قوائم المحتويات متاحة على المجلات الأكاديمية العراقية

مجلة رؤية للدراسات الاجتماعية

الصفحة الرئيسة للمجلة: https://visj.dws.gov.iq/

تحليل دور التلوث البيئي المصاحب لحقول النفط وتأثيره على الايرادات النفطية دراسة تحليلية للفترة من (٢٠١٥– ٢٠٢٥)

Analysis of the role of environmental pollution associated with rightstoOil and its impact on oil revenues: An analytical study for the period (2015–2025)

ريم صباح محمد[١] صفا نجاح عبد الامير[٢]

شيماء ماهود محمد[٣] مناف جاسم محمد العنتاكي[٤] فاطمة محمد جاسم[٥]

جامعة ميسان ، طريق الكحلاء ، العراق ، ميسان

Keywords

Environmental Pollution ,Petroleum Sector ,Oil-Producing Countries, Environmental Sustainability.

Abstract

This study aims to highlight a pivotal challenge facing the extractive industry in the modern era: the growing role of environmental pollution resulting from oil field operations and its direct and indirect impact on the structure of oil revenues during the period (2015-2025). The study is based on the premise that the sustainability of financial returns is no longer solely determined by the quantitative volume of production, but is now governed by its associated environmental footprint.

The study employed a descriptive-analytical approach to track the nature of pollutants associated with oil field production, primarily carbon emissions from associated gas flaring, and soil and groundwater contamination by chemicals and produced water. Financial analysis revealed that these factors led to "hidden environmental costs" that eroded net profits, resulting from increased operating expenses for waste management, rising legal compensation payments, and the costs of complying with stringent international regulations following the Paris Climate Agreement.

The study reached several conclusions, most notably a structural shift in the relationship between production volume and revenue. It observed a growing "environmental discount" phenomenon, whereby global markets and financial institutions imposed credit restrictions and higher financing costs on high-emission projects, thus diminishing the investment appeal of conventional oil fields. In a practical context, the study discussed Iraqi government policies aimed at reducing gas flaring. While acknowledging tangible efforts to invest in gas and improve infrastructure, the study demonstrated the persistence of the problem due to security and political challenges and a lack of investment funding.

The study concludes that the sustainability of oil revenues now hinges on adopting "green production" strategies. It recommends transforming investment in emissions reduction and gas recycling technologies from a matter of "environmental luxury" to a firm and mandatory economic imperative, while simultaneously removing structural and security obstacles to environmental projects in Iraq to ensure future revenue flow.

reem-sabah@uomisan.edu.iq[1], safa.najah@uomisan.edu.iq[2] ,

shaymamahod@uomisan.edu.iq[3] , sis09039@uomisan.edu.iq[4] , fatema18aljlba@gmail.com[5]

معلومات المقال

تاريخ المقال:
القبول:30\6\2026

الكلمات المفتاحية:
التلوث البيئي ، قطاع البترول ، الدول المنتجة للنفط ، الاستدامة البيئية

ملخص

تستهدف هذه الدراسة تسليط الضوء على إشكالية محورية تواجه الصناعة الاستخراجية في العصر الحديث، وتتمثل في الدور المتعاظم للتلوث البيئي الناتج عن عمليات حقول النفط وأثره المباشر وغير المباشر على هيكلية الإيرادات النفطية خلال المدة (٢٠١٥ – ٢٠٢٥). تنطلق الدراسة من فرضية مفادها أن استدامة العوائد المالية لم تعد ترتبط بحجم الإنتاج كمياً فحسب، بل باتت محكومة بالبصمة البيئية المرافقة له.

اعتمدت الدراسة على المنهج الوصفي التحليلي لتتبع طبيعة الملوثات المصاحبة للإنتاج في الحقول، وعلى رأسها انبعاثات الكربون الناتجة عن حرق الغاز المصاحب، وتلوث التربة والمياه الجوفية بالمواد الكيميائية والمياه المنتجة. وأظهرت التحليلات المالية أن هذه العوامل أدت إلى نشوء "تكاليف بيئية مستترة" تسببت في تآكل صافي الأرباح، نتيجة لارتفاع النفقات التشغيلية الموجهة لمعالجة النفايات، وتنامي مبالغ التعويضات القانونية، فضلاً عن تكاليف الامتثال للتشريعات الدولية الصارمة بعد اتفاقية باريس للمناخ.

وتوصلت الدراسة إلى مجموعة من النتائج أبرزها: حدوث تحول هيكلي في العلاقة بين حجم الإنتاج والإيرادات المحققة، حيث رُصد تنامي لظاهرة "الخصم البيئي" التي فرضت بموجبها الأسواق العالمية والمؤسسات التمويلية قيوداً ائتمانية وتكاليف تمويل أعلى على المشاريع ذات الانبعاثات المرتفعة، مما أضعف الجاذبية الاستثمارية للحقول التقليدية. وفي السياق التطبيقي، ناقشت الدراسة السياسات الحكومية العراقية لتقليل حرق الغاز؛ ورغم رصد جهود ملموسة لاستثمار الغاز وتحسين البنية التحتية، إلا أن الدراسة أثبتت استمرار المشكلة بفعل التحديات الأمنية والسياسية ونقص التمويل الاستثماري.

