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IRAQ'S POST-2003 ENVIRONMENTAL POLLUTION: ISSUES AND SOLUTIONS

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ABSTRACT. Typically, emerging countries face environmental pollution issues as they grow their economies. Simultaneously, as urbanization increases, the case of insufficient land resources and inefficient agricultural land use in Iraq comes to the fore. While Iraq is a developing country, it did not begin aggressively implementing environmental protection measures years ago to change into an inventive country. Economic development, environmental preservation, and land use all play critical roles in creating sustainable cities. This article examines the regional progression of economic development and ecological degradation in Iraq following 2003. The data indicate that the shift in economic growth following 2003 is less pronounced than environmental pollution. The results show that environmental pollution is adversely connected with economic scale and quality but favorably correlated with economic growth depending on the industrial structure and municipal legislation. This study delineates the regional developmental pattern of economic development and environmental degradation. Additionally, it gives theoretical and empirical references for understanding the economy's link with the environment. As a result, it is advised that the Iraqi government implement an environmental protection policy that prioritizes the development of cleaner technologies and goods that can reduce environmental pollution.

JEL Classification: C01, E01, E27 ***Keywords***: Pollution, Green Economy, Environmental conservation

Introduction

The environment is the physical and social arena where man lives, receives physical and social resources, and engages in interpersonal relationships (McNeill, Kreuter, & Subramanian, 2006). The natural environment comprises three components: water, air, and land, necessary for life to exist (Purvis, Mao, & Robinson, 2019). Based on natural resources, which resulted in the translation of those resources into manufactured materials and commodities, resulting in high levels of pollution in their constituents' quality and posing further difficulties to sustainable human growth and well-being. Breakdown of the air, water, and soil endangers the lives of

humans, animals, and plants in the living space throughout the world in general. In addition to global warming, air pollution directly impacts human health. Human activity has increased global warming by releasing excessive greenhouse gases, which have detrimental consequences on human health and the environment. At least 92% of the world's population cannot breathe clean air because of pollution, according to a World Bank and the Institute for Health Metrics and Evaluation report (Bank, Metrics, & Evaluation, 2016). Asthma, pneumonia, and heart issues can result from short-term exposure to air pollution (Eze et al., 2014). Exposure to pollutants in the air has been shown to impact the skin and eyes, resulting in skin aging, eczema, acne and urticaria, and dry eye syndrome (Mo et al., 2019). Cancer and death can result from long-term exposure. There is a lot of harm done to the human respiratory system by pollutants such as ozone, dust, and benzene inhaled through the airways (Kurt, Zhang, & Pinkerton, 2016).

According to research, air pollution has been linked to cardiovascular illness and the immunological system. It is well-known that the rate of industrialization or structural change in the economy affects air pollution. Much prior research has looked at how air pollution is connected to different phases of economic growth. Glencross, Ho, Camina, Hawrylowicz, and Pfeffer (2020) originally discovered a nonlinear inverted U-shaped relationship between per capita GDP and air pollution, suggesting that air quality tends to worsen as economies grow until the GDP per capita reaches a particular threshold, beyond which it progressively improves. In the early stages of economic growth, environmental preservation is often overlooked, and pollution is a significant problem during industrialization. Several following research verified the inverted U-shape curve and later found an N-shaped angle indicating the association between economic growth and air pollution. Prior studies have stressed economic development before addressing air pollution issues.

It has been widely accepted that fossil fuels are a significant contributor to air pollution. However, renewable energy sources have lately attracted the attention of policymakers because of their environmental benefits and potential for long-term economic growth. According to the International Energy Agency, renewable energy consumption rose considerably from 2000 to 2014, rising from 520,370.4 to (or 7.4% of total energy consumption) to 902,546.4 KTOE (or 9.7% of total energy consumption) (IEA). Many nations have also been prompted to implement renewable energy regulations due to the 2015 Paris Climate Change Agreement. Research shows that increasing renewable energy intensity improves environmental quality and reduces carbon dioxide emissions. However, few studies have revealed that renewable energy sources can reduce air pollution concerns. It is especially true when it comes to air pollution.

