formulate strategic recommendations for Iraq to optimise its gas ecosystem using global lessons adapted locally. Using the grounded theory approach, this study draws inductive insights from secondary data and expert interviews to determine the critical success factors, practices, and policies that enable some countries to productively invest in the gas industry as an engine for economic development. Specific aspects analysed included domestic exploitation, export potentials, sustainability practices, bilateral energy relations, infrastructure capabilities, and regulatory efficiency. Qualified by the different performance of countries in these parameters, this study outlined principles and planning considerations for optimal and context-specific mapping. This analysis showed how leading gas economies have invested significantly in production infrastructure and distribution networks to prioritise domestic consumption while gradually developing exports by leveraging geopolitical partnerships. The changing global landscape requires agile but strategic policies that balance energy security, economic efficiency, and sustainability. For Iraq, the implications include the rapid expansion of gas infrastructure to serve households and industries before selectively entering export markets, obtaining technologies for efficient use of gas resources, strengthening legal institutions and acquiring local expertise through international cooperation, maintaining appropriate internal pricing, prudent participation in regional energy linkages and embedding environmental stewardship through production modernisation. Consistent pursuit of these goals can transform Iraq's economy in the next decade.

1. Introduction

In recent decades, the global energy market has seen significant changes, among which the role of natural gas as a clean and efficient energy source has become increasingly prominent. This vital material has become one of the most significant strategic components in the world's energy field due to its features, such as high efficiency, less pollution than other fossil fuels, and flexibility in

production and distribution. Iraq, having vast reserves of natural gas (over 111.5 Tcf), has a high potential to become one of the key players in the global gas market. However, exploiting these resources requires extensive investments and international experience. International experiences show that success in the natural gas industry depends not only on having enough resources but also on careful planning, appropriate policies, investment in infrastructure, new technologies, and the creation of reliable export markets. Countries such as Qatar, Iran, Saudi Arabia, Russia, and Algeria have achieved significant success by adopting different approaches. For Iraq, paying attention to these experiences and adapting them can pave the way for the sustainable development of the natural gas industry and the optimal use of its resources. This action will not only help economic growth and increase national incomes but will also be effective in ensuring energy security and reducing dependence on imported energy sources.

As a powerful and abundant energy source, natural gas has transformed the dynamics of global energy markets and offers countries a viable option for transitioning to a sustainable energy future. However, effective use of this resource requires a combination of suitable geographical conditions, technological advances, and practical policy frameworks. Despite having the world's 12th largest natural gas reserves, Iraq mainly depends on natural gas imports for its domestic consumption, especially for electricity generation [18]. This situation represents a paradox that needs to be addressed urgently. Due to its unique geographical location and vast natural gas reserves, Iraq is in an excellent position to use these advantages. Nevertheless, this country has faced many obstacles, including old technology, weak infrastructure, and political instability, which have hindered the development of its natural gas sector. The main issue is the lack of an effective strategy that can create a favourable environment for investing in natural gas and encourage the participation of domestic and international stakeholders. Several countries have successfully developed their natural gas sectors and built strong markets and infrastructure supporting their transition to a cleaner energy future. It emphasises Iraq's urgent need to explore international experiences in natural gas investment, draw lessons, and implement effective strategies to unlock its natural gas potential. Filling this gap can bring significant economic, social, and environmental benefits, including energy self-sufficiency, job creation, increased national income, and reduced greenhouse gas emissions [18].

Insufficient use of Iraq's abundant natural gas reserves poses a significant problem. The problem is multidimensional and includes technical, economic, political, and environmental aspects. Technically, Iraq does not have the necessary infrastructure to extract, process, and distribute natural gas. From a financial view, inadequate exploitation of this resource is a lost opportunity for income generation, job creation, diversification of the country's economy, and reduction of dependence on oil. Politically, various internal and external stakeholders influence the allocation of investments and resources, whose interests may not necessarily be aligned. This affects decision-making in the natural gas sector, leading to underinvestment and mismanagement. Finally, environmentally, gas flaring leads to increased greenhouse gas emissions, representing a waste of a valuable resource. [10].

Given its unique socio-economic and geopolitical conditions, the issue is how Iraq could learn from international experiences in investing and managing the natural gas sector. United States, Russia, Qatar, Australia, and even countries like Iran, Venezuela, and Nigeria, which have faced sanctions, have been able to benefit from their natural gas resources significantly. [10]. They have developed complex value chains that include exploration, extraction, processing, transportation, and natural gas distribution. However, repeating their success in Iraq is not easy. Understanding the dimensions of this problem requires us to consider several factors. These include, but are not limited to, technological capabilities, infrastructure availability, regulatory frameworks, investment conditions, and Iraq-specific geopolitical implications.

