

# ANALYSIS OF THE RELATIONSHIP BETWEEN ENERGY SUPPLY AND ECONOMIC SECTORS IN IRAQ FOR THE PERIOD (2004–2022)

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**Abstract** *Energy is the most important component of economic development at the level of all countries, and what confirms this is that the interruption of the power supply or its fluctuation negatively affects all economic sectors, which in turn affects the life of society and its future, as the interruption of energy supplies leads to catastrophic effects on vital functions, such as production and care. Medical, security and industrial crises and recurring crises due to the shortage of refined petroleum derivatives, may lead to the cessation of production operations or their damage through the provision of products outside the specifications. For example, a power outage may lead to damage to production equipment and goods produced for industrial projects and its negative impact on productivity, unemployment and economic stability. On the other hand, social: A power outage may lead to poor quality of vaccines, severe damage to sensitive medical equipment and its negative impact on an increase in people with disabilities and unintended medical errors. On the environmental side, a power outage means an increase in diesel consumption (bio generators) and an increase in environmental pollution.*

**Keywords** *Energy Index on Economic Development, Energy Security, Economic Development, Energy Supply*

## INTRODUCTION

Thus energy affects the economy, society and the environment, which directly affects the level of economic development, human development and sustainable environmental development. The interest in the energy sector as the engine that drives economic development transformations, the researcher focused his attention on the study of securing the supply of energy, and ways to promote this vital sector, as well as its role in the development of economic sectors. Therefore, the process of researching ways and means to modernise and activate the reliability of securing energy supplies and studying their economies would affect the fruits of its development on the overall activities of the economy and development.

## REVIEW OF LITERATURE

A research conducted by Ahmed (2009), entitled (Oil and the Future of Development in Iraq), discussed the relationship between Iraqi development and its dependence on crude oil exports. The study confirms that this dependence makes economic development vulnerable to fluctuations in global oil prices, which leads to the deterioration of infrastructure. Lack of investments in other economic sectors, impeding the diversification of sources of income to create economic development. A research conducted by Haitham (2013)

entitled (The Economics of Renewable Energy in Selected Countries) indicated the importance of renewable energy for sustainable development, which is one of the main indicators because of its positive role in preventing environmental pollution, based on the experience of Germany and Egypt, and Germany has achieved high indicators. In the consumption of renewable electrical energy, this success has been achieved through (the development of the production of renewable energy equipment) and (popular awareness, which is an essential element for ensuring the success of the use of renewable energy).

A research conducted by Hani (2013) entitled (Analysis of oil price fluctuations and the pattern of public spending in Saudi Arabia and Iraq) indicated that global fluctuations in crude oil prices harm growth and economic stability in most oil-producing countries (Iraq and Saudi Arabia) as a result of their impact on the pattern and structure of public spending, which requires... Reducing the dominance of the oil resource over financial policy tools in these countries. Saif (2022), entitled (Energy Security in Iraq: Dimensions and Challenges), indicated that the United States' control over Iraq and its control over global energy prices had a negative impact on the construction of an industrial base for oil and gas despite its possession of these resources in large quantities. It was also shown that the abundance of oil in Iraq constituted an incentive for the United States of America to impose its control, which contributes to strengthening its influence over

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Iraq and its oil resources, in addition to administrative and financial corruption in the country and the fragile security situation. Research conducted by Gasparatos (2009), entitled (Environmental Support, Energy Security and Economic Growth in Japan) indicated that energy security may play an important role in Japan's long-term economic stability, even though the Japanese economy is increasingly dependent on access to natural resources. Of developing countries, which may affect the rate at which the economy grows? A study presented by Paletsky (2014), entitled (Energy Security and Economic Growth in the European Union), found that natural gas is one of the most important energy sources among these countries and that economic stability helps maintain energy security presented a study entitled (The Impact of Renewable Energy Consumption on Economic Growth). It is important for decision makers to take into account the experimental results regarding the relationship between energy security and economic development. A number of studies have shown that the consumption of renewable or green energy is positively related to stability. Economic and economic development in 38 major countries consuming renewable energy (Bhattacharya, 2016).

## Research Gap

**Focus on Specific Aspects:** Some studies focus on the impact of oil price fluctuations on the Iraq economy while others focus on the role of renewable energy in sustainable development. Broader studies that combine these different aspects may provide a more comprehensive understanding of the relationship between oil dependence and development in Iraq.

While studies provide insights into the relationship between oil dependence and development, they sometimes lack detailed analysis of the policies needed to mitigate the risks of oil dependence and promote development. Studies that include policy analysis can help Iraqi decision-makers formulate effective strategies for diversifying the economy and investing in alternative energy sources. Most studies focus on the national level, neglecting regional differences within Iraq.

Some studies may not consider external factors, such as geopolitical conflicts and climate change, which can affect the relationship between oil dependence and development.