The relationship between air quality, economic growth, and renewable energy usage is explored in-depth in this article to better address air pollution. This research contributes to the knowledge of how air pollution fluctuates dynamically with both economic growth and renewable energy usage because of the lack of focus in the literature. This paper has a specific goal in mind. First, the dynamic adjustment of air pollution is evaluated, revealing how quickly air pollution varies over time. Also examined is how economic growth and air pollution are intertwined. This research explores the environmental Kuznets hypothesis that economic growth first raises the levels of pollutants such as particulate matter, sulfur dioxide, nitrogen oxide, and carbon monoxide and later decreases them. Lastly, this study investigates the impact of renewable energy use on air pollution. While previous studies have focused on the link between carbon dioxide emissions and renewable energy consumption at the country or regional level, this research adds to evaluating whether the usage of renewable energy sources may contribute to lowering air pollution on a worldwide basis. Fourth, it investigates the connection between urbanization and corruption and the openness of commerce. This research contributes to the knowledge of how air pollution levels are affected by urbanization and trade openness in economic growth phases.

Iraq in particular, and in light of the relationship between human well-being and environmental factors and the need to develop and exploit natural resources in the most efficient manner possible. In light of the need to re-examine how to deal with the environment and build sound planning to use their resources deliberately (Almagtome, Al-Yasiri, Ali, Kadhim, & Bekheet, 2020). The research made extrapolations to Iraq's environmental contamination.

Additionally, establishing the realities of the Iraqi environment before and during 2003, establishing the economic consequences of environmental pollution, and addressing environmental pollution in Iraq after launching the Iraqi environment's issues. Environmental pollution has become a significant concern for Iraq's economy, manifested by unrestricted use of natural resources, resulting in enormous resource waste. As a result, it is represented in various disciplines and ecology. The study's objective is to determine the most significant environmental contaminants and their magnitude of impact on society and the economy.

Additionally, it tries to ascertain the truth of the Iraqi environment to treat pollution using current approaches. Like the rest of the globe, Iraq's environment is deteriorating in terms of the quality of its constituents as a result of corruption in numerous forms and an economic strategy that has produced an environmental imbalance. The research employed an inductive and analytical method, drawing on various Arab and foreign sources and United Nations-issued international publications. The Iraqi Ministry of Planning, the Central Bureau of Statistics, and the Environment Ministry provided the data.

1. Theoretical Framework of Pollution

Globally, health-related political priorities have only recently begun to incorporate environmental concerns; for a long time, public health and environmental protection were treated as somewhat distinct concerns and budget chapters in governments and local communities (Tait, McMichael, & Hanna, 2014). However, communities and governments have increasingly recognized the critical need to comprehend the significant impact of environmental degradation on human health and the requirement to calculate the health costs connected with environmental quality appropriately. Furthermore, improving the factors affecting the population's overall health status, i.e., income levels, better working conditions, GDP growth and health expenditure per capita, social status, lifestyle, diet, and health education. These implications have resulted in a significant increase in life expectancy in the more developed economies and regions and most of the world's developing countries. Simultaneously, evidence indicates that the harmful impact of pollution on public health, including that caused by human activities, has grown (Organization, 2016). Ecology has been defined in several ways, and the reason for the variation in definitions is attributable to the intellectual tendencies of academics (Mace, Norris, & Fitter, 2012). However, its economic, social, and cultural dimensions shape the human need for ways, means, and methods of utilizing natural resources and putting them to use (Huckins et al., 2020). The variety of natural components is represented by water, air, and land and their interactions with humans and other animals. They would supply essential and required services to humans such as life support, raw materials, and energy and absorb waste from productive activities (Piccarozzi, Aquilani, & Gatti, 2018). To accurately describe the idea of the environment from an economic standpoint, five factors must be considered:

1. **Bio-aspect**: This aspect addressed the spatial entrance and encompassed the lower layers of air, the upper layers of water, and the surface layers of the earth's land, which are represented by the atmosphere, the water atmosphere, and the land cover, respectively, and it is the boundaries of this ocean that have emerged naturally from the life of the planet's organisms that are unrelated to human action.