تخلص الدراسة إلى أن استدامة الإيرادات النفطية باتت مرهونة بتبني استراتيجيات "الإنتاج الأخضر". وتوصي بضرورة تحويل الاستثمار في تقنيات خفض الانبعاثات وإعادة تدوير الغاز من إطار "الترف البيئي" إلى محدد اقتصادي وإلزامي صلب، مع تذليل العقبات الهيكلية والأمنية أمام المشاريع البيئية في العراق لضمان تدفق الإيرادات مستقبلاً.

1. the introduction :

The oil and gas sector is the cornerstone of the Iraqi economy and the primary source of public revenue. However, the sector's efficiency faces chronic structural and environmental challenges, most notably the flaring of associated natural gas during crude oil extraction. This flaring represents a massive economic waste of alternative energy resources that could have been used to address the severe shortage of electricity generation domestically, or directed towards export and manufacturing industries to support the national budget.

This crisis has worsened over decades, becoming particularly entrenched after 2003 due to the cumulative effects of internal conflicts and security instability, as well as the lack of strategic investments aimed at developing gas gathering and processing infrastructure. Despite Iraq's vast gas reserves, technological gaps and economic and political constraints have prevented the reduction of emissions from this flaring, transforming this resource from a financial asset into an environmental and economic burden that has cost the country lost opportunities to maximize its revenues.

From this perspective, this research presents an analytical study of the period (2015-2025), focusing on tracking the role of environmental pollution associated with oil operations and its dynamic impact on revenue structures. The research aims to identify the factors contributing to the

continued practice of gas flaring and propose practical pathways for its effective utilization, drawing on a review of successful international experiences in this field. The ultimate goal is to formulate a vision that supports Iraq's financial stability and fulfills the requirements of sustainable development..

2. Research problem:

The research problem focuses on the lost opportunity to invest in this gas to increase financial returns from the oil and gas sector, thus negatively impacting the state's overall revenue. Iraq needs effective strategies to utilize associated gas in a way that achieves greater long-term benefits..

3. Burning associated gas

It is natural gas that is extracted in parallel with the extraction of crude oil from oil fields, where it is produced during the drilling and fracturing of rocks to extract oil. It is usually a mixture of gases such as methane, ethane, and propane in many oil fields. Associated gas is produced as a by-product that cannot be easily transported or stored due to the lack of sufficient infrastructure (Jabbara et al., 2023: 321)..One solution used in the past to dispose of this gas was to burn it, where the associated gas is flared, destroying the gases in an inefficient manner. Although this burning reduces the quantities that accumulate on-site, it results in significant economic and environmental losses (Al-Khaikani et al., 2017: 45)..The process of burning associated gas occurs when there are not enough facilities to collect, store, or transport the gas to markets, so it is burned in the air or converted into electrical energy in some rare cases.

4. Causes of associated gas burning

Several structural factors contribute to the continued flaring of associated gas. Foremost among these is the severe shortage of infrastructure and pipeline networks necessary for storage and transportation, which compels companies to prefer flaring to avoid large-scale investments (Al-Asadi, 2020: 12). This crisis is exacerbated by the security and political instability surrounding the fields, which hinders the implementation of long-term strategic projects (Al-Asadi, 2024: 78). Financial challenges and a lack of funding also incentivize the adoption of flaring as a less costly operational option (Hamza, 2024: 33), coupled with a clear technological gap and a shortage of advanced equipment needed for liquefying and processing compressed gas (Mahjoub, 2017: 57). Finally, the commercial pressures exerted by international oil companies to maximize rapid oil production lead to the postponement and marginalization of gas investment projects to avoid disrupting production operations (Al-Samak et al., 2018: 102).

5. The economic effects of associated gas flaring and government efforts to address them

Flaring associated gas has severe negative economic and environmental repercussions for oil-producing countries (Al-Shalji et al., 2007: 88). The most prominent of these effects is the loss of public revenue; flaring deprives the Iraqi budget of annual revenues estimated at approximately $2-3 billion that could have been generated through optimal utilization. Furthermore, it deprives the local industrial sector of a cheap energy source, thus increasing

production costs and weakening competitiveness (Geller, 2009: 20). The damage extends to undermining sustainable development by wasting promising job opportunities in gas projects. Simultaneously, emissions (such as carbon dioxide and methane) cause air pollution, destroy biodiversity and agricultural lands, and exacerbate serious health crises, such as respiratory diseases and cancers, in nearby communities (Kleij, 2004: 14). In response to these effects, government policies have focused on promoting gas investment through international partnerships, culminating in the establishment of the Basra Gas Company in cooperation with (Shell), along with integrated strategic agreements with TotalEnergies for infrastructure development. The measures also included linking associated gas to the electricity sector to operate power plants independently and reduce import costs, supported by the issuance of binding environmental legislation and joining international initiatives such as the World Bank's initiative to eliminate routine flaring, and within long-term strategic plans that seek to gradually reduce emissions in line with the Sustainable Development Goals (Qasim, 2009: 24)..

6. Public revenues:

Public revenues refer to the financing of the overall economic activity. Covering public expenditures requires securing the necessary financial resources. The state obtains these resources primarily from national income, within the limits of its national financial capacity, or from external sources when these resources are insufficient to meet public spending requirements (Ajamiya et al., 2014: 56). In the modern era, the types of public revenues have diversified, their methods have varied, and their nature has changed to reflect the different types of public services provided by the state. This is a result of the state's evolution and its responsibility for maintaining economic and social equilibrium (Qumayha et al., 2019: 38). Public revenues are no longer simply a means of covering public expenditures necessary for the state to perform its traditional functions of security, defense, and the judiciary. Rather, they have become an instrument of fiscal policy, leading to an increase in the volume and variety of public revenues. Revenues are the sources from which the state derives the funds necessary to cover its various expenditures in order to satisfy essential public needs (Khair El-Din, 2013: 49).

