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Environmental Impact Assessment for Industrial Organizations using Rapid Impact Assessment Matrix

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ABSTRACT
Several environmental impact assessments (EIAs) have been conducted since the petroleum ındustry environmental guidelines and standards were issued in 1991. Thus, EIA has become a standard practice in environmental planning for various project operations and activities. However, studies indicate that little has been achieved regarding environmental management in Iraq's oil industries. The reason for this is the reluctance of institutions to adopt environmental management systems, either due to the scarcity of basic information through which environmental impacts are measured, or the lack of financial allocations to implement mitigation measures and control plans, or the lack of human resources and the lack of political commitment to implementing environmental management plans .This research aims to assess the environmental impact of the East Baghdad field in the Midland Oil Company, by identifying a number of indicators that have been selected in proportion to the nature of the company's work. A rapid impact assessment matrix was used, which includes a set of components (physical and chemical, environmental and biological, social and cultural, economic and operational) and for each component a set of sub-indicators that ultimately indicate the environmental degree of environmental impact. Accordingly, the research reached a group of results, the most important of which is the presence of serious negative environmental impacts in the field site and the operations and activities related to it, such as soil and air pollution, obsolescence of equipment and scarcity of technology with a percentage of 70.8%, while the positive effects amounted to 25% only, which predicts an environmental deterioration in the company's work sites.

Keywords: environmental impact assessments; industrial organizations; rapid impact assessment matrix.

INTRODUCTION

Environmental impact assessment (EIA) is one of the most important and important modern administrative systems at the present time, as it is considered an entry point to address or reduce environmental risks and their effects, as the focus is now increasing on how to increase production and maximize profits without paying attention to the future environmental effects on society as a result of the depletion of natural resources and the increase in the volume of pollution and emissions toxic, which in turn will reflect on the nature and type of life, as well as contribute to precipitation. Highlighting the problem of environmental pollution resulting from industrial activities and processes, especially oil industries. It has become necessary to preserve and protect the environment from environmental impacts by developing plans, mechanisms and work procedures to address the effects of environmental aspects, as these environmental effects pose a challenge to industrial organizations on how to transform these environmental aspects into opportunities to improve the environment and enhance environmental reputation, and embody ethical environmental commitment.

It is no secret that organizations of all kinds have impacts on the environment, as they work to get rid of damages and wastes resulting from production or operation processes and dispose of them in the surrounding environment without incurring any financial compensation that leads to environmental damage and pollution.

Therefore, there was a need to study environmental issues and the damages of environmental pollution as a result of the demands of societies to hold the facilities polluting the environment responsible for the environmental costs. The importance of this research lies in supporting the management of the Midline Oil Company/East Baghdad Field Division with numerical values on the ratios of positive and negative environmental impacts on environmental pollution of all kinds various impacts on (water, air, soil and noise), which make the company's management face many problems with the local population and the relevant parties (the concerned parties) because of these effects, as well as the company incurring financial losses represented by environmental taxes due to pollutants exceeding the legally permissible level (environmental determinants) with the aim of showing the pollutants resulting from the operations and activities of the East Baghdad Oil Field Authority's operational activities that cause environmental problems, to suggest alternatives and possible solutions to avoid their damage and advance the environmental reality of the company in a more organized and acceptable way than the current random practices, which aim at best to comply with environmental laws and legislation.

LITERATURE REVIEW

Environmental impact assessment (EIA)

Environmental problems are widespread, that is, they have no borders, which mean that they have direct or indirect repercussions on all countries of the world, whether they are developed or developing, and that the greatest of these problems have a reflection on the environment and development. They are climatic changes, biodiversity degradation, and desertification [Jaber, 2015]. Despite the environmental management tools that have been used, it takes much longer than what organizations expect [Al-Obaid, 2006], and this pushes organizations to devise new tools and systems in order to conserve and use renewable natural resources in a way that does not lead to their degradation or decrease for future generations [Drayabeigi Zand and Vaezi Heir, 2019].

Over the past five decades, there has been a noticeable growth in interest in environmental issues, and this growth in interest has been accompanied by the introduction of new laws, legislation and guidelines stemming from national sources, and even international, such as the European Commission and the World Bank/International Finance Corporation, that seek to influence the relationship between development and the environment. Environmental impact assessment is an important example of this as EIA appeared in the United States of America more than 50 years ago and directed the European Community (EC) in 1985 in order to accelerate its implementation in the member states of the European Union and its worldwide spread [Glasson and Therivel, 2019]. The United Nations Environment Program has stated that EIA is the world's best known and most widely used tool for environmental planning and management, and is the only environmental policy tool required by most countries around the world [Cave et al., 2021].

Environmental Impact Assessment is a study conducted on projects to determine their environmental impacts and take the necessary means and procedures to prevent or reduce negative impacts and increase the positive returns of the project on the environment in line with applicable environmental standards and determinants. It is also considered an examination of the unintended effects resulting from development projects with the aim of maximizing the positive effects and minimizing the negative effects. Environmental impact assessment studies and the development of their procedures came as a result of the increase and spread of negative environmental effects and risks left by the industrial renaissance, especially oil and nuclear, and therefore it became necessary to protect the environment from these polluting projects in all phases (planning, design and implementation). The EIA process helps to include most of the environmental factors in the proposed project to include an assessment of the project's potential impacts on the ecological system and balance [Yang, 2019]. There are many definitions of EIA that can be clarified in the Table 1. Accordingly, the researcher believes that the environmental impact assessment can be defined as follows: It is a study of the environmental damage resulting from projects, programs and plans according to reference standards to be taken in this aspect by the competent official authorities, where the positive and negative effects on the environment are studied as a result of engaging in activities and operations different development.

Objectives of the environmental impact assessment

The objectives of the EIA can be represented in enabling the competent administrative authorities, local governments, and developers to carefully consider the potential environmental impacts and consequences of the proposed project, and to make recommendations to try to prevent or mitigate these consequences if necessary. The objectives of the EIA can be divided into two main categories [Cave et al., 2021; Glasson and Therivel, 2019; Mareddy, 2017]. The first category is short-term goals: assessing the environmental impact and informing decision makers of the nature of the risks and possible negative effects. The most important of these goals are the following:

- improving the environmental situation of the activity (the project);
- ensure proper use of resources;
- take the necessary measures to mitigate the possible negative effects;
- assisting in rationalizing decision-making and defining environmental terms and conditions.
- emphasis on community participation in the evaluation process.

