

Assessing of Imbalance among Economic, Environmental and Social Sustainability: Evidence from Oil and Gas Industry in Iraq

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Abstract. Sustainability has increased importance, particularly for oil and gas industry (O&GI) to address the imbalance in the economic, environmental and social issues. Consequently, this descriptive study aims to evaluate the imbalance between the economic, environmental and social performance of the O&GI in Iraq and to propose a conceptual model for addressing it. Secondary data of economic sustainability environmental sustainability and social sustainability (2011-2017) was descriptively examined. The findings are revealed a significant imbalance between the three indicators. Moreover, the present study also proposed a conceptual model based on prior literature on how to improve and reduce this imbalance and create sustainability performance within the O&GI.

1. Introduction

Traditionally, the economic goals and profits of the organisation are the sole concern of operations managers. On the contrary, today's managers are responsible not only for generating the economic value of the company but also they should respond to social welfare and environmental protection [1, 2]. Nowadays, manufacturing companies are faced with a more complicated environment than ever previously [3]. In addition, since it meets a sharp rise in economic uncertainty [4], as a result of depletion of natural resources and a lack of attention to responsibility towards society [5], develop strict environmental and safety/health regulations [6, 7], pressure from stakeholders and increased social awareness [8] and degradation of global environmental [9], sustainability has become a global goal and strategic necessity of the twenty-first century [10-12].

Moreover, the phenomena of global sustainability have increased importance by academics, practitioners, policy makers and relevant global organisations. Sustainability has become a matter of concern and great importance at the same time in many fields of study [13-15], all areas of life [16]. Also, sustainability has attracted worldwide interesting [17], in industrial operations [6, 18].

Iraq is one of the major oil exporting countries in Asia and the world; oil is the central factor that drives and develops the global economy, in addition to contributing to raising the level of GDP, which is the country's economic performance indicator [19]. Wherever, share petroleum exports 34.4% of GDP during the period 2012-2016 [20]. Despite the O&GI has been and continues to be the leading financier of the Iraqi economy, there are considerable concerns as a result of environmental pollution caused by this industry and a lack of responsibility towards society. According to Elhuni and Ahmad

[21] the O&GI considers the major contributor to environmental pollution and social damage. Likewise, issues of sustainability for this industry in the country suffers from careless implementation and lack of concern for protecting the interests of society [22]. However, to achieve a balance in the dimensions of SP, there should be sustainable practices and activities in the O&GI. In this respect, empirical evidence in literature has confirmed that sustainable manufacturing practices (SMPs): sustainable product design (SPD), sustainable manufacturing process (SMP), sustainable supply chain management (SSCM) and sustainable end-of-life management (SEoLM) [23, 24], improve economic, environmental and social sustainability and thus balance it. Therefore, this study aims to evaluate the imbalance between the economic, environmental and social performance of the O&GI in Iraq and to propose a conceptual model for addressing it. The results of the current study are expected to benefit many aspects in different areas. Policymakers and top management in the O&GI will obtain a better perception of the of importance to the balance of sustainability performance dimensions.

2. Sustainability challenges to oil and gas industry in Iraq

The O&GI in Iraq faces significant challenges in creating a balance between the three dimensions of sustainability performance: the economic, environmental and social.

2.1. Economic sustainability

OPEC's report recorded that the volume of the daily production of Iraqi crude oil is growing increasingly, that the daily production capacity in 1960 was 972.2 thousand barrels, while it amounted to 4,647 thousand barrels in 2016, as shown in Figure 1 [20]. Also, according to the Foreign Trade Bulletin of Arab Countries issued by the Economic and Social Commission for Western Asia (ESCWA), the shares of crude oil exports from total exports for the years 2011-2015 were 99.8%, 99.8%, 99.8%, 99.7%, 99.8% respectively, illustrated in Figure 2 [25]. These percentages confirm that Iraq depends entirely on crude oil exports. Likewise, the international community has great trust in Iraq in providing large quantities of oil when occurring a crisis in the supply as in 2008 [26]. Therefore, Iraq's economic development depends wholly on oil and gas exports.