Studies that include analysis of external factors can provide a more accurate understanding of the factors shaping Iraq's long-term future. In addition to these gaps, further research is needed in the following areas:

The impact of oil dependence on specific economic sectors, such as agriculture, industry and services.

The role of institutions and governance in managing oil revenues and promoting development.

The experiences of other countries that have faced similar challenges of oil dependence.

By addressing these gaps, researchers and policymakers can develop a better understanding of the complex relationship between oil dependence and development in Iraq, and formulate effective strategies for achieving sustainable and inclusive development in the country.

## Analysis of the Relationship between Energy Supplies and Economic Sectors in Iraq

As we can see from Table 1, although the Iraqi economy enjoys an abundance of primary energy sources, oil and gas, they are unstable and unreliable. GDP consumption per unit needs (91) million British thermal units (BTU) in 2004, where we note from the table the alternation of energy consumption between decline and rise until 2020, which recorded (82) despite the growth of GDP and population growth over the duration of the study. This is a sign of poor energy supply and instability, thus impeding the weak energy supply for economic development.

On the comparative side, energy efficiency represents the reduction of energy consumption units to GDP, as we note that Iraq recorded (86) million BTU per unit of GDP in 2021. This indicator does not reflect the comparative reality, as explained by the support allocated to the production of electric power and energy sources.

On the other hand, the waste of electrical energy as the average distribution losses amounted to 58% of the total electricity supply, compared to an average of 8% for the world during the period (2011–2020) (Report U.S. Energy Information Administration 2022) and to irrational consumption. In addition, the necessary condition of stability and reliability of energy supply has not been met compared between energy consumption and GDP.

We note from the table that Iraq's real GDP was about (92) billion (502) million US dollars in 2004, but the contribution of the agricultural sector was (9.09%), the manufacturing sector (2%), the extractive industry sector (40.70%) and services with a contribution rate of (57.40%). These percentages indicate a significant weakness in the transformational industry sector, which depends directly on the supply and reliability of energy in addition to other sectors.

We also note from the table the weak contribution to the performance of the economic sectors and their continuous decline along the time series until 2022, where real GDP growth recorded (192) billion (926) million US dollars,

an increase of (108.56%) over 2004. With the continued low performance of the basic economic sectors without economic development that would help in the development of economic sectors. The share of the agricultural sector reached (10,249), at a rate of (5.31%). The industrial sector recorded (86,069) in both types extractive industry and manufacturing industry, at a rate of (44.61%) for the extractive industry, and at a rate of (2%) for the

manufacturing industry. The service sector also recorded a percentage of (51.69%), which is an indicator of the low level of economic development in Iraq, in addition to not being placed on right track to address the foundations of economic problems, including the energy sector. This analysis shows the impact of poor reliability of energy supply on the performance of economic sectors, and thus in achieving economic development.

**Table 1: Contribution of Economic Sectors to the Iraqi GDP for the Period (2004-2022) (Constant Price Million US Dollars for 2015)**

Year	GDP	Agriculture Sector	Industrial Sector	Services Sector	Power Consumption (Million BTU)	Percentage of Agriculture contribution in (%GDP)	Percentage of Extractive Industry Contribution in (%GDP)	Percentage of Manufacturing Industry Contribution in (%GDP)	Percentage of Services Contribution in (%GDP)	Other Sectors (%GDP)	GDP per unit of Energy Consumption / Dollar
2004	92,502	8,405	37,652	53,095	1,013,195,059	9.09%	40.70%	2%	57.40%	24.43%	91
2005	94,049	11,042	36,658	55,464	1,098,685,875	11.74%	38.98%	1%	58.97%	17.54%	86
2006	99,359	11,513	38,718	58,781	1,077,500,844	11.59%	38.97%	2%	59.16%	17.66%	92
2007	101,233	8,326	41,470	58,443	985,451,496	8.22%	40.96%	2%	57.73%	25.82%	103
2008	109,562	7,169	46,585	61,799	1,097,388,208	6.54%	42.52%	2%	56.41%	30.51%	100
2009	113,265	7,424	47,919	63,881	1,314,242,852	6.55%	42.31%	3%	56.40%	30.49%	86
2010	120,516	8,427	50,346	68,910	1,358,581,948	6.99%	41.78%	2%	57.18%	28.84%	89
2011	129,611	9,798	53,991	73,849	1,401,409,066	7.56%	41.66%	3%	56.98%	27.90%	92
2012	147,674	9,122	62,440	83,834	1,626,546,332	6.18%	42.28%	3%	56.77%	30.88%	91
2013	158,940	11,304	66,058	91,069	1,728,490,974	7.11%	41.56%	2%	57.30%	28.48%	92
2014	159,253	11,076	67,612	87,842	1,663,506,701	6.96%	42.46%	2%	55.16%	30.93%	96
2015	166,774	6,991	75,616	85,471	1,434,806,985	4.19%	45.34%	2%	51.25%	40.37%	116
2016	189,768	6,969	91,607	84,983	1,768,347,218	3.67%	48.27%	2%	44.78%	47.87%	107
2017	186,315	5,854	88,328	89,222	2,364,614,779	3.14%	47.41%	2%	47.89%	45.83%	79
2018	191,222	8,059	86,897	98,552	2,630,779,714	4.21%	45.44%	2%	51.54%	40.03%	73
2019	201,765	11,780	93,288	97,194	2,531,811,960	5.84%	46.24%	2%	48.17%	40.15%	80
2020	177,479	14,425	77,957	90-103	2,163,563,152	8.13%	43.92%	3%	50.77%	32.98%	82
2021	180,290	11,459	77,432	98,645	2,088,296,564	6.36%	42.95%	2%	54.71%	32.57%	86
2022	192,926	10,249	86,069	99,729	-	5.31%	44.61%	2%	51.69%	37.68%	-