On the other hand, the second category is long-term goals: promoting sustainable development by ensuring that vital functions and lifestyle are not undermined. Among the most important of these goals are the following [Barasa, 2016]:

- protecting human health and safety;
- avoid changes that will cause serious damage to the environment;
- protect nature, resources and the ecosystem in general;
- encouraging community participation in preserving the environment.

Grouping of environmental impacts

The resulting environmental impacts of any proposed project or program can be classified into the following categories: beneficial or harmful, naturally reversible, smooth or irreversible, repairable through management practices or irreversible, affects short or long term, temporary or continuous, occurs during the design or operational phase, local impacts regional, national or global, its effects are incidental or planned (recognized previously), direct (primary) or indirect (secondary), cumulative or individual, etc. [Mareddy, 2017]. Depending on the characteristics and extent of those effects, the effects can be divided into three main categories or types, which are direct, indirect, and cumulative. It is worth noting that EIA (direct, indirect and cumulative) should not be considered in isolation or as separate phases of EIA. Ideally, the assessment of such impacts should form part of the entire EIA process [Alimohammadlou et al., 2013].

Stages of the environmental impact assessment process

In EIA systems, there is a logical sequence of activities to be carried out in the project. Conceptually, this process is not different for almost all countries, but the steps may differ from country to country based on climate, terrain and conditions, nature of the activity life cycle and the financial conditions of the country in question. Glasson and Therivel [2019] assert that EIA procedures go through three preparatory stages (screening, scoping and assessment) before the actual EIA begins.

Environmental impact assessment tools

To assess the environmental impacts of any activity or project, a number of methods have been developed. Each method differs from the other in the way the data is presented, the technical level required to implement it in practice, and the volume of data required to implement it. Among the most important of these methods are [Mashkour and Okla, 2021; Meex et al., 2018]:

- checklists – they are standard checklists used to evaluate the types of impacts associated with a particular activity or project, where a set of questions are formulated depending on the nature of the expected effects from this activity or project. In addition to giving a brief picture of the nature and level of environmental impact (severe, moderate, weak, no impact) there are several types of checklists; simple, descriptive, standard and accurate;
- the direct method – this method is characterized by its ease, as the elements of the environment to be evaluated are identified, and then the expected effects of those elements are determined;
- composite map method – It is a method that uses transparent maps and presents the evaluation result in the form of a geographical document and at an appropriate scale.

Table 1. Definitions of environmental impact assessment according to the opinions of researchers (2019–2020)

Definition	Reference
It is the primary environmental management tool on a global scale and is now recognized as a global standard in international environmental law. It is a process by which potential development impacts, both positive and negative, are identified, assessed and managed	[Pope et al., 2019]
The process of identifying, predicting, assessing and mitigating the biophysical, social and other relevant impacts of development proposals before major decisions and commitments are made	[Bond et al., 2020]
A systematic way of identifying and investigating positive and negative environmental impacts, physically, biologically, and socially and economically, and this method can be applied to a plan, policy, program or project	[Shayesteh et al., 2020]
One of the environmental planning and management tools that can collect important information to predict future environmental impacts in decision-making processes	[Aung et al., 2020]

The Matrices Method: Matrices are two-dimensional tables that allow and facilitate the process of determining the effects resulting from the interaction of project activities with the various elements of the environment. Through matrices, it is possible to identify the interactions between different project actions, required standards, and elements of the environment. This method performs a comparison of the list of project activities combined with another checklist of components from the environment affected by these activities, and a matrix of possible interactions is produced. By integrating the contents of these two lists, the most important and recent of these matrices is: the Quick Impact Matrix.

Rapid impact assessment matrix (RIAM)

One of the most important impact assessment tools is the rapid impact assessment matrix (RIAM). At present, a comprehensive environmental impact assessment is required to plan, design or construct any project [Karbassi and Pazoki, 2015]. In line with the foregoing and for more clarification, a number of definitions can be highlighted in the Table 2. In light of the foregoing, the researcher believes that the rapid impact assessment matrix can be defined as "a tool used to organize, analyse and present the results of the environmental impact assessment process in a simple and organized way".

The simple and organized form of this matrix allows for an in-depth analysis of the various elements of the environment in a relatively quick and accurate manner. This method provides a transparent record of the evaluation process [Pastakia and Jensen, 1998] and the organization of the RIAM requires identifying unified environmental categories or components to conduct the assessment process, and these environmental components fall into one of the four categories (physical and chemical, biological and environmental, social and cultural, and economic and operational) [Valizadeh and Hakimian, 2019]. The use of these four categories in itself can be an effective tool for assessing the environment, as each major category of these categories can be divided into sub-categories that cover all components of the environment in a way that gives a clear picture of the environment [Baby, 2011].

The five evaluation criteria listed include impact significance (A1), magnitude (A2), permanence (B1), reversibility (B2) and cumulative (B3). The individual score for each component assesses

Table 2. Definitions of rapid impact assessment matrix for a group of researchers from (2014–2020)

Definition	Reference
The rapid impact assessment matrix (RIAM) is a landfill assessment tool. Since this method is able to integrate all the different components and parameters, it is an ideal mechanism that ensures a clear and rapid assessment of the environmental impacts of the project.	[Taheri et al., 2014]
A very useful and flexible tool in the EIA process recommended for small-scale assessment and prioritization of proposed projects.	[Valizadeh and Hakimian, 2019]
It is a tool for organizing, analysing and presenting the results of a comprehensive environmental impact assessment. This method provides special assessment components to determine the steps for determining potential environmental impacts.	[Saeedi Mofrad et al., 2020]
It is one of the environmental impact assessment tools that is implemented based on the analysis of environmental activities and the parameter matrix.	[Shayesteh et al., 2020]

the effects of project activities on the environmental components. The environmental component score is set as a measure of the expected impact on that component. Standards are categorized into two categories [Taheri et al., 2014]: A) Criteria that are important to the condition, and influence the final outcome independently. Which in turn consists of two criteria: A1) which represents the level of importance within the spatial boundaries, and A2) represents the level of improvement and benefit [Chaudhary and Rawal, 2020] and B) standards that demonstrate the importance of the situation and do not influence the final outcome independently. These consist of three criteria: B1) which represents the level of continuity of impact, B2) which represents the level of reflection of the impact on the rest of the environment elements, and B3) the level of cumulative impact. The evaluation criteria used in the RIAM can be found in previous works [Drayabeigi Zand and Vaezi Heir, 2019; Rawal et al., 2017]. Figure 1 shows flowchart for RIAM matrix work which was adopted from previous work [Valizadeh and Hakimian, 2019]. After calculating the final evaluation score (environmental score, Es), it is compared with the specified group range for this tool, which is represented in Table 3.