The international community has recognised natural gas as a critical player in the global energy transition towards cleaner energy sources. This transition is carried out due to the necessity of combating climate change and reducing greenhouse gas emissions [15]. As the cleanest burning hydrocarbon, natural gas produces half the carbon dioxide of coal when burned, along with lower levels of harmful pollutants such as sulfur dioxide, nitrogen oxides, and particulate matter. Therefore, effectively exploiting this resource can significantly contribute to global efforts to reduce climate change. For Iraq, which has the world's 12th largest proven natural gas reserves, effectively exploiting this resource has great potential [3]. Through this research, Iraq can learn from international experiences in natural gas investment, understand what has worked and what has not, and adapt these lessons to its unique circumstances. Such learning could help Iraq optimise its natural gas industry and lead to improved energy security. Given Iraq's dependence on natural gas imports for electricity generation, energy security is a paramount national concern. By developing its natural gas industry, Iraq can reduce this dependence on imports, increase its energy sovereignty, and ensure a reliable energy supply for its citizens.

Establishing an efficient natural gas industry has excellent potential for economic growth and reducing dependency in Iraq. This potential goes beyond direct revenues from the extraction and sale of natural gas. For example, a robust natural gas industry can act as an essential generator of employment, reducing the unemployment rate and helping to reduce poverty in the country [22]. In addition, the prosperity of the natural gas industry can lead to an increase in domestic and foreign investments in Iraq and contribute to its economic growth and stability. It can also boost technological progress and skills development and increase Iraq's overall industrial competitiveness. Studying and analysing international experiences in the field of natural gas investment can provide essential insights into how to successfully develop natural gas industries in different countries despite different contexts and challenges. The key to adapting these lessons to the unique conditions of Iraq is its technological capabilities and geopolitical location. Such adaptation requires an understanding of the strategies that work in different contexts. This understanding can enable the development of an appropriate strategy for Iraq to exploit its natural gas potential and economic growth and diversification. In addition, this research could also help Iraq align its energy sector development with its broader commitments to sustainability and the UN's Sustainable Development Goals (SDGs). This alignment is critical as the world increasingly prioritises balancing economic growth with environmental stewardship.

2. Theoretical foundations and literature review

The energy transition theory, conceptualised by Vaclav Smil, emphasises a significant shift from non-renewable energy sources such as coal and oil to more sustainable and renewable sources such as wind, solar, and hydropower. This theory is rooted in the urgent global need for environmental sustainability and energy security for countries such as Iraq, which have vast fossil fuel reserves, this theory is essential. While a shift to renewable energy is critical for long-term sustainability, immediate abandonment of fossil fuels is not feasible due to various economic and infrastructural constraints. Here lies the role of natural gas. Natural gas, often called a "bridge fuel, " can be a vital intermediary in this energy transition. It is cleaner than other fossil fuels and emits about half as much carbon dioxide when burned as coal, helping to reduce greenhouse gas emissions. It also has high energy efficiency, which makes it a suitable option for power generation and industrial applications.

When energy transition theory is applied to the study of international experiences, it can provide strategic insight into how countries can use natural gas on their way to a sustainable energy future. It can show how countries have balanced the economic benefits of fossil fuels, the environmental benefits of renewable energy, and the pragmatic use of natural gas. By applying these insights to Iraq,

the country could create a roadmap for its energy transition. Iraq can devise strategies to maximise benefits from its natural gas reserves while investing in renewable energy infrastructure. This would entail promoting natural gas for domestic energy consumption and electricity generation, releasing oil for export, and investing revenues in renewable energy development. As Brealey, Myers, and Allen proposed, investment theory addresses the factors that shape investment decisions and aspects such as risk, return, market conditions, and the regulatory and legal environment like international treaties, governing bodies, and regulatory and global trade rules [4]. Applying this theoretical framework in the field of natural gas investment allows a detailed analysis of how these factors come into play. Market conditions include the global and regional balance of supply and demand, the competition of natural gas against other energy sources, and broader economic and geopolitical trends that may affect the natural gas market. Regulatory environments, such as policies related to natural gas extraction, taxation, environmental standards, and foreign investments, can also significantly shape investment decisions.

Therefore, investment theory provides a solid theoretical basis for analysing and comparing international experiences in natural gas investment. Applying this theory to Iraq can help identify the most relevant factors affecting natural gas investment. It can shed light on potential strategies for attracting investment, managing risk, maximising returns, and creating a market and regulatory environment conducive to the growth of the natural gas sector. In addition, it can guide the analysis of international experiences to identify practical insights and best practices that can be adopted or adapted to Iraq's unique circumstances.