Source: (Economic Sectors and GDP) World Bank data for the years (2004-2023). Energy data: <https://www.eia.gov/international/overview/country/irq>

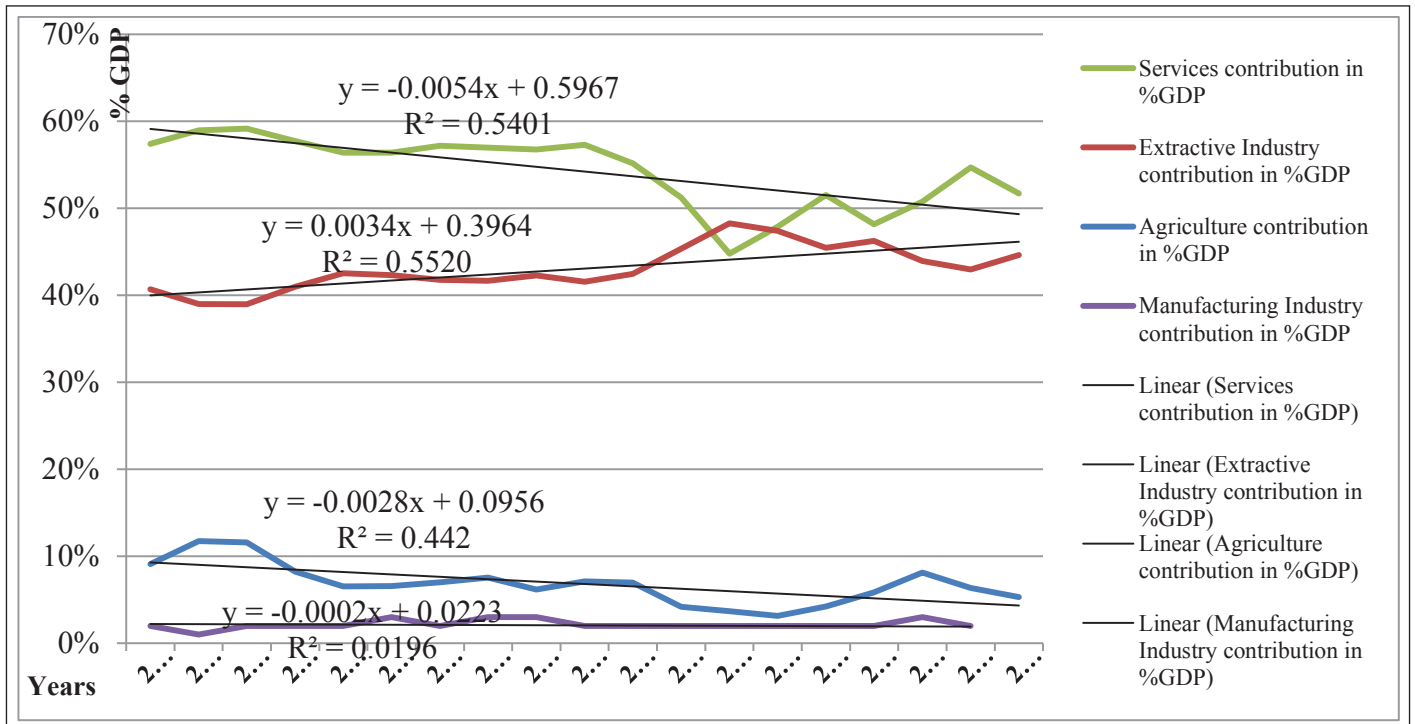
(Manufacturing Industry): Iraqi Ministry of Planning, Statistics Department, the period (2004-2022).