METHODOLOGY

Description of the East Baghdad field of the midland oil company/Rashidiya

It is a convex fold affected by several longitudinal and transverse faults that contributed to the division of the field into separate sections, each of which contains oils and contact levels for the barriers that differ according to the different locations of the reservoirs in relation to the structural situation in them. The East Baghdad field is located in the area that extends from the east of the city of Al-Suwaira in the southeast to the Al-Nabai area in the northwest, cutting east of the centre of Baghdad. The residential, the third and the Taji, which is confined between the Diyala River in the southeast and the Al-Nabai area north of the Tigris River, where the Rashidiya patch, located within the third region, was chosen as the first region for the purpose of selecting and developing a

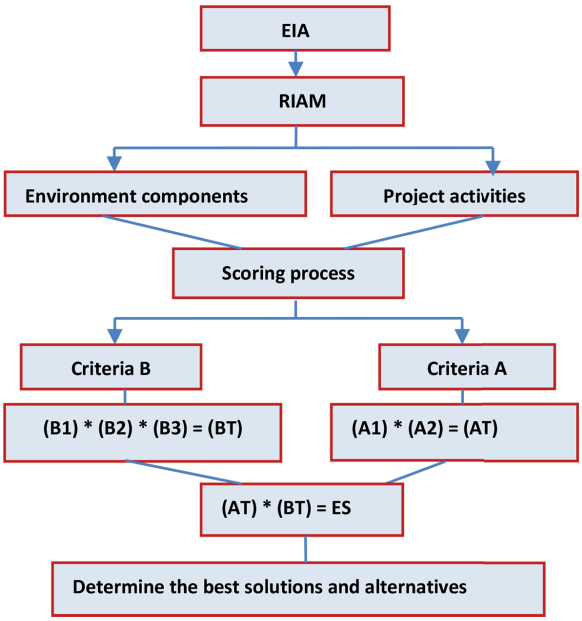

Figure 1. Flowchart for RIAM matrix work

Table 3. The range bands of environmental scores in RIAM analysis

Physical and chemical components (PC)		Social and cultural components (SC)	
PC_1	impact on land and its use	SC_1	Loss of farmland
PC_2	ambient air quality	SC_2	Providing job opportunities
PC_3	acid rain	SC_3	Public health and safety
PC_4	ambient noise level	SC_4	Residential areas near the company site
PC_5	the effect of odours and suspended particles in the air	SC_5	Education and culture for workers
PC_6	the quality of the water used and produced	SC_6	Local solidarity and social cooperation
Biological and environmental components (BE)		Economical and operational components (EO)	
BE_1	Impact on biological balance and lifestyle	EO_1	The cost of losing neighbouring lands
BE_2	Soil erosion and increased toxicity	EO_2	Waste transportation cost
BE_3	Impact on the ecosystem	EO_3	Work equipment costs
BE_4	Ecological balance	EO_4	Fuel costs
BE_5	Climate changes	EO_5	Site maintenance costs
BE_6	Impact on ground water	EO_6	The costs of paying workers' rights

field east of Baghdad from the geological and reservoir aspects and gaining experience in relation to the experience of oblique drilling in drilling and production complexes, as well as the experience of Double completion, artificial gas lift, and reservoir behaviour in relation to the effect of water injection. The East Baghdad field is one of the large fields of the Midland Oil Company, and the first well was drilled in it in 1976 and is currently producing more than 38 thousand barrels per day from the eastern and southern parts.

The most important pollutants at the site of an oil field east of Baghdad/Rashidiya

Noise acoustic pollution

Noise from the construction phase of the Central Process Facility (CPF) comes mainly from the operation of construction equipment and from activities associated with civil and structural works and the movement of vehicles. The noise from the CPF operating stage is mainly from compressors, pumps, and gas turbines, and from burning, venting, gas flow in process piping, and air and steam leaks.

Ambient air quality

Air quality can be affected by gaseous emissions that depend mainly on combustion sources primarily by diesel generators, heavy equipment and movement of heavy vehicles along with soil movement during site preparation because they generate dust and can be affected by power generation and emissions The process includes furnaces and other fugitive emissions, including equipment leaks and emissions from tanks. Ambient air quality includes: 1) ignition during commissioning and operation: During the operating phase of the CPF fluids will be introduced into the system to test and ensure that all newly installed facilities can operate safely and will operate as designed. Generally, any gas produced during the operating phase is disposed of by incineration. This will result in emissions of pollutants whose concentration will depend on the composition of the gas to be burned. CPF operations will include a flare system i.e. low pressure flare (LP) and high pressure flare system (HP) This flare system will be used to safely release gas as part of an emergency depressurization or detonation operation. Ignition could have direct effects on air quality. 2) Diesel engines: The exhaust gas produced by the diesel engine contains several substances harmful to the human body and the environment and its main components are: monoxide (CO), nitrogen oxides (NO), sulfur dioxide (SO2), particulates of carbon smoke, etc. and 3) Vehicles: vehicles generate more air pollution than any other human activity, as they are the fastest source of CO2 generation. Vehicles with engines at the factory site include, but are not limited to: pickup, ambulance, forklift, crane and other operating trucks.

Terrestrial ecology

During the oil and gas production process in CPF that leads to temporary loss and disturbance of terrestrial habitats leads to environmental disturbance Movement of vehicles, flow of manpower and noise created during the production process in CPF can lead to disturbance of terrestrial animals within the land.