Public revenues are the sources from which the state obtains the funds necessary to cover its public expenditures. The book of finance has taken care to divide these revenues according to their nature into compulsory revenues and optional revenues, and according to their continuity into exceptional revenues and ordinary revenues (Al-Narouz, 2019: 62).

Public revenue is one of the three elements of public finance, alongside public expenditure and the general budget. For the state to fulfill its financial function, it must secure the necessary resources to cover its public expenditures. The purpose of revenue is no longer simply to collect money to cover public spending; rather, like other elements of public finance, it has become a tool for influencing public life in various spheres. The state uses it to achieve its public policy objectives in addition to its financial goals. The functions of the state have increased, leading to a rise in the volume of public

expenditures, which in turn has increased the volume of public revenues (Burjas et al., 2010: 101). Public revenues are the funds collected by the state from various sources and entities to finance public expenditures and meet public needs. Public revenues are a crucial component of fiscal policy and the financial means by which the state can implement its public policy. They are also the instrument that distributes public burdens according to the principles of justice and equality (Othman, 2019: 76)..

7. The concept of public revenue and fiscal policy across economic schools:

The features of fiscal policy and the philosophy of public revenue crystallized in classical thought as an implicit effect of liberal philosophy and the laws of the free market (laissez-faire) during the nineteenth and early twentieth centuries. Classicists believed in the harmony of private and public interests without the need for state intervention (Al-Lami, 2014: 29). Their fiscal characteristics were defined by the necessity of "neutrality" in fiscal policy, such that the role of revenues (such as taxes) is limited to covering limited public expenditures without affecting the private economy or harming savings and capital formation. This led them to prefer proportional and indirect taxes over progressive ones, with a strict commitment to achieving annual budget balance and avoiding borrowing to prevent crowding out private investments and to avoid the inefficiency of the state, which was described as poor management (Zamal et al., 2018: 35).

However, the Great Depression of the 1930s marked a turning point, demonstrating the inadequacy of market mechanisms and the invisible hand to restore equilibrium, thus paving the way for the emergence of Keynesian economics with its new structural perspectives (Al-Lami, 2014: 47; Hammam, 2016: 60). Keynes advocated for government intervention through fiscal policy to stimulate "effective demand," the deficiency of which he considered the root cause of the crisis, emphasizing that equilibrium did not necessarily imply full employment of the factors of production (Taqa et al., 2007: 15). Consequently, the concept of public revenue became linked to the necessity of diversifying and expanding its sources through loans and monetary issuance to finance increased public spending, and to linking budget balance to macroeconomic equilibrium, which aims to achieve equality between aggregate supply and demand (Muhammad, 2011: 19).

By the 1970s, Keynesian thought faced a stagflation crisis that its fiscal tools could not resolve, paving the way for the rise of monetarism (the Chicago School) led by Milton Friedman (Al-Janabi, 1999: 42; Marar et al., 1980: 37). Monetarists opposed extensive government intervention and advocated a revival of classical economic thought through the activation of monetary policy, arguing that the free market economy is self-stable (Al-Wadi, 2010: 22). Their opposition to expansionary fiscal policy was based on the argument that it deepens budget deficits and fails to achieve stability unless accompanied by monetary policy, in addition to raising interest rates and undermining private investment through the "crowding-out effect." This historical trajectory summarizes the evolution of fiscal policy from a classically neutral role to a singularly positive Keynesian role,

and finally to a positive role in conjunction with monetary policy in contemporary thought (Baali et al., 2003: 55; Ayeb, 2010: 39)..

8. The economic effects of public revenues (taxes and loans):

States determine their public revenue streams to cover their expenditures in accordance with their economic, social, and political structures, to ensure the achievement of their desired development goals (Al-Ali, 2011: 25). Taxes stand out as a highly influential financial tool because they are a direct deduction from individuals' income and wealth, giving them the ability to reshape consumption, savings, and investment patterns, as well as influencing the movement of factors of production such as labor and capital (Khasawneh, 2014: 44). Their positive effects are evident in directing the economy towards desirable sectors by granting tax exemptions that raise the rate of return on capital, and protecting local products through protective tariffs on imports. Furthermore, they play a structural role in redistributing national income, reducing class disparities, and achieving social stability by implementing progressive taxation and reinvesting its proceeds to benefit lower-income groups (Abdul Hamid, 2005: 31).

Conversely, the economic effects of the second variable, public loans, vary depending on whether the financing source is internal or external. Internal loans (obtained from individuals or local banks) draw down available liquidity and purchasing power, reducing private sector savings and negatively impacting consumer and investment spending. This can lead to economic contraction, especially if the loans are mandatory (Juwar et al., 2018: 88). In contrast, external loans contribute to expansionary effects and a direct increase in national output by providing the central bank or commercial banks with foreign financing that boosts investment and consumer spending (Khair El-Din, 2013: 49). However, for this effect to be beneficial, funds must be directed towards investment projects and the importation of production inputs to ensure growth. Limiting them to consumption purposes without adding new productive capacity may generate inflationary pressures that hinder economic stability (Al-Lami, 2014: 47).