Geopolitical theory, as described by Saul B. Cohen, provides a lens for understanding how geographic factors and political considerations influence international relations and economic development. It shows how the interplay between geography (location, natural resources, and physical terrain) and politics (including political systems, international relations, and power dynamics) can shape a country's strategic choices and development paths. When applied to the natural gas sector, geopolitical theory provides valuable insights into how a country's geographic endowments and geopolitical position may shape the development of its natural gas industry. For a resource-rich country like Iraq, its geographic advantage lies in its abundant natural gas reserves. However, the location of these reserves, their ease of extraction and transportation, and their proximity to domestic and international markets can significantly affect the dynamics of the sector.

Political factors can be equally influential. These include government stability, relations with foreign governments and international organisations, national security issues, and domestic and foreign policies related to energy and natural resources. All these can affect the natural gas sector's attractiveness to domestic and international investors, competitiveness, and capacity to contribute to national economic development.

For Iraq, geopolitical considerations are crucial, especially given its strategic location, turbulent history, and relations with neighbouring countries and world powers. Applying geopolitical theory can clarify how these factors affect the development of Iraq's natural gas sector. In addition, this theory can help compare Iraq's situation with that of other countries that have successfully developed their natural gas sector. It can show how these countries have used their geopolitical perspectives to attract investment, manage risks, and maximise benefits from their natural gas reserves. In essence, geopolitical theory provides a critical theoretical pillar for this research. It enables a detailed understanding of the unique geopolitical factors affecting Iraq's natural gas sector and how they compare with international experiences.

Together, these theoretical frameworks can provide a comprehensive perspective for examining international experiences in natural gas investment and extracting applicable lessons for Iraq.

Al-Maleki et al. (2019) describe the financial cost of the Iraqi electricity sector and its potential benefits. This study discusses Iraq's critical gas-to-power value chain, which remains underdeveloped, and the need to boost domestic natural gas production through gas absorption projects. [1]

Alzuwaini et al. (2019) studied the challenges and problems of the Iraqi oil industry. This study discusses Iraq's plans to develop the Akkas gas field early to attract foreign investment and increase gas production. The study discusses Iraq's $27 billion contract with French Multinational Total Energies, which covers oil, natural gas, and solar energy.[2]

The article "Natural Gas in Iraq, Currently and Future Prospects: A Review" was written by Jasim, Dheyaa, et al. in 2021. This paper highlights the importance of natural gas as an alternative energy source to crude oil. It discusses Iraq's current natural gas situation and prospects [17].

In his study, Suleiman Abdullah (2021) stated: According to the World Bank report, Iraq is one of the largest sources of flaring natural gas. This shows the potential of using natural gas resources. The oil sector in Iraq suffers from significant problems related to oil infrastructure in terms of extraction, production, transportation, storage, and export terminals. It is generally said that the economic policy, including the oil policy, has failed in short-term and long-term planning for the management and optimal use of oil wealth [14]. Although several formal institutions manage the oil industry in Iraq, there is no competent authority for the investment and management of surplus reserves deposited in the Development Fund of Iraq (DFI). However, oil revenues constitute over 90% of the country's budget. On the other hand, Norway's experience has become a successful model in the oil industry among oil exporting countries. It can benefit from its experiences in this field by trying to make a suitable oil investment policy.

Semenova, T., and Al-Dirawi (2022) conducted research on the "Economic Development of Iraq's Gas Sector." This study examines the development factors of the gas industry in Iraq, including investment strategies for natural gas production, the necessity of developing gas industry infrastructure, and encouraging the natural gas service sector through investment contracts [20].

3. Theoretical framework

According to the obtained results and the conceptual model of the thematic method of grounded theory, the results of selective coding were first placed in the form of the main categories of the thematic method, as shown in Figure 2. The summary's main practical components and consequences are presented in Tables 2-9.

Table 1. Extraction of axial codes from open codes by selected countries

	Axial code	Qatar	Iran	Saudi Arabia	Russia	Algeria
1	The low domestic price of gas		*			
2	Domestic gas consumption	*	*	*		*
3	Poor gas infrastructure		*			
4	Gas tax		*			
5	Institutional capacity	*	*	*		
6	Priority for domestic gas consumption		*	*		
7	Government subsidies in the gas sector	*	*	*		
8	Share of gas in GDP		*			*
9	Gas demand	*	*	*	*	*
10	Budget deficit and dependence on oil and gas		*	*		
11	Iranian fuel and gas smuggling		*			*
12	Gas contracts and legal framework	*	*	*	*	
13	Marine environment protection	*			*	
14	European Union's dependence on gas				*	*
15	The monopoly power of Gazprom in the Russian gas market				*	