Waste

Waste is expected to be generated from sources and activities such as sewage, site facilities, sewage operations, industrially produced water, laboratory water discharge Hydro test and solid waste generated from construction and public operation works, and generally divided into: 1) non-hazardous waste: those that do not show any hazardous characteristics and have a relatively low risk to human health and the environment. This category will include a range of materials that can be recycled. The list of materials is as follows: glass, aluminum cans, metal waste and general waste (food, other polluted food waste) and 2) hazardous waste: substances that can be harmful to human health and can harm the natural environment if not managed and disposed of properly. They can be generated during operations. Waste can become hazardous due to its quantity or physical, chemical or infectious properties. Hazardous waste also appears one or more characteristics such as being highly flammable, toxic, corrosive, etc.

It may consist of liquid materials generated from the two stages of construction and operation of CPF and the associated processes of maintenance of the chemical drain system and other open systems, water produced from the container of organic solvents and water used in hydraulic testing, and those resulting from leakage of chemicals and oils resulting from various accidents, and may be Solids generated from lubricating processes, chemical containers, paint, welding

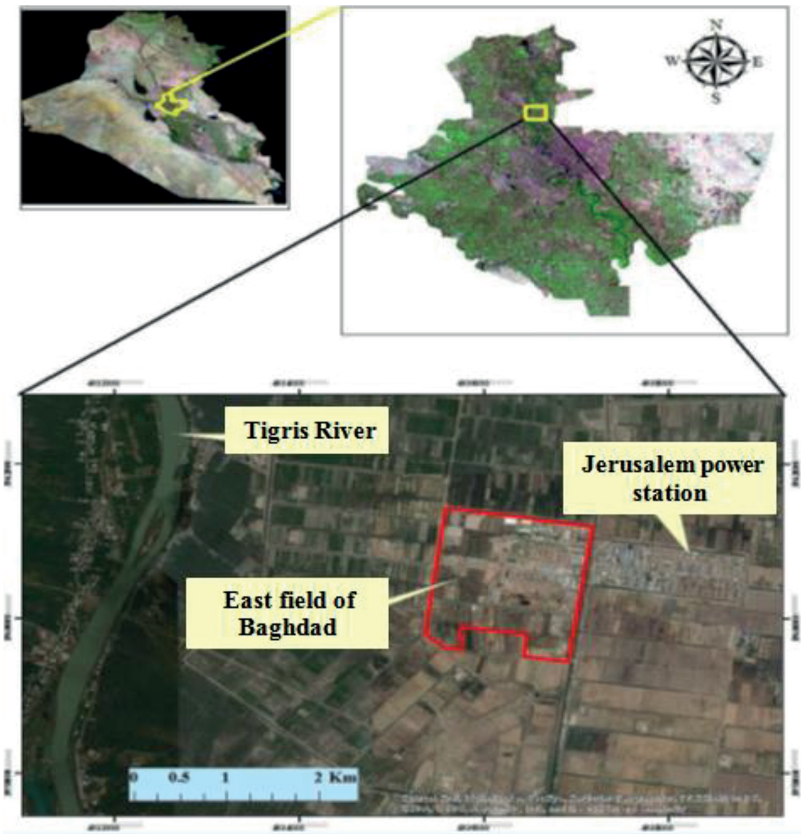

Figure 2. The location of the East Baghdad oil field

rods, used batteries, polluted pipes, and others. The location of the oil field is shown in Figure 2.

RIAM ANALYSIS

The RIAM is one of the tools commonly used in an EIA study whereby RIAM uses a structured matrix to allow subjective and quantitative data-based judgments to be made on a comparative basis and provides a permanent and transparent record of judgments. The RIAM methodology has been developed to improve on existing major shortcomings of EIA methods. The simplified and structured format of RIAM allows reanalysis and in-depth analysis of the components selected in a fast, accurate and flexible manner, this flexibility makes the method a powerful tool for implementing and evaluating environmental impact assessments. This methodology has been adopted for the current study to determine the negative and positive impacts resulting from the operations and activities of the Extractive Midland Oil Company and to identify the problems that require the most urgent attention and mitigation measures to protect the environment from pollutants generated by the oil industry. Environmental components are categorized into four main categories, namely, (PC) physical and chemical criteria, (BE) biological and environmental, (SC) social and cultural, and (EO) economic and operational criteria and fall into two categories of criteria: (Criteria A) Important criteria Situation and impact on the final outcome independently and criteria (Criteria B) that represent the importance of the situation and do not affect the final outcome independently. The score assigned to each category of criteria is determined using the equations mentioned earlier in Figure 1.

Environmental components

The environmental components of RIAM fall into four categories: 1) Physical and chemical (PC): This group covers all physical and chemical aspects of the extractive industry in the oil field, including non-renewable natural resources and the degradation of the physical environment through pollution. 2) Biological and environmental (BE): This group includes all biological aspects affecting the environment, including renewable natural resources, biodiversity conservation, interaction between species and biosphere pollution. 3)

Sociology and culture (SC): This group includes the human aspects of resource management, including social issues that affect individuals and society; along with the cultural aspects, including the preservation of human development, which means that these components include the social environment in which workers practice their daily activities, the surrounding framework and the non-living components of resources and wealth, as well as the inclusion of the culture of individuals and institutions who interact with this field. 4) Economic and operational (EO): This group is used to determine the economic consequences of the change, whether temporary or permanent, and includes several indicators through which the environmental impacts can be assessed, such as the costs of various maintenance works such as removing scales, painting valves, replacing damaged internal parts of oil reservoirs, transportation of waste, fuel used and the costs of precautionary measures to confront the sharp rise in temperature and its side effects, and these measures include cooling crude oil tanks and removing weeds and bushes, as they are a major cause of the outbreak and spread of fires. A total of 24 environmental components were used to assess the environmental impact of the oil extractive industry in the East Baghdad field of the Central Oil Company, with six sub-components for each category of components, as described in Table 4.

Identify the main components of the Rapid Impact Assessment Matrix (RIAM)

Concerning the physical and chemical components (PC), it is clear from Table 5 that the indicator (impact on land and its use) obtained the highest degree within the scale of the importance of the situation (A1), where it reached a degree of (3). While the size of the change (A2) reached (-1). While the values of (B1, B2 and B3) for each of them (3) is important for the national interest and that the size of the change was negative, permanent and irreversible in addition to being cumulative. While the (acid rain) indicator got the lowest degree within the scale of the importance of the situation (A1), where its value was (1) and the change amounted to (A2) to (-3). While the values from (B1, B2 and B3) amounted to (3) for each, which means that acid rain falls within the local interest, but it was characterized by a very large and permanent negative change that cannot be reversed, in addition to being cumulative.