9. The impact of associated gas flaring on public revenues in Iraq

Oil revenues constitute the cornerstone of public income and the dominant source of funding for the federal budget in Iraq, with crude oil sales representing the largest portion of national income (Al-Khaikani et al., 2017: 45). With modern economic trends, the urgent need to activate alternative and renewable energy resources, including natural gas, has emerged to strengthen and diversify the structure of these revenues. However, the continued practice of flaring associated gas poses a critical obstacle, resulting in the squandering and loss of a significant portion of these sovereign resources (Jabara et al., 2023: 321). The dimensions of this problem can be traced along the following axes:

First: The impact of associated gas flaring on public revenues:

The flaring of associated gas in Iraq represents an ongoing economic crisis, resulting in the waste of an estimated 20 billion cubic meters annually due to weak

infrastructure, security challenges, and financial constraints (Al-Asadi et al., 2020: 12). The direct impact of this phenomenon is the loss of approximately $2-3 billion in annual revenue to the national budget, revenue that could have been generated from direct sales or exports. Furthermore, it forces the state to spend billions of dollars importing electricity and gas from neighboring countries (Qasim, 2009: 24; Al-Asadi, 2024: 78). The indirect impact is the increased cost of domestic energy production, which weakens the industrial competitiveness of the private sector and undermines overall economic growth that feeds into the state's tax base (Geller, 2009: 20; Al-Samak et al., 2018: 102).

Second: Factors affecting the utilization of associated gas:

Several structural constraints hinder optimal gas investment; most notably, a severe logistical deficit in pipeline networks and liquefaction plants, the construction of which requires massive financial inflows that often clash with bureaucracy and political shifts (Mahjoub, 2017: 57). Security instability in some extraction field areas further complicates the operations of international companies, while financial crises and mounting public debt limit the state's ability to finance gas projects (Al-Khaikani et al., 2017: 45). Moreover, the local technological gap and lack of innovation in compressed gas processing technologies make flaring the easiest and least expensive operational option for companies at present (Al-Asadi, 2024: 78).

Third: Opportunities to improve public revenues from associated gas:

Iraq possesses promising opportunities to revitalize its public finances if it adopts integrated infrastructure development strategies through strategic partnerships with major international companies capable of providing financing and complex technology (Al-Shalji et al., 2007: 88). This necessitates connecting the collected gas to the national electricity grid to reduce foreign import expenditures, as well as embracing renewable energy projects (such as solar and wind) to alleviate the strain on hydrocarbon resources and generate larger surpluses for export to high-demand global markets.

Fourth: The government's role in improving the utilization of associated gas:

The government is the primary actor responsible for leading this transformation through the formulation of a comprehensive and integrated national energy policy. The government is committed to implementing flexible legislative and legal reforms that guarantee the protection of investments and provide attractive financial incentives and credit facilities for the private sector and foreign companies (Clegg, 2004: 14). Furthermore, a portion of spending must be directed towards education and technical training to build and develop the skills of the national workforce and localize technical knowledge in the gas sector.

Fifth: The potential effects of improved gas utilization on public revenues:

Successfully halting gas flaring and harnessing its potential will positively impact overall financial stability by transforming Iraq into a regional hub for liquefied natural gas (LNG) exports, thereby securing new, non-oil revenue streams (Geller, 2009: 20). This step will help address the chronic budget deficit, reduce the economy's vulnerability to external shocks stemming from fluctuations in crude oil prices, and revitalize forward and backward linkages

with the manufacturing, petrochemical, and agricultural sectors, thereby driving sustainable development..

10.Analysis of the impact of associated gas flaring on public revenues in Iraq (2015-2025)

table(1Demand for crude oil, economic growth, and the average nominal price of crude oil for the OPEC basket.

Nominal price of crude oil	economic growth	% change	Global demand for crude oil	*Year*
51.7	3.4	2.4	94.2	*2015*
43.2	3.2	1.6	95.7	*2016*
53.1	3.6	1.8	97.4	*2017*
69.8	3.6	1.44	98.8	*2018*
64.0	2.8	1.0	100.27	*2019*
41.5	3.0-	0.9-	91.19	*2020*
69.9	6.2	6.4	97.1	*2021*
100.1	3.4	2.52	99.55	*2022*
77	2.6	3.5	103.033	*2023*
79	2.9	3.2	106.156	*2024*
85.3	2.96	3.07	102.913	*2025*

Source:(International Energy Agency - Official Website:https://www.iea.org,The 49th Annual Report of the Secretary General of the League of Arab States (Various Editions)).

YTable (1) indicates a direct relationship between economic growth and demand for crude oil, as the change in global economic growth rates from 5.1% in 2010 to 3.8% in 2011, to 3.3% in 2012, with a decrease in the growth rate of demand for crude oil from 2.8% in 2010 to 0.9% in both 2011 and 2012. Anyone following the levels of demand for crude oil in 2022 will clearly notice the slowdown of the global economy and the uncertainty due to the continued impact of the COVID-19 pandemic, which has affected expectations for forecasting future demand for crude oil.