16	Government intervention in gas export contracts	*	*	*	*	*
17	Gas network maintenance costs		*		*	
18	International cooperation in the field of gas					*
19	The high share of the government in the ownership of the energy sector					*
20	Gas agreements with Italy and Spain					*
21	High cost of gas exploration and production					*
22	Empowerment of local manpower					*
23	Gas industry sustainability reporting	*				
24	Gas reserves	*	*	*	*	*
25	Gas production	*	*	*	*	*
26	Access to gas exploration technology		*			
27	Strengthening infrastructure and gas transmission network		*		*	*
28	Development of downstream gas industries		*			
29	Availability of gas storage technology		*			
30	Vulnerability of gas infrastructure		*	*	*	
31	Cyber threats against the gas industry		*	*		
32	Gas supply disruptions				*	
33	Gas leakage in pipelines				*	
34	Access to deep drilling technology				*	
35	Maintenance and repairs of facilities and gas pipelines		*		*	
36	Improving the safety of gas operations				*	
37	Use of natural gas instead of coal in Russia				*	
38	Localisation of gas technologies		*	*		*
39	Development of discovered gas fields	*	*	*		*
40	Advanced LNG technologies	*				
41	Liquid natural gas storage capacity	*				
42	Gas technology export	*				
43	Improvement of gas refining technology			*		
44	National Climate Change Adaptation Program					*
45	Reducing gas wastage in industries		*			
46	Reducing air pollution caused by gas extraction and consumption		*		*	*
47	Preventing burning and increasing the recycling of associated gases and gaseous compounds	*	*		*	*
48	Gas waste management		*			
49	Algerian environmental standards					*
50	Dependence of the economy on oil and gas revenues	*	*	*	*	*
51	Gas foreign policy	*			*	
52	Russia's strategic relations with China in the field of energy				*	
53	A tool of political pressure against the West				*	
54	Gas disruptions under the pretext of sanctions				*	
55	Vulnerability of energy facilities against terrorist attacks			*		*
56	Gas export as a tool of foreign policy	*				
57	Competing with the UAE in the global gas market	*				
58	Global leadership in LNG exports	*				
59	Bargaining power with gas-importing countries	*				
60	Border dispute in the gas field	*	*	*		
61	Saudi regional cooperation in the field of energy	*	*	*		
62	Political tensions			*		
63	Yemeni missile attack on oil facilities			*		
64	Energy geopolitics	*	*	*	*	
65	Strait of Hormuz and the effect on gas export	*	*			
66	Geopolitical position in energy transit		*			*
67	Geopolitical power in the European energy market				*	*
68	Geopolitical pressure lever of gas				*	

69	Geopolitical tensions in the path of Russian pipelines				*	
70	Sahara Pipeline to Europe					*
71	Distribution of income	*	*	*		
72	Restrictions on foreign investment in the gas industry		*			
73	Gas export	*	*	*	*	*
74	Foreign exchange earnings from gas exports	*	*	*	*	*
75	Job creation in the gas sector	*	*			
76	Development of the private sector in the gas value chain		*			
77	Investing in the upstream gas sector	*	*	*	*	*
78	Diversification of gas export markets	*			*	
79	Gas consumption management		*	*		*
80	Extensive foreign exchange earnings from LNG exports	*				
81	Diversification of income sources			*		
82	The policy of reducing dependence on oil revenues		*	*		
83	Improving energy efficiency in the household sector		*			
84	Sustainable urban development with natural gas		*			
85	Reducing greenhouse gas emissions	*	*		*	
86	Sustainable and responsible management of gas tanks	*		*		*
87	Diversifying the energy portfolio					*
88	Development of LNG capacity	*				
89	Water management in the gas sector and recycling of produced water along with gas	*				
90	Improving the efficiency of the LNG production process	*				
91	Stabilisation of gas supply and supply	*				
92	Reducing energy consumption in gas production	*				
93	Energy policy		*			
94	Regional security relying on energy resources					*
95	Guaranteeing the security of gas supply to customers	*				
96	Physical protection of gas facilities	*				
97	Development of access to energy		*			