2. **The social aspect** results from the accumulations of civilized human work represented by many intellectual and legal factors and social norms. They are a set of social, cultural, political, and administrative relations and systems that are human on the one hand and which are passed down through multiple generations.
3. **Technical aspect**: it is represented by all human activity inside the boundaries of the first side (biosphere), such as cities, roads, industries, farms, and transportation, which is referred to as changes represented by human capital; hence, this aspect may be divided into two components:
4. **The natural aspect** refers to the physical characteristics of the environment, such as water, air, seas, oceans, and renewable and non-renewable natural resources.
5. **Environmental aspect**: it is regarded as more extensive than the natural element since it incorporates all of the industrial element's social features into a collection of social, economic, cultural, and administrative systems that man used to manage his behavior and exert control over nature.

2. The Environment Pollution In Iraq Before 2003

In Iraq, environmental protection started before the shift by developing ecological regulations. It symbolizes the legislative side; in 1967, legislation was enacted emphasizing the building of foundations for river and public water preservation. Its description of the permitted upper limits on water quality is available for various agricultural and recreational purposes (Al-jarakh, Hussein, Al-azzawi, & Mosleh, 2021). This law remains today, following Iraq's 1972 participation in the Stockholm Conference on the Human Environment. In 1974, the Supreme Authority for the Human Environment was established and operated until 1975, when the Supreme Council was established. Later, it was renamed the Environmental Protection Council.

Additionally to drinking water and its quality in terms of the specifications for drinking water sites and the filtering method used, the adoption of international drinking water specifications, and the necessity of housing each water filter project within an integrated laboratory for conducting chemical, biological, and physical tests to determine the scientific efficiency of filtering and sterilization. Furthermore, the Directorate General of Human Environment, the Supreme Council for the Protection and Improvement of the Environment, was formed. Its mission is to safeguard the environment, prevent pollution, make policy, plan for it, and impose regulations on environmental pollutants. It was founded with a view to Iraq's international contacts in ecological preservation and enhancement according to Article 12 of Law (76) of 1986. The Department of Environmental Protection and Improvement was established to replace the Directorate General of Humanity and are responsible for various functions (Chabuk et al., 2019). The functions include analyzing and offering solutions to environmental pollution concerns in Iraq, testing for all ecological toxins, and monitoring the environment's safety and improvement. Specific and unambiguous to preserve and enhance the environment, including:

- Provide rules for pollution measurement.
- Reporting pollution measurement data to the Department of Environmental Protection and Improvement.
- Providing and running pollution control and waste management systems.
- Establishing informational rules.
- All actions that affect the environment are censored.
- Conduct a detailed feasibility analysis for each project, which should include an environmental impact report.
- Prevent any agricultural, industrial, oil, or service leftovers from being discharged into rivers, aquifers, the air, or land.

Even though Iraq has had a long-standing interest in the legislative and regulatory aspects of the ecology for more than three decades, we have not detected any evidence of ecological growth throughout the period specified. It demonstrates the inadequacy of Iraq's economic and development policies. The environment has faced several issues and obstacles, the causes of which varied according to decision-makers and development schemes and between wars and international sanctions. As a result of different human activities, fruitful land became arid. The advent of various forms of water and air pollution altered the natural characteristics of the ecosystem without regard for the deterioration of service quality, infrastructure, sanitation projects, garbage accumulation, and oil industry initiatives. As a result of the environmental balancing criteria, the government has grown incapable of providing ecological security. It is manifested via sound infrastructure, specialist environmental employees, environmental planning that adheres to environmental requirements, a lack of environmental awareness, a civic spirit, and sophisticated ecological technology. The United Nations Environment Programme affirms that environmental degradation is an unavoidable conflict product.