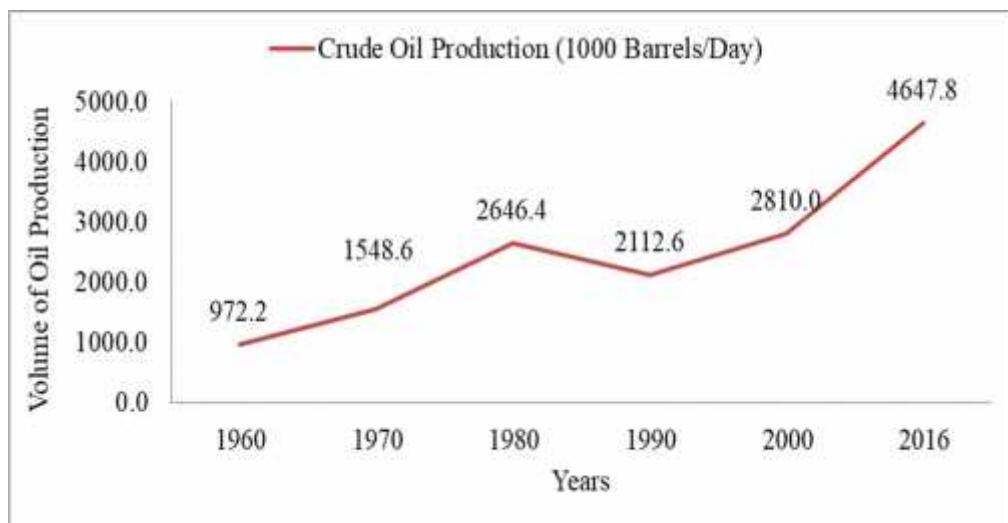
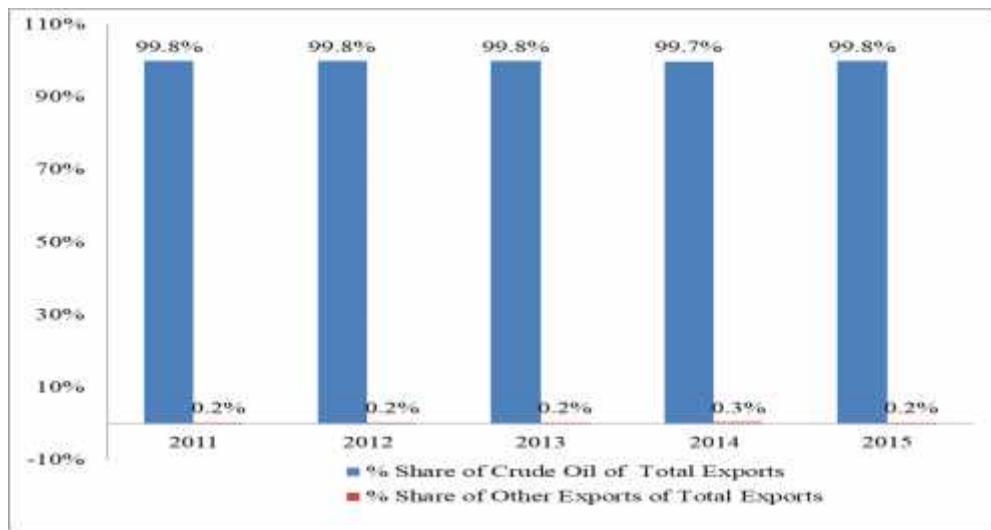


Figure 1. Average Daily and Cumulative Crude Oil Production in Iraq 1960-2016
Source: OPEC [20]

**Figure 2.** % Share of Crude Oil & Other Exports of Total Exports 2011-2015

Source: UN-ESCWA [25]

Iraq relies entirely on its extractive exports represented by crude oil; revenues are considered the leading contributor to the development of GDP. Besides, it has a significant role in the development of the economic level, contributing more than 90% of the total annual revenue over the past years [27, 28]. Furthermore, the country's report on Iraq, issued by the International Monetary Fund (IMF), noted many financial and economic indicators related to the O&GI. For example, amounted to the value of oil exports for 2016 is USD 48.8 billion, which is very large when compared to the value of total exports for the same year, which amounted to USD 49 billion, and the value of other exports is very few, amounting to USD 0.4 billion [29]. Also, the value of oil revenues for 2016 amounted to ID (Iraqi Dinar) 58 trillion, while the value of non-oil revenues for the same year ID 8 trillion [29]. Consequently, the value of oil revenues is considered the main contributor to the financing of the Iraqi economy. More details in Table 1.