Concerning the biological and environmental components (BE) from Table 5, it is clear that the (ecological balance) indicator has obtained the highest degree within the scale of the importance of the situation (A1), as its degree is (4). While the size of the change (A2) has reached (-1). While the values of (B1, B2 and B3) for each of them (2), being of importance to the national interest, and that the size of the change was negative, temporary and not cumulative. While the indicator (the impact on groundwater) got the lowest degree within the scale of the importance of the situation (A1), as its value was (2) and it is not A change of (A2) amounted to (-2). While the values of (B1, B2 and B3) amounted to (3) for each of them, which means that the removal of vegetation cover falls

Table 4. Environmental components for the RIAM analysis

Physical and chemical components (PC)		Social and cultural components (SC)	
PC_1	impact on land and its use	SC_1	Loss of farmland
PC_2	ambient air quality	SC_2	Providing job opportunities
PC_3	acid rain	SC_3	Public health and safety
PC_4	ambient noise level	SC_4	Residential areas near the company site
PC_5	the effect of odours and suspended particles in the air	SC_5	Education and culture for workers
PC_6	the quality of the water used and produced	SC_6	Local solidarity and social cooperation
Biological and environmental components (BE)		Economical and operational components (EO)	
BE_1	Impact on biological balance and lifestyle	EO_1	The cost of losing neighbouring lands
BE_2	Soil erosion and increased toxicity	EO_2	Waste transportation cost
BE_3	Impact on the ecosystem	EO_3	Work equipment costs
BE_4	Ecological balance	EO_4	Fuel costs
BE_5	Climate changes	EO_5	Site maintenance costs
BE_6	Impact on ground water	EO_6	The costs of paying workers' rights

Table 5. Results of matrix components

Physical and chemical components (PC)		A1	A2	B1	B2	B3
PC1	Impact on land and its use	3	-1	3	3	3
PC2	Ambient air quality	2	-3	3	3	3
PC3	Acid rain	1	-3	3	3	3
PC4	Ambient noise level	2	-1	3	3	3
PC5	The effect of odours and suspended particles in the air	2	-3	3	3	3
PC6	The quality of the water used and produced	2	-2	3	2	2
Biological and environmental components (BE)		A1	A2	B1	B2	B3
BE_1	Impact on biological balance and lifestyle	3	3	3	3	3
BE_2	Soil erosion and increased toxicity	3	3-	3	3	3
BE_3	Impact on the ecosystem	3	1-	2	2	2
BE_4	Ecological balance	4	1-	2	2	2
BE_5	Climate changes	3	3-	3	3	3
BE_6	Impact on ground water	2	2-	3	3	3
Social and cultural components (SC)		A1	A2	B1	B2	B3
Sc_1	Loss of farmland	3	-3	3	3	3
Sc_2	Providing job opportunities	2	2	3	1	3
Sc_3	Public health and safety	2	1	1	1	1
Sc_4	Residential areas near the company site	2	0	1	1	1
Sc_5	Education and culture for workers	2	3	3	3	3
Sc_6	Local solidarity and social cooperation	1	-1	2	2	2
Economical and operational components (EO)		A1	A2	B1	B2	B3
EO_1	The cost of losing neighbouring lands	3	2-	3	3	3
EO_2	Waste transportation cost	1	1	2	2	2
EO_3	Work equipment costs	2	2-	3	2	1
EO_4	Fuel costs	2	1	2	2	2
EO_5	Site maintenance costs	2	1-	2	2	2
EO_6	The costs of paying workers' rights	2	1	1	1	1

within the interest close to the locality, but it was characterized by a very large and permanent negative change that cannot be reversed in addition to being cumulative. Regarding the social and cultural components (SC) from Table 5, it is clear that the indicator (loss of farmland) has obtained the highest degree within the scale of the importance of the situation (A1), as it reached a degree of (3). While the size of its change (A2) reached (-3). While the values of (B1, B2 and B3) for each of them reached to (3) being of importance to the national interest and that the size of the change was characterized by a very large, permanent and cumulative negative that cannot be reversed. While the indicator (local solidarity and social cooperation), obtained the lowest degree within the scale of the importance of the situation (A1) whose value amounted to (1) and the size of change (A2) amounted to (-1). While the values of (B1, B2 and B3) amounted to (2) for each of them, which means that the general problems caused by the company and affecting social cooperation fall within the local interest, but it has been characterized by negative, temporary, non-cumulative change and can be reversed to have a positive environmental impact.

Regarding the economic and operational components (EO) from Table 5, it is clear that the indicator (cost of losing neighbouring lands) has obtained the highest degree within the scale of the importance of the situation (A1), as its degree is (3). While the size of the change (A2) has reached (-2). While the values of (B1, B2 and B3) for each of them is (3), as it represents an important national interest, and that the size of the change was characterized by a large, permanent and cumulative negative that cannot be reversed. While the (waste transportation cost) indicator got the

Table 6. Extract the value of (TA) and the value of (TB)

Physical and chemical components (PC)		TA	TB
PC1	Impact on land and its use	3-	9
PC2	Ambient air quality	6-	9
PC3	Acid rain	3-	9
PC4	Ambient noise level	2-	9
PC5	The effect of odours and suspended particles in the air	6-	9
PC6	The quality of the water used and produced	4-	7
Biological and environmental components (BE)		TA	TB
BE1	Impact on biological balance and lifestyle	9-	9
BE2	Soil erosion and increased toxicity	9-	9
BE3	Impact on the ecosystem	3-	6
BE4	Ecological balance	4-	6
BE5	Climate changes	9-	9
BE6	Impact on ground water	4-	9
Social and cultural components (SC)		TA	TB
SC1	Loss of farmland	9-	9
SC2	Providing job opportunities	4	7
SC3	public health and safety	2	3
SC4	Residential areas near the company site	0	3
SC5	Education and culture for workers	6	9
SC6	Local solidarity and social cooperation	1-	6
Economical and operational components (EO)		TA	TB
EO1	The cost of losing neighbouring lands	6-	9
EO2	Waste transportation cost	1	6
EO3	Work equipment costs	4-	6
EO4	Fuel costs	2	6
EO5	Site maintenance costs	2-	6
EO6	The costs of paying workers' rights	2	3