3. The Environment Pollution In Iraq After 2003

Following the transition that occurred in Iraq, new measures were taken in the environment sector. By introducing an Iraqi environment ministry, the attitude toward environmental protection has shifted. It developed a thorough and ambitious program that comprised several initiatives in this sector to identify the country's most serious environmental problems and provide appropriate answers and treatments. Unfortunately, the ecosystem has been subjected to several acts of neglect during the last century. According to Article 114, paragraph 3, of the 2005 Iraqi Constitution, an environmental strategy must be developed to guarantee that the environment is safeguarded from contamination and kept clean in conjunction with the irregular provinces and provinces of the region. As a result, the old approach that separated the environmental factor from the economic and social development elements has shifted. In 2009, the House of Representatives passed the Environmental Protection and Improvement Act, regarded as more protective of the environment. The rules successfully address environmental degradation issues and enforce rigorous regulations to remedy them. This legislation includes a provision establishing environmental police to hold offenders accountable and adopting a set of objectives, which consists of constructing an information base on the Iraqi environment. It encompasses the quantity and source of pollutants and the protection of water and air, reducing noise, and enhancing environmental management.

4. Removing Environmental Pollution In Iraq

Environmental pollution has many dimensions that we have already addressed in the theoretical framework of the environment (Khoshnevisan, Farshchi, Karimi, & Pournouri, 2019). Here it is necessary to identify these dimensions within the reality of the Iraqi environment to estimate the extent of the damage done to it.

4.1 The First Dimension: Air Pollution

Air pollutants are classified according to their source of origin (Zeng, Liu, Feiock, & Li, 2019). Thus, primary pollutants are released directly from pollution, such as sulfur dioxide gas released into the air when fossil fuels are burned. At the same time, secondary pollutants are

formed due to contaminants interacting with one another (Kumar, Shahi, & Singh, 2018). Despite the multitude and diversity of sources of air pollution in Iraq, the majority are primary pollutants created by industrial sources and automobile exhausts leaking odd compounds into the air layer (Al-Obaidy, Jasim, & AlKubaisi, 2019). After 2003, the number of automobiles held by state agencies, the public sector, and diverse sectors climbed to (29,064). It grew to Car ownership, which rose to 44,842 in 2007 and 219,550 in 2014, excluding the Kurdistan area (5388968). Most of these cars ran on low-quality imported gasoline, increasing environmental pollutants and suspended minutes and bullets with concentrations above the national limit of 350 g/m3. In contrast, the maximum permitted levels of So2 gas exposure ranged from 3 to 10 pm, depending on the duration of exposure. The following table details outstanding minutes and the rate of gas concentration (SO2) in three provinces:

Table 1. the concentration rate of suspended minutes in µg/m3 units and gas concentration rate SO2

	2017		2018		2014	
Province	The annual rate of disabled minutes	gas concentration rate (SO2)	The annual rate of disabled minutes	gas concentration rate (SO2)	The annual rate of disabled minutes	gas concentration rate (SO2)
Baghdad	830	0.035	1389	0.035	525.8	0.182
Basra	436	...	...	0.029	...	...
Nineveh	1394	...	694	0.038	242	...