- ❖ - Population growth rate: Population size is an important variable in the crude oil demand equation, as it reflects the number of people, their growth rate, the rise in their income and living standards, and the quantity and quality of goods and services required to satisfy their needs. (Bakheet et al., 2024: 177),In 1950, the world's population was 2.5 billion, and consumption was around 11.7 billion barrels of oil. By 1999, the population had risen to 6 billion, and oil consumption had increased to 96.2 billion barrels. The world's population is projected to reach 9 billion by 2050, with consumption expected to reach 200 billion barrels of oil..
- ❖ Crude oil prices: The price of oil is one of the main factors that affect the demand for crude oil, and the relationship between them is inverse, as a decrease in oil prices leads to the consuming countries seeking to expand their demand for oil, whether in its crude form or in the form of petroleum products. There is also a difference in the way the price of oil is determined, through the attempts of producing countries to make it a strategic commodity, and the basis for determining its price differs from determining the prices of other commodities (Abdul-Moneim, 2012: 11)..
- ❖ Climate Change: Changes can be viewed in two specific directions. The first expresses a temporary situation in climate changes throughout the year in the changing levels of demand for crude oil. It has been observed that these levels of demand decrease in the summer as a result of the rise in

temperatures, in contrast to the rise in demand in the winter as a result of the drop in temperatures (Al-Nasrawi, 2023: 14). The second situation expresses a problem that continues for a long period and is represented by climate change, which is one of the concepts launched by the United Nations and defined as changes in the climate, and its direct or indirect causes are due to human activities, which generate a change in the composition of the atmosphere (Al-Ghandour, 2023: 363).

- And agreeMost economists agree that carbon pricing is the solution that economic theory offers to address the imbalance resulting from fossil fuel pricing. Crude oil pricing is determined by market equilibrium, which does not take into account the social cost of carbon emissions. These are external costs that the market finds difficult to absorb unless they are incorporated through carbon pricing (Boudada, 2021: 418). An environmental tax can be defined as a tax imposed to achieve environmental balance in society by limiting or reducing the damage inflicted on the environment and humans as a result of practices in economic activity at its known stages of extraction, production, consumption, and distribution, which cause environmental pollution in its various forms. From this definition, we can conclude the following:
  - Taxes are levied only on activities that cause pollution.
  - Taxes cover the various stages that the production process goes through.
  - The purpose of the environmental tax is to use it as a means to reduce environmental pollution (Abu Karima, 2019: 164).
- Two important issues arise when considering energy security and greenhouse gas emissions from transportation from a broader perspective: First, how to distribute efforts to combat greenhouse gases across different sectors. Cost-effective strategies to combat carbon dioxide emissions should aim to distribute efforts across sectors efficiently. The challenge lies in minimizing the costs of reducing carbon dioxide emissions and the potential losses in economic capacity in industry and the costs of dependence on energy imports. Second, interventions to reduce greenhouse gas emissions from the transportation sector should be integrated with policies aimed at reducing other transportation externalities such as air pollution, accidents, etc.(Small, 2008: 15). The following table shows the amount of carbon dioxide pollution from various energy sources.

Table (2) Estimated value lost (opportunity lost) as a result of associated gas flaring in Iraq

Economic observations and transformations	Estimated financial losses (billion dollars annually)	Quantity of gas flared (million standard cubic feet/day)	Year
The beginning of a decline in global oil prices.	2.0 - 2.5	~1,500	**2015**
The waste continues despite the increase in oil production.	2.2 - 2.6	~1,600	**2016**
Signing preliminary agreements for gas investment.	2.5 - 2.8	~1,750	**2017**
The rise in global gas prices has increased the cost of waste.	3.0 - 3.5	~1,800	**2018**
Iraq is the second largest gas-burning country in the world.	3.5 - 4.0	~1,850	**2019**
Oil production has declined due to the coronavirus pandemic.	2.0 - 2.5	~1,700	**2020**
A sharp increase in the cost of importing alternative gas.	4.0 - 4.5	~1,750	**2021**
A surge in global energy prices has exacerbated the losses.	5.0 - 5.5	~1,800	**2022**
New projects of the "Basra Gas Company" have begun operation.	4.5 - 5.0	~1,650	**2023**
Expectations are that waste will decrease as Total's projects come into effect.	4.0 - 4.5	~1,550	**2024***
A sharp increase in the cost of importing alternative gas.	5.5-4.0	1.666	**2025**

Sources:Iraqi Ministry of Oil: Annual reports of the South Gas Company and the North Gas Company.

It is clear Table number(2)Value Appreciation Missing a result burn mystification companion in Iraq"size waste Financial and material that He faces Economy National, where Reveals Fluctuation quantities mystification burnt that I registered Its peak in general2019Approximately1,850million foot cube standard daily, Which Caused in losses Finance They ranged between3.5and4.0one billion dollar annually in that the time, while Stand out Data jump enormous in losses Finance Appreciation during general2022To reach to what between5.0and5.5one billion dollar annually a result mutation Global in Prices Energy despite that amount mystification burnt She was1,800million foot cube, He is what less About She was attic in general2019, And in The opposite Monitoring Notes Economic Transformations Positive It began in general2023with employment projects a company gas Basra New that Contributed in cut Quantity burnt to1,650million foot cube, Arrival to Predictions general2024decrease additional in waste Financial To reach to what between4.0and4.5one billion dollar with entrance projects a company Total space Implementation, This Analysis digital It indicates to that Iraq may lost opportunities Economic huge She was guarantor Payment Cost import mystification alternative, Which makes from investment this mystification necessity Supreme To maximize Revenue and reduce Accreditation on Import External in shadow fluctuations Price Global.