Table 1. Selected Iraqi Economic and Financial Indicators for 2013-2016

Indicators	Year	2013	2014	2015	2016
Total exports (Billion USD)		89.8	92.9	56.5	49.2
Exports of crude oil (Billion USD)		89.4	92.5	56.1	48.8
Other exports (Billion USD)		0.4	0.4	0.4	0.4
Oil revenue (Trillions ID)		105.7	98.5	57.7	58.0
Non-oil revenue (Trillions ID)		9.7	5.9	5.8	8.0
Total revenue (Trillions ID)		115.4	104.4	63.5	66.0

Source: IMF Country Report, 2016

2.2. Social sustainability

Notwithstanding the actual benefits of the O&GI according to the financial and economic indicators mentioned above, there are significant adverse effects on society as a result of this industry such as occupational accidents and diseases. Likewise, Kane [30] showed that this

industry has high risks and many injuries and diseases that lead to death. Khalaf and Abd [31] pointed out that Iraq suffers from pollution in the air, soil and water, which has caused health and social effects that have negatively affected the welfare of society. Further, the report of the UNEP revealed that the number of child deaths in Iraq resulting from air pollution reached 1945 and 555, respectively, the highest number in the countries of East Asia [19].

According to Cohen, Brauer, Burnett, Anderson, Frostad, Estep, Balakrishnan, Brunekreef, Dandona and Dandona [32], the global burden of disease is a significant challenge in the future, which is mainly the result of air pollution that has risen over the last 25 years, especially in low- and middle-income countries. In this respect, considers Iraq to be one of the middle-income countries, as mentioned in the latest world bank classification [33]. Besides, there are 12.6 million deaths globally in 2012 due to environmental hazards, most of which are caused by industry, equivalent to 22.7% of the total global deaths [34]. Likewise, one of the social dangers that affect people in Iraq is the establishment of oil and chemical plants near cities, which are devoid of the simplest means of safety.

According to a report by the World Health Organization (WHO), one of the causes of cancerous diseases for men and women, which have increased in recent years in Iraq, are the industrial risks [35]. Moreover, according to the annual statistical collection issued by the Central Statistical Organisation in Iraq, the number of cancer disease cases for 2012, 2013 amounted to 21101, 23308, respectively, and the number of deaths due to the same disease for the same years 10278 and 8341, respectively [36]. These large numbers are a serious indicator of the increasing incidence of this disease in Iraq. Furthermore, another report for the WHO stated 94% of the world's deaths due to by diseases in adults, such as lung disease, cardiovascular disease, cancer and cataracts, which made by the burning of fuel and industrial waste in the air [37]. In the same connection, CSO [36] claimed that the quantity of flared gases burned in the atmosphere by the oil and gas companies in Iraq had increased dramatically for the years 2012-2017, reaching 11976, 12432, 13383, 15662, 17714 and 16639 respectively, as showed in Figure 3.

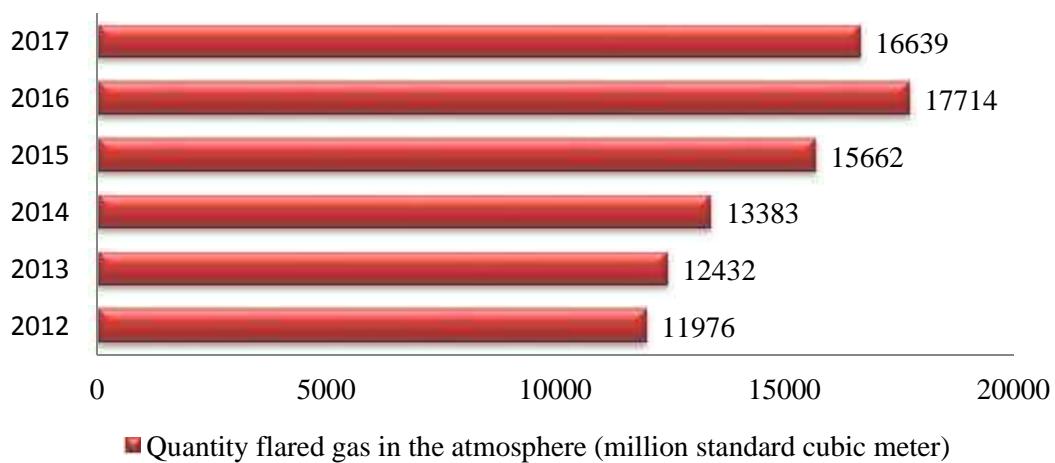


Figure 3. Quantity Flared Gas in the Atmosphere in Iraq 2012-2017

Source: CSO [36]