The table of the researcher's work is based on the data contained in the annual statistical group 2016,theMinistry of Planning, the Central Bureau of Statistics. As seen in the chart above, the annual concentration rate of the outstanding minute group varies significantly between the three provinces, with the most significant rate occurring in Nineveh province (1394) in 2017. Baghdad province followed closely behind with a speed of (1389) in 2018, with national border overruns of (350) g/m3 in Baghdad in 2006. Even in Basra province, the lowest concentration rate of total suspended minutes was reported in the three years listed above. Additionally, it surpassed the aforementioned national boundaries. However, the quantity of gas (SO2) in Baghdad city exceeded the national border in 2014 (0.182). It is higher by ppm units above the suggested federal limit of (0.04). Other forms of air pollution include falling dust, one of the indicators used at the provincial level to assess the surrounding air quality, particularly in desert areas. Recent studies and reports indicate that the primary issue is suspended dust, followed by rising dust and dust storms, which have become recognizable and common natural occurrences in Iraq over the last decade. Due to vegetation clearance and cutting, particularly in the country's southern parts, and the impact of drought caused by water scarcity and poor rainfall. The following table illustrates falling dust:

Table 2. The minimum and maximum amount of dust falling in units (g/m2/month) for Iraq provinces (2014-2019)

Province	2014		2015		2016		2017		2018		2019	
	minimum	Upper Limit	minimum	Upper Limit	minimum	Upper Limit	minimum	Upper Limit	minimum	Upper Limit	minimum	U L
Nineveh	9	60	8	27	9	30	7	18	7	24	..	
Kirkuk	20	145	20	80	20	70	19	86	10	66	7	
Salads	11	514	16	71	8	97	9	107	37	192	32	
Diyala	2	45	2	34	11	52	17	55	8	37	5	
Al, Anbar	5	142	16	89	13	164	10	206	6	98	..	
Baghdad	10	102	11	61	10	94	11	57	9	46	5	
Babylon	14	115	20	79	16	135	16	132	12	68	5	
Interface	21	61	21	43	20	66	6	50	2	39	6	
Karbala	12	137	18	113	13	244	20	116	6	53	6	
Al , Qadisiyah	7	67	15	83	10	64	6	71	8	33	7	
Najaf	17	75	27	154	15	263	7	193	10	63	8	
Al , Muthanna	11	44	19	226	23	181	18	100	9	47	11	
Maisan	9	28	9	29	9	34	11	15	10	14	10	
Dhi Qar	21	130	18	147	12	103	12	48	10	69	15	
Basra	10	52	12	38	7	44	8	28	6	44	6	

The table above shows that the provinces of Salah al-Din, Muthanna, Najaf, Anbar, Salah al-Din, and Karbala recorded the highest amount of dust falling compared to the areas of Iraq for the years 2014 to 2019, respectively. On the other hand, the lowest appeared in the provinces of Diyala, Ninawa, Basra, Qadisiyah, Wasit, Baghdad, and Anbar, respectively, for the same years. Increasing these pollutants in the Iraqi environment beyond national and internationally permitted limits, especially in residential areas, has a significant impact on many problems in human health, especially for people of sensitive ages. For example, it explains the prevalence of deformed births, increased cancer morbidity, and shortness of breath resulting from air pollution. Pessimistic on the present and future of sustainable human development and the environment in Iraq, these problems have widened under weak laws and environmental control deterrents for violators and inadequate means and controls that reduce pollutant emissions for industrial centers and transportation sector, household sources, etc.

4.2 Second Dimension: Water Pollution

Water is one of the most critical and rare elements of development globally, as is the problem of water pollution in all its forms (Bolisetty, Peydayesh, & Mezzenga, 2019). These forms include groundwater, river water, lakes, and seas. It emerged due to most countries' economic development processes and programs without considering the relationship between development and the environment or the so-called environmental balance system. The most crucial element is Water pollutants in various chemical compounds resulting from industry, pesticides, agricultural fertilizer compounds, and urban sanitation (Singh, Yadav, Pal, & Mishra, 2020). In addition, the development of the oil industry and its extraction have played an essential role in increasing water pollution in various forms. Iraq is one of the countries affected by this pollution by dumping contaminated waste and water in rivers and territorial waters without treatment, which has affected their quality (Ali, Salman, Guda, Abojassim, & Almayabi, 2020).