Table (3The percentage of carbon dioxide emitted by energy sources (tons)

Carbon dioxide (in tons)	Source
94%	solid coal
108%	coke
105%	brown coal
75%	Primary oil
72%	car gasoline
72%	kerosene
74%	diesel
65%	Associated gas
55%	natural gas

Source: Zaid Farid Sahib Al-Mousawi – The Impact of Oil Price Fluctuations on Economic Performance Indicators in Iraq for the Period (2015- 2025p. 14.

It is clear Table number(3)Contrast The big one in levels density Carbonaceous resulting on burning sources Energy The different ones, where Reveals In a way clear that coal In its various forms It represents Source The most gravity on the environment To overcome Its emissions roadblock The94%Arrival to Peak with coal Coke that Record higher an average pollution In proportion108%, while It comes Derivatives oil fuel liquid in Rank Medium In proportions emissions close like oil First In proportion75%Diesel In proportion74%Which Reflects size The challenge that He faces sector Transportation And transportation, And in The opposite He appears mystification natural As a minimum Sources mentioned damage in the environment In proportion55%only Which He gives it feature strategy as fuel transitional Contributes in reducing pollution In proportion Arrives to half what It causes it coal almost, This Gradual in Data It indicates to necessity re Drafting Policies energy To focus on Sources The least carbon To ensure investigation balance between Meeting needs development and preserving on order environmental, as Reflects Table fact that Transformation from coal brown that Record105%to mystification natural It represents Shortest Roads To reduce emissions Global In a way immediate And influential. Which makes This is amazing Numbers Reference Basically in evaluation Efficiency environmental per resource energy and determining Its cost The real on range far away.

11. Proposed solutions and measures to reduce associated gas flaring in Iraq

The flaring of associated gas is a major problem in Iraq, resulting in the loss of enormous financial resources and posing a serious environmental threat. Although Iraq possesses the world's third-largest reserves of associated gas, its exploitation has been inadequate. Due to the continued flaring of this gas, Iraq remains far from realizing the economic and environmental benefits that could be derived from this resource. Therefore, developing effective solutions to reduce associated gas flaring is crucial for improving Iraq's economic and environmental situation..

First: Technical solutions to reduce associated gas flaring

A. Developing the infrastructure for gas storage

One key solution to reducing associated gas flaring is improving the infrastructure needed for efficient gas storage. By developing gas storage facilities, surplus gas that cannot be used immediately can be stored, allowing it to be used later for electricity generation or export. Several technologies can be used by Iraq to store associated gas, such as:

Natural gas storage plants(LNG terminals): Associated gas can be invested

in the construction of gas-to-liquids (LNG) terminals, from which it can be exported to global markets or used domestically.andCompressed natural gas (CNG) stationsCNG stations): Gas can be stored as compressed gas for use in cars or in local factories.

b. Construction of integrated gas pipelines

A key solution to reduce flaring is the construction of an integrated pipeline network to transport associated gas from oil fields to refineries or power plants. These pipelines would deliver the gas to locations where it could be used for electricity generation or exported. Iraq should collaborate with international energy companies specializing in pipeline construction to expedite this process. Furthermore, it is essential to ensure the security of these networks to safeguard them from threats.

c. Using more efficient gas collection and combustion technologies

Gas collection and flaring techniques can be improved to reduce gas loss to the atmosphere. Emissions from associated gas flaring can be reduced using technologies such as:

Integrated combustion techniques (Flare Gas Recovery): These technologies aim to collect the gas instead of burning it in a flare, and then reuse it in electricity generation or liquefy it. High-efficiency combustion: The application of modern combustion technologies that provide high temperatures helps to burn gas more efficiently, reducing air pollution and increasing combustion capacity.

secondly: Economic solutions to enhance the utilization of associated gas

A. Financial and investment incentives

Reducing associated gas flaring requires significant infrastructure development investments. To encourage investment in this sector, the Iraqi government could offer financial incentives to investors in associated gas projects. These incentives could include:

Tax exemptions or customs reductions on equipment and technology used in gas collection or conversion.

Concessional financing for major projects to develop associated gas in Iraq.

Partnerships with the private sector: Agreements can be signed with global energy companies that have experience in exploiting associated gas, such as Shell or ExxonMobil, to undertake joint projects.

b. Improving gas pricing and export policies

The Iraqi government can improve policies related to associated gas pricing to ensure its efficient utilization. For example, the government should: Setting competitive gas prices to encourage local and international companies to invest in associated gas.

Opening up export markets for liquefied natural gas and developing agreements with other countries to purchase gas will boost public revenues.

c. Developing the local gas industry

The Iraqi government should strive to establish a domestic industry to utilize associated gas for electricity generation, petrochemical production, or fertilizer manufacturing. This could reduce dependence on imported gas, thereby enhancing energy security and stimulating economic growth.

Third: Political and administrative solutions to reduce associated gas flaring

A. Developing policies and legislation

To reduce associated gas flaring, the Iraqi government must develop clear policies and legislation to ensure better gas utilization. Possible measures include:
Tightening controls on oil and gas companies to ensure that associated gas is not flared without treatment.
Develop comprehensive development plans for investment in the natural gas sector, and allocate a portion of oil revenues to gas projects. Enact strict environmental legislation to reduce air pollution caused by gas flaring.

b. Strengthening cooperation with international organizations

Iraq can collaborate with international organizations such as the World Bank and the International Energy Agency to develop strategic plans for managing associated gas. Such partnerships could help secure the necessary funding and technologies to reduce flaring.