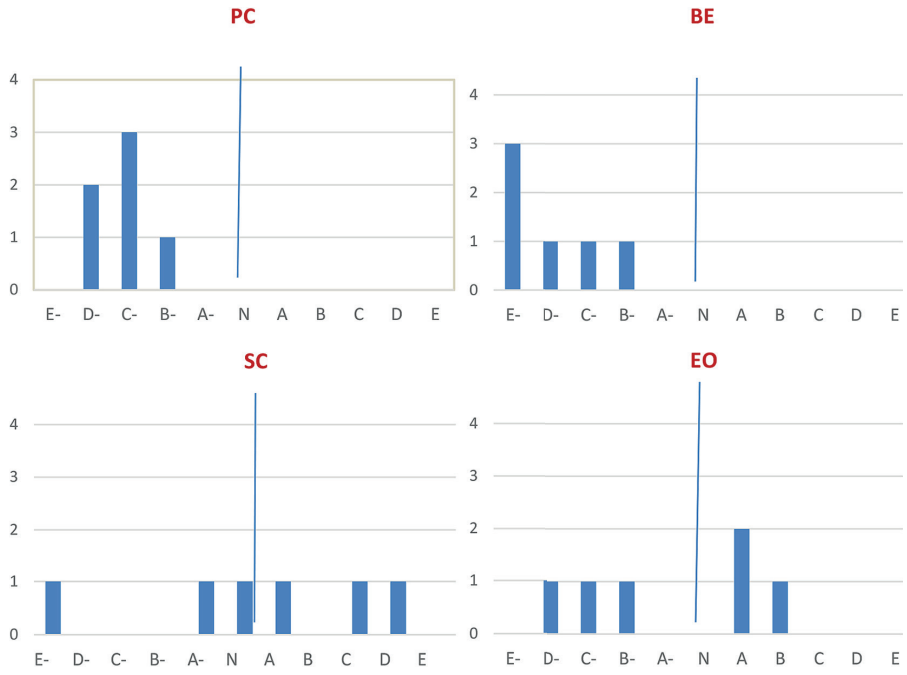

Figure 3. Comparing negative and positive effects within and between categories

lowest degree within the scale of the importance of the situation (A1), as its value reached (1). The change of (A2) amounted to (1), while the values of (B1, B2 and B3) amounted to (2) for each of them, which means that the transportation cost falls within the local interest, but it was characterized by a negative, temporary, non-cumulative change that can be reversed to have a positive environmental impact.

Evaluate the individual criteria for the RIAM

The sub-criteria values are considered the second stage within the Environmental Impact Assessment Matrix (RIAM), which requires extracting the (TA) value and the (TB) value according to the equations in Figure 1 and the results are shown in Table 6.

Environmental grade (ES)

Depending on the values of the individual criteria (TA, TB), the results of the environmental impact assessment (ES) are found through equation in Figure 1. While the results of (ES) are compared with the alphanumeric value ranges and the environmental statement values, which are listed in Table 3. Figure 3 shows the comparison of negative and positive effects within and between groups.

We find that the activities of the Midland Oil Company have a negative impact ranging from (large negative) to (negative) that the physical and chemical components of the environment are negatively affected by the company's activities, which necessitates the company to search for solutions to reduce the negative effects on the environment within its physical and chemical component as in Table 7. Also, the activities of the Midland Oil Company have a negative impact ranging from (comprehensive negative) to (negative), which indicates that the biological and environmental components of the environment are negatively affected by the company's activities, which is why the company should search for solutions to reduce the negative impacts on the environment within its biological and environmental component as in Table 7. On the other hand, it is clear that the activities of the Midland Oil Company have a positive impact on three indicators (job creation, public health and safety, education and employee culture) on the social and cultural components of the environment, and the indicator (residential areas near the company's location) was not recorded. Influence of the social and cultural components of the environment, but the indicators (losing agricultural land) had a major negative impact on the social and cultural components of the environment, and the indicator (local solidarity and social cooperation) recorded a slight negative impact within the social and cultural components of the environment as in Table 7. Moreover, it is clear that the activities of the Midland Oil Company have a positive impact on three indicators: (the cost of transporting waste, fuel costs, the costs of paying workers' rights) on the economic and operational components of the environment, and the indicators (the cost of losing neighbouring lands, costs of work equipment, site maintenance costs) had a negative impact on the environment within the economic and operational components as in Table 7. By comparing the results of the environmental points with the group table used in the RIAM instrument, the following results shown in Table 8 were reached.

As shown in Table 8 and by comparing the total score of the components with the table of the group ranges, we note that the negative effects are more than positive, because the negative effects amount to (17) the effect of (change) on (24) changes varying between a negative change and a negative change. Its percentage is (70.8333%), and there was no change in (1) out of (24) percentage change of (4.1667%). While the positive percentage of change was (6) only from (25%), which is a small percentage compared to the negative change. In general, the environmental impact assessment of the East Baghdad oil field of the Iraqi National Oil Company/Midland Oil Company showed that the effects generated within the framework of the extraction and production of oil and associated natural gas were unacceptable, given the magnitude of the negative effects, which amounted to (70.8%) while the positive (25%) only. In addition to the fact that the most positive effects are related to the economic aspects, and from here we note that the company's projects will achieve economic development but on the other hand lead to the deterioration of the environment because most of the negative effects are among the components (physical, chemical, environmental and biological). The overall effects are shows in Figure 4.