In addition, the Institute for Health Metrics and Evaluation (IHME) presented a statistic indicating that more frequent causes of death in Iraq are ischemic heart disease, cerebrovascular disease, lower respiratory infection, chronic kidney disease, heart and other

blood vessels, which these are mainly the result of industrial activities, totalling 11560 during 2016 [38]. In 2016, the number of cases of each disease in Iraq was 6690, 2390, 819, 976, and 685, respectively. Moreover, the rate of change for these diseases for the period 2005-2016 has increased significantly, particularly in chronic kidney, heart and other blood vessels [38], as illustrated in Figure 4.

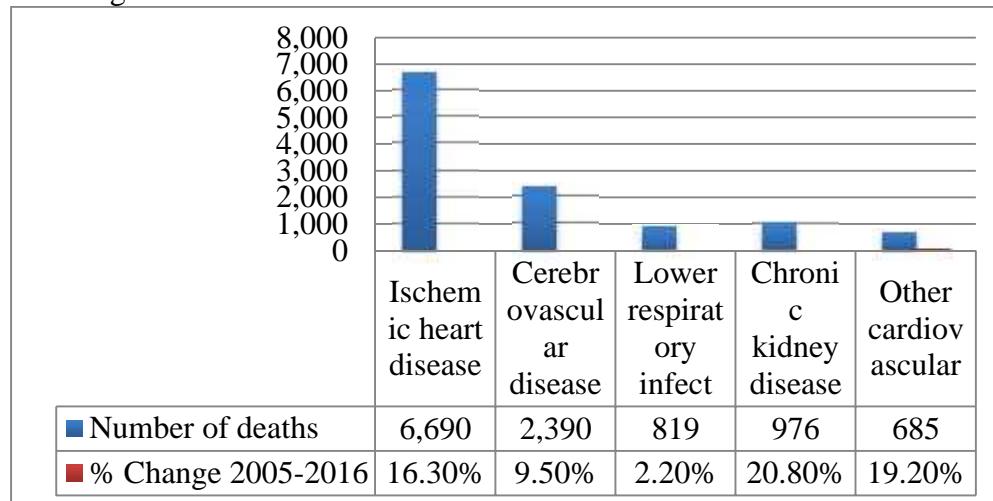


Figure 4. Diseases Causing Most of the Deaths and Their Number in Iraq 2016

Source: IHME [38]

Moreover, Khdaire [39] maintained that the number of occupational accidents in the Iraqi oil and gas sector for 2010 amounted to 1159, which is much higher than the accidents at work in manufacturing industry which totalled to 296 for the same year. Although there is an Iraqi law on Health Disability Act for Employees and its proportionality No. 11 of 1999, there is considerable weakness in its full application. Similarly, AL-Saleem [22] demonstrated that Iraqi laws on SD do not implement the message and the spirit and that these laws suffer from two main problems: delays in the implementation of existing laws and the lack of other legislation to protect society. Accordingly, the O&GI negatively affects the welfare, health and safety of society.

2.3. Environmental sustainability

In addition to the adverse social impacts of the O&GI in Iraq, there is significant concern about the tremendous environmental pollution in the air, water and soil caused by this industry. Muttitt [40] noted that environmental issues, specifically climate change, are important issues to be addressed in O&GI in Iraqi. For instance, the cost of environmental degradation resulting from the industrial sector, including O&GI in Iraqi according to a study conducted by the World Bank in 2008 amounted to about 6.4% of GDP, equivalent to USD 5505 million, and Iraq came second after Iran which reached approximately 7.5% of GDP [41]. Also, UN-ESCWA [42] classified Iraq in the first category according to the volume of CO₂ emissions with annual emissions of more than 100 million tons, quantify emissions in 2012 was 107.5 million tons, an increase of 11.4% in 2011.