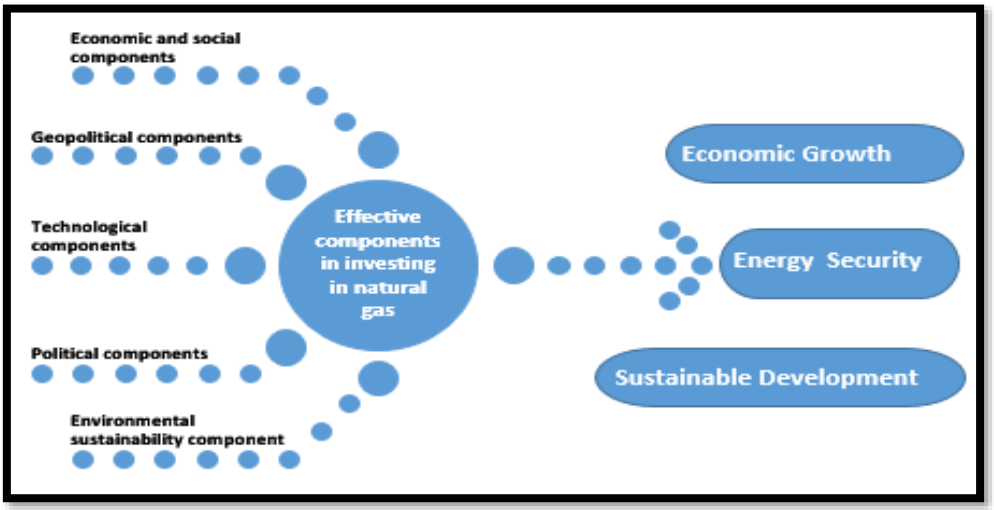

Figure 2- Components and consequences of investing in natural gas

Table 2-Economic-social components

Gas consumption	Share of gas in GDP
Domestic gas consumption	Gas revenues
Industrial consumption of gas	Gas export
Electricity generation from gas	Domestic gas consumption
Gas protection	Gas reserves
Energy security	Gas production
Access to energy	Gas infrastructure
Ability to pay for gas	Gas pipeline network
Gas tax	Institutional capacity

Table 3- Environmental components

Emission of greenhouse gases	Safety and health of the workplace
Energy Management	Sustainability indicators
Effects of climate change	Sustainability reporting
Conservation of biodiversity	green economy
Waste Management	Environmentally friendly technologies
Use of renewable energy	Environmental Education
Improving energy efficiency	Protection of birds and animals
Reducing the intensity of carbon emissions	Ecological footprint of the gas industry
Prevent oil pollution	Marine and coastal ecosystems
Recycle and reuse	The return-ability of gas resources
Life cycle assessment	Carbon emissions audit
Environmental standards	Environmental safety and security considerations
Environmental assessment studies	Environmental liability insurance
Industrial ecology	Environmental fines and penalties
Management of environmental crises	Compliance with international standards
Pollution control technologies	

Table 4- Political components

Foreign policy based on energy	Competition of regional and extra-regional powers
Leveraging political pressure through gas	Terrorism and the threat of energy security
International sanctions	Corruption and rent-seeking of oil and gas revenues
Energy diplomacy	Transparency or lack of transparency of income
Coalitions and geopolitical equations	Interference of foreign actors in internal decisions

Table 5- Geopolitical components

Energy corridors	The influence of trans-regional actors
International pipelines	Military interventions under the pretext of providing energy
Energy export and import equations	Unilateral sanctions and cross-border laws
Political crises and sanctions	Public diplomacy and propaganda
Transit and energy transport	Regional and international alliances and axes
International energy actors	The competitive nature of energy markets
Competition of powers in obtaining energy resources	Power networks and cartels in the field of energy
Wars and conflicts over energy resources	Lobbying and influencing decision-makers
OPEC and international energy organisations	Transparency or lack of transparency of contracts
Foreign policy based on energy	Instrumental abuse of energy resources
Energy security and political stability	regional security or instability
The soft power of energy	Arms race and purchase of military equipment
Diversification of sources and export routes	Espionage and theft of technical and industrial information
Long-term energy contracts and agreements	Terrorism and sabotage against energy facilities
Foreign investment in the energy sector	Changing the balance of regional and international power

Table 6- Technology components

Gas exploratory studies	Manpower training for the gas industry
Drilling oil and gas wells	Gas information and communication technology
Offshore gas production platforms	Simulation and modelling of gas processes
Gas transmission pipelines	Artificial intelligence and data mining in the gas industry
Gas pressure boosting stations	Passive protection in gas facilities
LNG gas liquefaction facility	. Mechanisation and automation of processes
Gas storage tanks	Gas distribution and consumption control systems
Gas measurement and control equipment	Optimal management of storage tanks
Safety and fire extinguishing systems	Simulation and optimisation of gas transmission paths
Service and maintenance of gas facilities	Intelligent monitoring and demand forecasting
Technical inspection of gas equipment	Real-time measurement equipment
Management of physical gas assets	Online monitoring systems
Energy consumption optimisation engineering	Cyber security in critical infrastructure
Design and technical calculations	Passive defence and physical security
Standards and safety of gas operations	Preventive maintenance and repairs
Research and development of new gas technologies	

Table 7- Economic prosperity

Foreign exchange earnings	Improving human development indicators
Foreign investment	Increase in per capita income
Employment	Reducing poverty and inequality
Private sector development	Social Welfare
Economic diversification	macroeconomic stability
GDP growth	