Table 7. Description of the extent of the environmental impact

The components		ES	Range category	Range category	Describe the extent of the environmental impact
Physical and chemical components (PC)					
PC_1	Impact on land and its use	27-	3-	-C	Moderate negative change/impact (medium negative)
PC_2	Ambient air quality	54-	4-	-D	Significant negative change/impact (significant negative)
PC_3	Acid rain	27-	3-	-C	Moderate negative change/impact (medium negative)
PC_4	Ambient noise level	18-	2-	-B	Negative change/impact (limited negative)
PC_5	The effect of odours and suspended particles in the air	54-	-4	-D	Significant negative change/impact (significant negative)
PC_6	The quality of the water used and produced	28-	3-	-C	Moderate negative change/impact (medium negative)
Biological and environmental components (BE)					
BE_1	Impact on biological balance and lifestyle	81-	5-	-E	A major negative change/impact (an overall negative)
BE_2	Soil erosion and increased toxicity	81-	5-	-E	A major negative change/impact (an overall negative)
BE_3	Impact on the ecosystem	18-	2-	-B	Negative change/effect (limited negative)
BE_4	Ecological balance	24-	3-	-C	Moderate negative change/impact (medium negative)
BE_5	Climate changes	81-	- 5	-E	A major negative change/impact (an overall negative)
BE_6	Impact on ground water	36-	4-	-D	Significant negative change/impact (significant negative)
Social and cultural components (SC)					
SC_1	Loss of farmland	81-	5-	-E	A major negative change/impact (an overall negative)
SC_2	Providing job opportunities	28	3	C	Moderate positive change/impact (medium positive)
SC_3	public health and safety	6	1	A	Slight positive change/impact (minor positive)
SC_4	Residential areas near the company site	0	0	N	No change/status
SC_5	Education and culture for workers	36	4	D	Significant positive change/impact (significant positive)
SC_6	Local solidarity and social cooperation	6-	1-	-A	Minor negative change/effect (minor negative)
Economical and operational Components (EO)					
EO_1	The cost of losing neighbouring lands	54-	4-	-D	Significant negative change/impact (significant negative)
EO_2	Waste transportation cost	6	1	A	Slight positive change/impact (minor positive)
EO_3	Work equipment costs	24-	3-	-C	Moderate negative change/impact (medium negative)
EO_4	Fuel costs	12	2	B	Positive change/impact (limited positive)
EO_5	Site maintenance costs	12-	2-	-B	Negative change/impact (limited negative)
EO_6	The costs of paying workers' rights	6	1	A	Slight positive change/impact (minor positive)

Table 8. Statement of the environmental impacts

Category	-E	-D	-C	-B	-A	N	A	B	C	D	E
Range	-108 to -72	-71 to -36	-35 to -19	-18 to -10	-9 to -1	0	1 to 9	10 to 18	19 to 35	36 to 71	72 to 108
PC	0	2	3	1	0	0	0	0	0	0	0
BE	3	1	1	1	0	0	0	0	0	0	0
SC	1	1	1	0	1	1	1	0	0	0	0
EO	0	1	1	1	0	0	2	1	0	0	0
Total	4	5	6	3	1	1	3	1	0	0	0

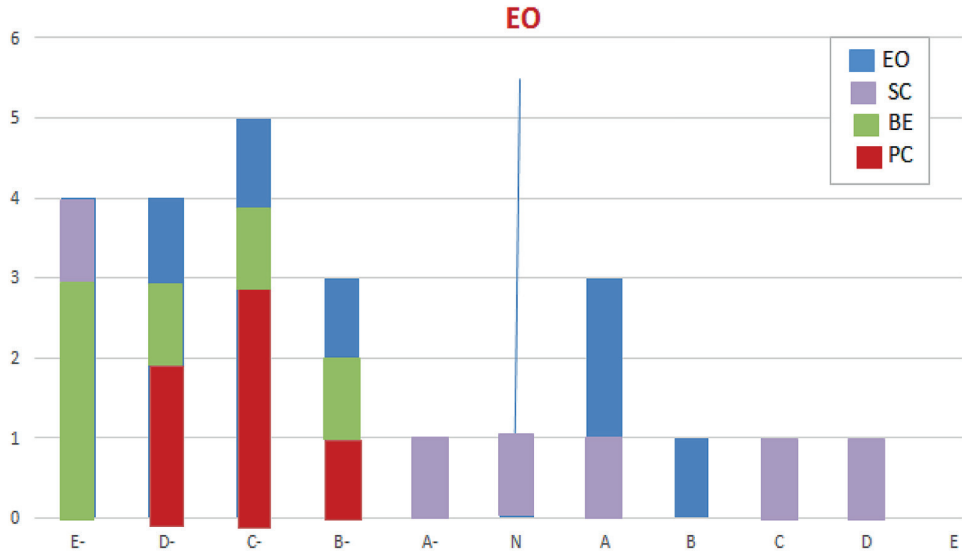

Figure 4. Overall positive and negative effects

CONCLUSIONS

The company's senior management is moving towards achieving the environmental goals as it is the basis for building the environmental quality structure, but it is moving at a somewhat timid pace, especially since the nature of the company's work requires quick solutions to avoid the pollutants that result from its operational operations, since most of its drilling activities are accompanied by the lag of pollutants in varying proportions. Midland Oil Company, represented by its senior management and specialized departments in the field of environment, is doing serious work to improve its environmental performance, but it is under preparation and review and no actual procedures have been applied to the various circumstances. The company does not have a specific strategy to prevent or reduce pollution, but there are routine procedures adopted by the company for the purpose of trying to reduce pollutants. Relative attention to procedures for preparing and responding to environmental emergencies resulting from the company's activities, products and services in relation to its neighboring areas and related to air and soil pollution resulting from insufficient regulatory procedures and related legal controls. The company does not set annual quantitative environmental goals that can be measured, but it is aware of the local and international environmental determinants that can be achieved to be a basis for measuring the environmental goals and objectives that it can achieve, with the availability of measuring devices for each environmental goal that basically falls within those determinants. Weakness in pollution control procedures and providing workers with safety procedures and tools, and a weak culture of workers with safety requirements. Weakness in the Midland Oil Company's procedures and programs specialized in maintaining environmental assets, especially pipelines and basins within oil reservoirs. The Midland Oil Company did not limit or reduce the waste of associated gas (burned) for the purpose of benefiting from it in filling the local need for industrial use, especially the production of electric power. Often there is an increase in the amount of oil exuded from the pipes due to the lack of periodic maintenance and in addition to sabotage operations from unknown parties, which leads to pollution in the lands surrounding the pipes and product loss. The presence of a leak in the gases associated with the oil extraction process, which poses a danger to living organisms, especially the gas (CH4). The necessity of conducting a preliminary review aimed at (identifying the defects that must be addressed, evaluating the environmental situation of the company, measuring the environmental performance indicators ,the extent of commitment to the environmental policy and environmental objectives and ensuring their suitability, the effectiveness of the system and its implementation procedures) and updating or re-implementing the environmental impact report annually for the East Baghdad field site and evaluating its various activities, especially operational, production and laboratory. The possibility of sorting solid waste

inside the oil site (plastic, paper, chemical liquids, etc.) to isolate the waste and ensure that it does not overlap and cause some problems.