In fact, the activities of the O&GI, which include exploration, production and refining, are a great source of pollutants in the land, water and air [43, 44]. For example, UNEP [19] reported out that the production and export of oil in Iraq has severe effects on the environment and population due to the pollution caused by its operations. Besides, a society living near oil refineries have a significant concern about environmental risks resulting from crude oil refining operations [43]. Further, AL-

Saleem [22] illustrated that there is a worrying environmental degradation in Iraq caused by this industry. It is because, it contributes to the emission of various types of toxic gases in the air [45].

In addition, Al-Alali [46] maintained that the Iraqi environment suffers from the massive pollution of toxic gases during the extraction and production of oil and gas, such as hydrogen sulphide, carbon and nitrogen oxides, as well as the release of some toxic metal elements such as mercury, arsenic and vanadium. Similarly, IMHE [47] showed that the O&GI is one of the most industries that emit gases, vapours and chemical compounds that harm the environment, and most oil and gas companies do not have gas emissions treatment systems. Consequently, air pollution with large quantities of toxic gases in Iraq is due to the O&GI.

Further, the O&GI has not only had environmental impacts on air pollution but has also had other adverse effects on both solid and liquid waste generation, as well as the risks of depletion of natural resources and energy. For instance, Al-Haleem, Awadh and Saeed [48] noted that there is a much waste generated during the exploration and production of oil and gas, including drilling waste, wastewater and waste associated with other processes. These residues affect the environment by releasing them into the atmosphere in massive proportions. Besides, the report of Compendium of Environment Statistics in the Arab Region states in West Asia published out that the management of these and other wastes is almost non-existent in Iraq, added, the local waste volume in 2013 amounted to 12778 thousand tons, and the size of hazardous waste for 2012 reached 119425 tons [42]. Hence, the O&GI in Iraq caused the generation of solid and liquid waste and drained resources and energy.

In addition to the above, environmental degradation is a significant issue affecting natural resources and energy, causing risks to human health and thus to social and economic instability [19]. To illustrate, Ashour and Wahab [45] showed air pollution in Iraq poses a serious threat to future generations because it reduces both renewable and non-renewable natural resources. Also, Ou, Zhang, Chang and Guo [49] noted that the O&GI is one of the principal industries that consume a significant amount of energy and emit greenhouse gas (GHG). Hence, growth and SD need reducing the consumption of natural resources, reducing the generation of pollutants and waste as well as reducing toxic substances during all stages of production and consumption, which confirmed in Goal 12 of the SD Goals of the UN initiative global, January 2016 [50].

As a summary, globally and locally, the O&GI contributes significantly to economic development through the significant revenues generated by the extraction, production and export of oil and gas. At the same time, because of the nature of its products that carry solid, liquid and gaseous chemicals adversely affect the environment by through the environmental pollution of air, land and water. Moreover, it has caused major social damage due to the diseases, occupational accidents, job injuries and depletion of non-renewable resources and energy for present and future generations. Therefore, there is a lack of balance in the dimensions of sustainability performance that are economic, environmental and social.

3. Conclusion

After completing the current study, researchers encourage the use of secondary data as a useful instrument for collecting data and information about sustainability performance. When we talk about these data, we find that they have provided valuable data on the sustainability performance of O&GI. It is clear that the oil and gas companies in Iraq focus on economic returns without considering the environmental and social effects caused by. The results of secondary data demonstrate this. The imbalance in the SP of O&GI in Iraq appears to be a result of a lack of interest in SMPs. In view of this, several empirical evidence suggests that SMPs contribute to improved economic, environmental and social sustainability and it balances(e.g. Abdul-Rashid et al., 2017a; Abdul-Rashid et al., 2017b; Gimenez, Sierra, & Rodon, 2012; Habidin, Zubir, Conding, Jaya, & Hashim, 2013; Hami, 2015; Hami et al., 2016; Hartini & Ciptomulyono, 2015; Shubham, Charan, & Murty, 2018; Zubir, Habidin, Conding, Jaya, & Hashim, 2012). Therefore, there is a necessary need to focus on SMPs by the O&GI in Iraq as they will contribute to addressing the practical issue of SP. We recommend conducting a quantitative study on the role of SMPs in improving and balancing SP among O&GI in Iraq.

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