Table 8- Energy security

Diversity of sources and sources of energy supply	Risk and damage insurance
Passive defence against physical threats	Armed and security forces
Secure communication infrastructure	International cooperation against transboundary threats
Video surveillance systems	Dealing with fuel and goods smuggling
Cyber security of networks and systems	Preventing the penetration of hostile agents
Emergency plans	False information and news

Table 9- Sustainable Development

Increasing energy efficiency	Transparency and accountability
demand management	International cooperation
Diversifying the energy portfolio	Establishment of the environmental management system
Transfer of environmentally friendly technology	Reducing the intensity of carbon emissions
Creating green employment	Auditing and reporting
Training and empowerment of manpower	Research and development of clean technologies

4. Discussion and results

This research was conducted to analyse the international experiences of selected countries in developing their natural gas sectors. The goal was to create strategic recommendations to help Iraq optimise its gas sector based on global lessons that match local realities. This study also showed how these global experiences can determine the situation in Iraq, considering the significant reserves that the country has, but currently does not perform well in exploiting its gas reserves.

The conceptual framework analysed the multifaceted dynamics that shape gas sector outcomes in economic, environmental, geopolitical, technological, and governance dimensions. Domestic exploitation, access, revenues, and exports form economic perspectives. Ecological approaches to sustainability were also explored. Bilateral relations, transit routes, and broader foreign policy goals constitute geopolitical factors. Technological capabilities included infrastructure, skills, and performance considerations—finally, issues of regulation, ownership structures, and transparency defined aspects of governance.

The main findings showed that prioritising domestic gas consumption through extensive pipeline networks and distributed grid access played a crucial role in the strategic policy approaches adopted by successful gas economies. This action ensures energy security and independent resource control. Subsequently, the integration of excess gas into a diversified export portfolio has provided higher returns as revenue streams expand through liquefied natural gas (LNG) and regional interconnections.

Economically rational pricing mechanisms, private sector participation under intense government supervision, technological innovation, and constructive geopolitics underpin these achievements. Responsible environmental management is also essential for long-term sustainability. The changing global energy landscape means countries must adapt dynamically to remain competitive.

For Iraq, critical implications include rapid development of domestic gas infrastructure, construction of pipelines to Turkey, Iran, Kuwait, and Saudi Arabia to integrate with regional networks, productive use of associated gas through technology acquisition, strengthening of legal institutions, development of local expertise through international partnerships, prioritising uninterrupted domestic supply in Iraq. Reasonable pricing, selective participation in export markets with mature capabilities, and adherence to sustainability best practices.

A coherent long-term and economically balanced plan for the gas sector, integrated with national development goals and established through constructive regional energy relations, can transform the Iraqi economy in the next decade by accelerating the global transition. Further research could be done on this framework through detailed planning models, options evaluation, and impact assessment. This study provides a futurology of gas-driven prosperity using global lessons with local realities.

The study found that successful natural gas economies have developed strong production and transportation infrastructure to unlock the resource's potential for domestic use and export. At the same time, they have established robust legal, regulatory, and institutional frameworks for efficient management of the sector for national development. Prioritising domestic demand, developing extensive pipeline networks and export corridors, balancing foreign partnerships, and reducing geopolitical risks have also been essential for using natural gas resources in the competitive global market. The application of advanced technologies for exploration, efficient production, storage, transmission, and distribution has also played a pivotal role in differentiating the performance of gas economies. Additionally, planning the future energy mix with natural gas and renewables in a coordinated manner can support cleaner economic growth in the long term. Managing the externalities of gas production and consumption is also necessary for sustainability. Generally, this analysis highlights the need to closely align energy goals with national development plans while embedding sound governance principles.

Iraq has significant gas reserves, but inadequate infrastructure and weak institutions currently limit its production and use. Optimising the gas sector can significantly increase energy security, reduce import dependence, activate industries, generate government revenues, and support environmental goals. However, a logical and coherent economic strategy is necessary that considers existing gas reserves, actual production timing, forecast domestic demand in sectors, requirements of gas-based industries, possible exports, and infrastructure investment needs in a single framework. Fostering innovation, advanced technologies, local skills, and responsible governance will also be essential. Increasing regional energy connectivity may also open up future opportunities. A balanced regulatory approach, promoting national and international private sector participation under production-sharing agreements, can attract critical investment and specialised expertise in infrastructure exploration and development. Strategic partnerships should also be established with experienced international energy companies to accelerate capacity development. Getting targeted help from global institutions around technology, management practices, and sustainability is also helpful for knowledge transfer. Previous experiences suggest such efforts focus on developing specialised technical skills, implementing favourable regulations, deploying infrastructure with cost optimisation, localising operations over time, and maintaining stewardship of natural resources.