RECOMMENDATIONS

Accelerating the construction and realization of environmental goals because they are the basis on which the company's work is built in order to avoid the pollutants that result from its operational operations, especially its activities related to drilling and exploration of oil areas and the various pollutants that accompany them. Treating the water resulting from drilling fluids, in coordination with the concerned authorities (such as the Municipality of Baghdad) to withdraw the water and reuse it after purification. Develop strategies to reduce pollution in the drilling areas with the need to use modern devices and equipment to quantitatively measure the percentage of pollutants. The necessity of providing safety equipment such as respirators, ear protectors, face and eyes protection equipment, dedicated shoes and others for the purpose of protecting the health of workers. Continuous monitoring of the field work areas in the fields and in order to spread the concern for the cleanliness of the sites and the disposal of waste and its non-accumulation. Rehabilitation of infrastructure by paying attention to work sites and dispelling all obstacles that prevent the reduction of pollutants and negative environmental effects. Evaluating the corrective measures taken to deal with reducing negative environmental impacts. Giving special importance to preventive measures because they avoid the research sample company from falling into many environmental problems.

REFERENCES

1. Al-Obaid A.H. 2006. Evaluation of the requirements for the application of total quality management for the environment / a comparative study. M.Sc. Thesis, University of Baghdad, Baghdad.
2. Alimohammadlou Y., Najafi A., Yalcin A. 2013. Landslide process and impacts: A proposed classification method. Catena, 104, 219–232.
3. Aung T.S., Fischer T.B., Shengji L. 2020. Evaluating environmental impact assessment (EIA) in the countries along the belt and road initiatives: System effectiveness and the compatibility with the Chinese EIA. Environmental Impact Assessment Review, 81, 106361.
4. Baby S. 2011. Assessing and evaluating anthropogenic activities causing rapid evolution in the coastal morphological landscape changes (CMLC) of Kuwait using riam. Environment and Natural Resources Research, 1(1), 152–170.
5. Barasa P.J. 2016. Environmental impact assessment - general procedures. Retrieved 20 March 2022, from http://os.is/gogn/unu-gtp-sc/UNU-GTP-SC-23-0804.pdf
6. Bond A., Pope J., Fundingsland M., Morrison-Saunders A., Retief F., Hauptfleisch M. 2020. Explaining the political nature of environmental impact assessment (EIA): A neo-Gramscian perspective. Journal of Cleaner Production, 244, 118694.
7. Cave B., Pyper R., Fischer-Bonde B., Humboldt-Dachroeden S., Martin-Olmedo P. 2021. Lessons from an international initiative to set and share good practice on human health in environmental impact assessment. International Journal of Environmental Research and Public Health, 18(4), 1392.
8. Chaudhary S., Rawal N. 2020. Rapid impact assessment matrix, sustainable analysis and environmental performance index-based approach for selection of wastewater treatment units. International Journal of Environmental Technology and Management, 23(1), 33–49.
9. Drayabeigi Zand A., Vaezi Heir A. 2019. Environmental impact assessment of solid waste disposal options in touristic islands. Advances in Environmental Technology, 5(2), 115–125.
10. Glasson J., Therivel R. 2019. Introduction to environmental impact assessment. Routledge, London.
11. Jaber H.N.S. 2015. Measuring the requirements of total quality management for the environment and sustainability, applied research in the iraqi drilling company. M.Sc. Thesis, University of Baghdad, Baghdad.
12. Karbassi A., Pazoki M. 2015. Environmental qualitative assessment of rivers sediments. Global Journal of Environmental Science and Management, 1(2), 109–116.
13. Mareddy A.R. 2017. Environmental impact assessment : Theory and practice. Butterworth-Heinemann, Oxford.
14. Mashkour A.H.L.Y., Okla R.A.H.G. 2021. Counterterrorism under EIA of checkpoints using the rapid impact assessment matrix analytical study / Al-Lyj checkpoint. Journal of Baghdad College of Economic Sciences University, 63, 333–352.
15. Meex E., Hollberg A., Knapen E., Hildebrand L., Verbeeck G. 2018. Requirements for applying LCA-based environmental impact assessment tools in the early stages of building design. Building and Environment, 133, 228–236.
16. Pastakia C.M.R., Jensen A. 1998. The rapid impact assessment matrix (RIAM) for EIA. Environmental

Impact Assessment Review, 18(5), 461–482.

17. Pope J., Wessels J.-A., Douglas A., Hughes M., Morrison-Saunders A. 2019. The potential contribution of environmental impact assessment (EIA) to responsible tourism: The case of the kruger National Park. Tourism Management Perspectives, 32, 100557.
18. Rawal N., Rai S., Duggal S.K. 2017. An approach for the analysis of the effects of solid waste management in slum areas by rapid impact assessment matrix analysis. International Journal of Environmental Technology and Management, 20(3–4), 225–239.
19. Saeedi Mofrad S., Taleb Elm M., Izadi A. 2020. Evaluation of the environmental impact of khurshid park through rapid impact assessment matrix (RIAM). Creative City Design, 3(1), 65–75.
20. Shayesteh A., Koohshekan O., Khadivpour F., Kian M., Ghasemzadeh R., Pazoki M. 2020. Industrial waste management using the rapid impact assessment matrix method for an industrial park. Global Journal of Environmental Science and Management, 6(2), 261–274.
21. Taheri M., Gholamalifard M., Ghazizade M.J., Rahimoghli S. 2014. Environmental impact assessment of municipal solid waste disposal site in Tabriz, Iran using rapid impact assessment matrix. Impact Assessment and Project Appraisal, 32(2), 162–169.
22. Valizadeh S., Hakimian H. 2019. Evaluation of waste management options using rapid impact assessment matrix and iranian Leopold matrix in Birjand, Iran. International Journal of Environmental Science and Technology, 16(7), 3337–3354.
23. Yang T. 2019. The emergence of the environmental impact assessment duty as a global legal norm and general principle of law. Hastings Law Journal, 70, 525–572.