Fourth: Potential effects of implementing the proposed solutions:

If the proposed solutions and measures are adopted, Iraq can achieve several positive outcomes:

1. **Increase in public revenues:** By utilizing associated gas for electricity generation or export, Iraq will achieve a significant increase in revenues, which will enhance the government's ability to implement development projects.
2. **Improving the environment:** Reducing gas burning will limit greenhouse gas emissions and reduce air pollution, improving the quality of life for local residents.
3. **Supporting economic development:** Utilizing associated gas strengthens local industries and creates new job opportunities, contributing to the growth of the Iraqi economy..

Conclusions

1. Loss of huge revenues: The study revealed that Iraq lost during the period (2015–2025) Billions of dollars as a result of burning associated gas, which constituted a lost resource that could have directly contributed to boosting public revenues and reducing dependence on oil exports alone.
2. Misuse of resources: Continued gas flaring is an indicator of poor natural resource management, as an energy resource that could be used for electricity generation, export, or to fuel local industries is being wasted.
3. Indirect impact on the general budget: As a result of the decline in gas revenues, the state bears additional financial burdens to cover energy needs by importing gas or operating liquid fuel-powered stations, which negatively affects other government spending allocations.
4. Lack of adequate infrastructure: One of the main reasons for the continued burning of gas is the lack of investment in infrastructure for gas processing and transportation, in addition to the lack of effective partnerships with companies specializing in its investment.
5. Negative impact on the environment and investment: In addition to financial losses, gas flaring has exacerbated environmental problems, weakening the investment climate in the energy sector and reducing opportunities for future gas project development.

Recommendations

1. The need to expand the establishment of specialized projects for processing and investing in associated gas, in cooperation with international companies that possess expertise and modern technology in this field., andDirecting investments towards developing the gas pipeline network, processing plants, and storage facilities will contribute to reducing flaring rates..
2. Develop an integrated national strategy for managing gas resources, linked to economic development and sustainable energy plans, with clear time targets set for gradually reducing flaring rates.
3. Opening the door for local and foreign private sector investment in the gas sector, by providing legal and tax incentives..
4. Adopting associated gas as a priority for electricity generation in Iraq will reduce dependence on imports and decrease government spending in this area, which will positively impact public revenues.
5. Launching media and educational campaigns about the effects of gas flaring, aimed at creating public opinion that supports government policies in this area, and encouraging society to participate in the debate about the future of energy.

References and Sources:

First: The Holy Quran

Second: Arabic sources

1. Abu Karima, Rushdi Ibrahim Mr.(2019).role Policies environmental in investigation Development Economic Sustainable:study Applied comparison.Cairo, Egypt:house Renaissance Arabic, T1, 164.
2. Al-Asadi, on slave The world(2024).arbitration in contracts investment mystification companion oil.magazine studies Basra, Year19, extension number(54), September, university Basra, Iraq.
3. Al-Asadi, Kazim slave The Giver; Al-Sharifi, rightly guided slave rightly guided(2020).mystification natural companion in Fields oil in governorate Basra between reality Challenges Investment and development.research conference, Basra, Iraq.
4. Bakhit, Haider blessing; Al-Issawi, Mohammed Jawad Friday(2024).Transformations market oil International and its implications on organized OPEC.Cairo, Egypt:house Babylonian For studies Scientific.
5. Burgas, Keep; The Majdoub, Mohammed(2010).Conflict International on oil Arabic, T1.Beirut, Lebanon:Bissan For publication and distribution.
6. Baali, Mohammed The small one; Abu Al-Ali, Yosra(2003).Finance public.Algeria:house the sciences.
7. Boudada, Dunya(2021).importance system Trading Emission As a mechanism pricing carbon:study condition China.magazine Research Economic And administrative,

university Mohammed Khader Biskra,15(3), 418.