A nuanced geopolitical approach could enhance Iraq's potential position as a strategic energy partner and transit country in an often contentious regional environment. Therefore, constructive diplomatic engagement around common interests is recommended. Domestically, curbing corruption and mismanagement ensures optimal resource mobilisation. Responsible investment of gas revenues for economic diversification and social well-being will also create long-term prosperity. The degree to which Iraq successfully manages these complex dynamics will determine future outcomes as the global energy transition accelerates.

Iraq, after decades of conflict and instability, seeks to rebuild and better utilise its vast gas reserves, estimated at more than 111.5 Tfc. there are enormous opportunities to adapt global best practices and technologies through structured partnerships with government institutions and foreign companies that have made more progress. Optimal stewardship models elsewhere, strategic contractual arrangements that ensure aligned interests while transferring skills locally, could draw on these international experiences to accelerate the maturation of Iraq's domestic capacity in the

manufacturing, infrastructure, and governance sectors that underpin the sectors. Natural gas is successfully used all over the world.

Above all, the technological expertise of major global companies such as BP, Shell, Total, and ENI offers valuable suggestions, from increasing field productivity through advanced oil recovery techniques relying on associated gas reinjection to scaling up flare gas absorption systems and advanced remote monitoring. Digital offers. By managing huge fields in southern Iraq and blocks of Kurdistan until disputes and instability derailed efforts, these companies retained the skills and lessons necessary to execute complex projects there. Frameworks that balance ownership controls through production-sharing agreements While requiring mandatory reinvestment in local infrastructure upgrades as a condition for continued participation, NANDs can incentivise transfers to balance economic development needs. As the impasse of controversial contracts with the Ministry of Oil continues after the developments, arbitration and review mechanisms provide pathways that once again place the company's international capabilities behind national modernisation priorities. Regionally, the success of neighbours such as Qatar and the UAE in increasing exports through tens of billions of investments in LNG production, regasification, and transportation infrastructure offers additional models for the potential release of Iraq's domestic wealth abroad. Now capable of transporting more than 20 billion cubic feet daily, Qatar's reservoirs and costs are similar to Iraq's [8].

While security barriers to major projects remain insignificant over the coming years, its institutional progress shows possibilities aided by favourable coastal access and partnerships. UAE gas infrastructure investments aligned with growing electricity demand could inspire strategies to avoid excessive idle capacity. Pipeline connectivity solutions could include Jordanian and Turkish grid platforms, so increased integration with regional gas projects would allow economies of scale from Iraqi development.

In the critical area of modernising the natural gas distribution and transportation infrastructure necessary for growing access and balancing domestic supply and demand situations, U.S. companies in the post-2003 Coalition Provisional Era provide alarming examples of the conflicts of interest impeding progress in Iraq. Before the relationship collapses, they provide.

For sustainable energy infrastructure financing solutions, as Iraq rebuilds public finances in the coming years, Malaysia's Independent Natural Gas Development Corporation, Petronas, has warranted a review for compatibility. Professionally owned by the Ministry of Finance, Petronas invests surpluses throughout the value chain to balance commercial and national interests. It creates a model for incubating Iraq's Basra Gas Company to stimulate short-term absorption systems for gas flared from oil operations that feed nearby power plants. Partial opening of future IPO opportunities to the public also promotes local ownership. Such approaches promote the interests of citizens in resource management and paths of economic mobility, and they offer tools to depoliticise institutions through more apparent regulatory and funding distinctions.

However, in Iraq's absence of fundamental public management reforms to overcome persistent corruption and inefficiency, deploying even the world's best oil and gas infrastructure technologies and organisational structures is inevitably flawed. Therefore, an essential prerequisite for successfully adapting to the global experience is the creation of governance environments in which capable institutions adhere to their commitments.

Here, policy prescriptions for escaping the resource curse from scholars such as Sachs and Warner (2001) for Iraq are instructive. Sachs's framework emphasises establishing strong oversight institutions, including parliamentary budget committees and independent audit institutions, that provide external oversight against the risks of autocratic and self-dealing lousy governance. Praising the government's capabilities and empowering local media and civil society organisations is another

pillar of strengthening accountability and transparency. Such independent weights provide systemic stability that allows for the emergence of competent technocratic ministers who can negotiate contracts with foreign infrastructure developers that balance commercial returns and national interests. Getting the foundations right allows for the careful adaptation of global experience[19].