We also note from Fig. 1 the weak productivity of the economic sectors that are severely affected by the shortage of energy supply. It affects the performance of sectors, job

opportunities, weak infrastructure, low productivity of the industrial sector and the low economic development process, as a result of lack of energy consumption. As well as relying

on the import of energy and its sources, which has negative effects in distorting the development process? Investment is usually looking for economies that enjoy security and

stability, as the lack of security and stability of energy supply would create a repellent environment for investment.



Source: Prepared by the researcher based on the data of Table (1).

**Fig. 1: Contribution of Economic Sectors to Iraqi GDP for the Period (2004-2022)**

We note from the figure that the service sector has the highest percentage of contribution to GDP, but it is unstable. It is directly dependent on the revenues of the extractive industry. As for the manufacturing industry, it shows a continuous decline in the trend line of its contribution to GDP.

The poor of energy supply directly affects the economic sectors, especially the industrial sector, because these sectors need the continuity of energy supply with the acceptability of prices.

Energy policies in Iraq provide significant support in energy pricing. This is a comparative advantage added to encourage the industrial sector, but without fulfilling the conditions in securing the supply of energy, so it remains an obstacle to the development of the industrial economy, in particular, and economic development in general. It is one of the most important reasons for the weak performance of the economic sectors, and economic development to the weak energy supply and the lack of necessary consumption of energy. This

shows that energy is the main engine in supporting economic sectors, and thus in achieving economic development.

*Standard Analysis:* The results show the stability of the model at the first difference. As we note from Table (2) that the results of the model estimation, the explanatory capacity of the estimated model was (19% =  $R^2$ ), which is a very weak percentage. As a result of the weak supply of energy, as well as the high support for energy consumption, and the production of energy sources intended for export. This indicates the weak impact of energy on GDP.

The value of Adjusted R-squared = 14%, as the change in GDP is explained by 19% of the changes in energy consumption in the Iraqi economy. The model is also significant at the calculated F value of (3.88), which is significant at the level of 10% according to Prob (F-statistic), where it is equal to (0.06), so the estimated model is significant, as we reject the null hypothesis ( $H_0: b=0$ ), and accept the alternative hypothesis ( $H_1: b \neq 0$ ).

**Table 2: Estimation of the Linear Regression Model of the Impact of Energy Consumption on Iraq's GDP**

Dependent Variable: D(GDP)				
Method: Least Squares				
Date: 02/09/24 Time: 17:51				
Sample (adjusted): 2005 2022				
Included observations: 18 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ENERGY)	1.86E-05	9.44E-06	1.971295	0.0662
C	4057.854	2272.480	1.785650	0.0931
R-squared	0.195414	Mean dependent var		5579.071
Adjusted R-squared	0.145127	S.D. dependent var		9808.001
S.E. of regression	9068.411	Akaike info criterion		21.16742
Sum squared resid	1.32E+09	Schwarz criterion		21.26635
Log likelihood	-188.5068	Hannan-Quinn criter.		21.18106
F-statistic	3.886006	Durbin-Watson stat		2.345282
Prob(F-statistic)	0.066239			

Source: Extracted by the researcher by E-views 13.

$D(\text{GDP}) = 4057.85 \times D(\text{Energy}) (1.86)$  Regression Equation for the Impact of Energy Consumption on GDP (Iraq)

We note that the relationship between energy consumption and GDP is a direct one. As the increase in energy consumption by one unit will increase the value of GDP by (1.86) units, this is consistent with the content of economic theory. The regression equation for the impact of energy consumption on GDP estimated the presence of basic (fixed) consumption by (c) = (4057.85) for the study years (2004–2022). So was  $D(\text{Energy}) = (b1 \times 1.86)$ , which represents the energy consumption parameter in Iraq. Reflects ( $R^2=19\%$ ) energy consumption in Iraq's economy.

We also note from Table 2 that the GDP parameter (t. test) is significant at the level of 5%, where it reached (1.79). GDP has a direct correlation with energy consumption. When increasing energy consumption leads to an increase in GDP, this is consistent with the content of economic theory. The increase in energy consumption by one unit will lead to an increase in GDP by (1.86) units, to reflect the impact of energy on economic activity.

## Conclusion

Quantitative descriptive analysis and metric analysis show the positive relationship between the abundance of energy supply and the development of economic sectors. Therefore,

GDP and economic development are directly related. The energy consumption trend parameter (1.86) was recorded in relation to the GDP in Iraq.

## CONCLUSION

The study deserves a positive response in light of the previous review of the literature, as there is a significant impact of energy supply on economic development in Iraq. It was observed that the data were negatively associated with variables in economic sectors and economic activities. This means that there is a negative impact of the energy variable on the Iraqi economy and the development process. This study mainly focused on comprehensive data analysis. Therefore, it can be concluded that the results of the study were statistically significant. Moreover, to explore the knowledge in this study, researchers will attempt to conduct this study using different statistical techniques and variables.

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