8. Jabbara, blossom; Khodair, Jawad; Jasem, Firas(2023).monitoring Analysis practical burn mystification companion Using paintings control Multiple Variables.magazine college Mesopotamia the university For science, number(1), p319–329, Baghdad, Iraq.
9. mountainous, The Secretary Mohammed(2016).effect Investment on countries The future for him:study condition to exploit fuels in Algeria. Algeria.
10. Al-Janabi, immaculate(1999).science Finance public and legislation Financial.Baghdad, Iraq:the university Al-Mustansiriya.
11. neighborhood, James; Tieni, Rigar(2018).Investment private:choice Year Private(translation:slave Al-Fattah slave The Most Merciful slave The Great Mohammed).Riyadh, Saudi Arabia:house Mars.
12. Geller, Howard(2009).revolution Energy:about future Sustainable.Abu gazelle, The UAE:center The UAE For studies Research strategy.
13. Hasnawi, piety(2018).effect Fluctuations Prices oil on Politics Finance in Algeria:study Statistics For the period1986-2014.magazine Good news Economic4(2),213-232.
14. Hussein, Hussein on me; Mohammed, Amrou Hisham(2023).possibility application tax carbon and limit from sources pollution environmental in Iraq(Ways and obstacles).magazine the university Iraqi,57(Part the second), 408.
15. Hamza, Hassan generous slave Hassan on(2024).mystification natural in Iraq between waste Resources and diversification sources Income.magazine heir For science, Volume6, number private, Iraq.
16. Khasawneh, Mohammed(2014).Finance public:Theory and the application.Oman, Jordan:house Curricula.
17. goodness Religion, lonely(2013).importance wealth oil in Economy International and strategies The alternative For the sector fuels:study condition Algeria.message Master's, university Biskra, Algeria.
18. Al-Khikani, Nizar Kazim morning; Boish, immortal Qassem(2017).Potential investment mystification natural in Iraq:study Foresight For horizons Future.magazine Al-Kut For science Economic And administrative, number(6), university Wasit, Iraq.
19. Zamal, Issa Faisal; bug(2018).Investment Live in Algeria from2002to2017:bet Challenges.magazine the sciences social and humanity.
20. sound, on Mustafa on(2016).Change climate And its effect on degree the heat in region Misrata during period1980-2010.The magazine Scientific College Education,3(6),360.
21. Fishmonger Mohammed Azhar happy; and others(2018).geography oil and energy.Erbil, Iraq:Forum Read Cultural.
22. Al-Shalji, badge Qassem; Jawad, princess Mohammed(2007).technique transformation mystification to Liquids:Her future and its returns Economic and its effect on industry oil.magazine oil Cooperation Arabic, Volume33, number(121), p86–110, Honesty public Organization Countries

Arabic Source For petroleum(OAPEC), Kuwait.

23. energy, Mohammed; Al-Azzawi, Hoda(2007).Economics Finance The general public, T1.Oman, Jordan:house The march.
24. Faulty, child slave Al-Hamid(2010).Antiquities Economic College policy Spending Governmental, T1.Beirut, Lebanon:library Hussein Modern.
25. slave Al-Hamid, slave The requirement(2005).Economics Finance public.Alexandria, Egypt:The house University.
26. slave The Benefactor great(2012).antiquities shocks Prices oil on Variables Economic College:condition Algeria, study analytical.university Algeria3.
27. Othman, Othman supporter Mohammed(2019).Guarantees Investment in countries Arabic.Cairo, Egypt:house Renaissance Arabic.
28. Ajamiyya, Mohammed slave dear; Younes, Mahmoud(2014).Resources and its economies.Beirut, Lebanon:The house University.
29. Al-Ali, fair Faleh(2011).Finance public and the law Financial And the taxpayer, T2.Oman, Jordan:Enrichment For publication and distribution.
30. Imran, twitter Ahmed(2011).more rate gas second oxide carbon in the weather And its effect in Change climate.magazine Etiquette, university Baghdad,98,378.
31. Al-Ghandour, twitter Mohammed Atef(2023).effect Changes climatic on strategy Development Sustainable in Egypt:study standard.magazine valley Nile For studies Research Humanity social And educational,37(37),363.
32. Fayyad, Arafat Ibrahim(2013).Investment International and dealing In currencies foreign.Oman, Jordan:house The desert.
33. Qassem, Ahmed Mohammed Faraj(2009).sources Energy pollution the environment.magazine Opinions The Gulf, number(57), p20–30.
34. Qamiha, toxicity; Amiur, Lara(2019).effect to retreat Prices oil on performance boxes Sovereignty.message Master's not Published, college the sciences Economic university Jijel, Algeria.
35. Clegg, Michael(2004).features mystification:Passport passage For his future.in:future mystification natural in market Energy Global(p8–15).Abu gazelle, The UAE:center The UAE For studies Research strategy.
36. Al-Lami, Metwally(2014).Economy International.Oman, Jordan:house thought.
37. Al-Lami, Good luck(2014).Investment private And its effect in the environment Economic.magazine Administration And the economy number(80), Iraq.
38. Hidden, Essam Mohammed Ahmed(2017).risks Industries oil and its effect on the environment surrounding:study Applied on warehouses The tree For storage Materials petroleum.message Master's not Published, to divide Protection Civilian college Studies environmental and management Disasters, university Khartoum, Sudan.
39. Mohammed, happy on(2011).Economics Finance The general public, T1.Iraq:house The magazine.

40. Marar, Faisal honorary; Indian, Adnan(1980).principles Administration Finance public and its economies.Oman, Jordan:Printing press Jordanian.
41. Narouz, Diaa(2019).Most important Cases Resources Economic and diversification Economic.Alexandria, Egypt:house education University.
42. Al-Nasrawi, on Ismael slave Glorious(2023).shocks Prices oil and procedures Confrontation Its effects Negativity on balances Cash Finance in Iraq For the period2004-2021.magazine college Administration and the economy For studies Economic and administrative And finance,15(4),14.
43. Hadhraq, Fatiha(2015).role Investment in transfer Technology.college Rights Science Political, university Zayan Ashour, Djelfa, Algeria.
44. Hammam, Mohammed(2016).obstacles Economic that Faces Investment in Iraq after2003.The magazine Iraqi For science Economic number(27), the university Al-Mustansiriya, Iraq.
45. The valley Mahmoud Hussein(2010).principles Finance The general public, T1.Oman, Jordan:house The march.

Third: English sources

1. Kenneth A; Van Dender, Kurt. (2008). Oil Dependence: Is Transport Running Out of Affordable Fuel? Paris, France: OECD Publishing (ITF Round Tables No. 139.(