Regionally, in the context of the Persian Gulf, the evolution of Qatar's bureaucratic capacities in managing hydrocarbon wealth through its commitment to good governance standards also suggests adaptable models. By supporting a pragmatic vision that promotes education and institution-building as central to providing citizen benefits essential for sustainable stability, deliberate governance choices foster astute resource management. This policy helped protect Qatar from destabilising spillovers during the 2011 Arab Spring. Iraq will similarly benefit from an emphasis on administrative professionalism and capacity development focused on public welfare as the reconstruction of energy infrastructure also progresses.

5. Conclusions

Finally, Iraq has many opportunities internationally to leverage technologies, financing structures, and responsible governance best practices through collaboration with foreign partners across the natural gas value chain; it also provides the possibility of attraction, productivity, and significant export achievements inside the country. But in the absence of committed fundamental reforms to address concerns of corruption and inefficiency raised by protesters that deeply undermine the government's legitimacy and deter local and international private investment capital essential to reconstruction efforts, the enormous potential for improvement paths that can be adapted from global experience to It is tragically in danger of disappearing as it has in the past. Technocratic efforts to revive the oil sector, hence the restoration of administrative legitimacy and competence focused on citizen representation, are the most essential prerequisites before the success of transformative energy projects at scale. Getting the foundations of governance right unlocks the benefits of global cooperation. Finally, some practical suggestions are presented based on the topics discussed.

1- Prioritizing the development of production infrastructure, especially investment in pipelines, storage facilities, import terminals, and distribution networks
2- Using advanced exploration technologies to evaluate the hydrocarbon potential fully
3- Accelerating strategic partnerships with leading international oil companies in infrastructure projects and knowledge transfer.
4- Increasing the role of the private sector throughout the gas value chain through incentives and public procurement mandates using internationally recognised standard contracting models.
5- —Comprehensive oversight of operations by strong regulatory bodiess, particularly on issues related to efficiency, transparency, and sustainability standards.

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التجارب الدولية في استثمار الغاز الطبيعي وامكانية الاستفادة منه في العراق

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المستخلص

أجرى هذا البحث دراسة نوعية من خلال تحليل تجارب دول مختارة وهي قطر وايران والمملكة العربية السعودية وروسيا والجزائر في تطوير قطاع الغاز الطبيعي لديها. وكان الهدف هو صياغة توصيات استراتيجية للعراق لتحسين نظامه البيئي للغاز باستخدام الدروس العالمية التي تم تكييفها محليا. باستخدام منهج النظرية المرتكزة، تستمد هذه الدراسة رؤى استقرائية من البيانات الثانوية ومقابلات الخبراء لتحديد عوامل النجاح الحاسمة والممارسات والسياسات التي تمكن بعض البلدان من الاستثمار بشكل منتج في صناعة الغاز كمحرك للتنمية الاقتصادية. قام الإطار المفاهيمي بتقييم الديناميكيات متعددة الأوجه في الأبعاد الاقتصادية والبيئية والجيوسياسية والتكنولوجية والحوكمة التي تشكل نتائج قطاع الغاز. وشملت الجوانب المحددة التي تم تحليلها الاستغلال المحلي، وإمكانات التصدير، وممارسات الاستدامة، وعلاقات الطاقة الثنائية، وقدرات البنية التحتية، والكفاءة التنظيمية. وقد حددت هذه الدراسة، المتأهلة للأداء المختلف للدول في هذه المعايير، المبادئ والاعتبارات التخطيطية لرسم الخرائط الأمثل والمحددة السياق. وأظهر هذا التحليل كيف استثمرت اقتصادات الغاز الرائدة بشكل كبير في البنية التحتية للإنتاج وشبكات التوزيع لإعطاء الأولوية للاستهلاك المحلي مع تطوير الصادرات تدريجيا من خلال الاستفادة من الشراكات الجيوسياسية. إن البراعة التكنولوجية، والإدارة الماهرة تحت إشراف مركزي، وتنويع السوق، والاستجابة البيئية، تدعم بقوة هذه النتائج. يتطلب المشهد العالمي المتغير سياسات رشيقة ولكنها استراتيجية تعمل على إيجاد التوازن بين أمن الطاقة والكفاءة الاقتصادية والاستدامة. بالنسبة للعراق، تشمل الآثار التوسع السريع في البنية التحتية للغاز لخدمة الأسر والصناعات قبل الدخول بشكل انتقائي إلى أسواق التصدير، والحصول على تقنيات للاستخدام الفعال لموارد الغاز، وتعزيز المؤسسات القانونية واكتساب الخبرة المحلية من خلال التعاون الدولي، والحفاظ على التسعير الداخلي المناسب، والمشاركة الحكيمة. في روابط الطاقة الإقليمية وتضمين الإشراف البيئي من خلال تحديث الإنتاج. إن السعي المستمر لتحقيق هذه الأهداف يمكن أن يحول اقتصاد العراق في العقد المقبل

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