Furthermore, the environment in Iraq was heavily polluted during the first half of the 1970s by industrial development. At that time, many existing industries lacked environmental balance regarding their locations and waste disposal methods. As a result, they were considered to be one of the primary sources of environmental pollution, especially on water resources, and for the following reasons:

- The majority of Iraqi industries are designed near rivers in terms of choosing their locations or draining their wastes without considering the conditions and requirements of environmental pollutants.
- Water recovered from the industry was characterized by high concentrations of pollutants, most of which were thrown into rivers without treatment.

Many pollutants have characterized the current phase for water, including industrial liquid pollutants, organic pollutants, liquid wastes for hospitals and sewage. They have been characterized by high concentrations of contaminants in them and the table as shown:

Table 3. water used and spent from factories under by sector (2015-2019)

Sector		Chemical	Engineering	Food	Radar	Structural	Total
2015	Total water used(m3/day)	120940.0	13991.0	6690.0	16284.0	27012.0	184917.0
	Drained total water(m3/day)	57928.5	8249.0	2994.0	11097.0	13302.0	93570.0
2016	Total water used(m3/day)	83794.6	13487.5	4856.0	12849.4	25792.0	140779.5
	Drained total water(m3/day)	47030.5	7931.8	2358.0	8515.2	13929.5	79765.0
2017	Total water used(m3/day)	60293.6	16443.8	5052.3	13184.7	18433.4	113407.8
	Drained total water(m3/day)	27101.5	5810.9	2249.0	8395.0	8728.0	52284.4
2018	Total water used(m3/day)	91339.8	17558.5	9494.3	10898.1	35536.5	164827.2
	Drained total water(m3/day)	33739.3	9136.9	6033.8	6349.7	14058.5	69318.2
2019	Total water used(m3/day)	44338.1	20698.2	3476.0	4844.7	28743.7	102100.6
	Drained total water(m3/day)	17554.8	11534.5	1611.5	3388.0	11155.3	45244.0

The table above shows that the Ministry of Industry and Minerals divided its sectors into five sectors: chemical, engineering, food, textile, construction. It was the highest amount of total water used in the chemical sector and the lowest amount of total water drained in the food sector in the years described in the table. It subtracts the amount of water drained directly to Water, sewage, and sewage systems, some to nearby land and others to recycling and houses. Many studies have indicated that industry and agriculture use thousands of organic chemical compounds manufactured in the production of plastics, pesticides, medicines, dyes, and other substances, many of which are very toxic. They can result in congenital disabilities or cancer. The problem is exacerbated by Some of these environmentally friendly compounds that do not degrade quickly enough. As a result, their access to water poses a serious threat to human health if inhaled or taken. As a result, the ecosystem in Iraq is severely disrupted, and the environmental balance is disrupted under weak ecological control.

If we follow the reality of sewage plants, they are characterized by high concentrations of organic materials. They are collected by sewage systems, pushed to plants for treatment, and made within acceptable determinants before being released to water. On the other hand, these stations are characterized by their feet, lack of maintenance, the inefficiency of treatment units,

and lack of chemical treatment units with an insufficient capacity of these plants. Although, as a result, it receives more water than its core capabilities, the Ministry of Environment indicated when following up (30) wastewater treatment plants, found that (6) plants dispose of their water to the river and (5) stations to the landfill, (11) are not working or parked and (8) plants are viable.

4.3 The Third Dimension: Soil Pollution

The soil in Iraq is subjected to environmental degradation in the quality of its soil elements and its physical, chemical, and biological characteristics, due to floods, over-irrigation, and vegetation removal (Delang, 2017). It has led to the transformation of productive land into arid land because of human activities such as tree-uprooting for agriculture, fuel, and construction. The high soil salinity, pollution of irrigation water, and ill-considered use of fertilizers. Pesticides and military operations in Iraq have generated a fragile environmental balance. The data and studies available on soil pollution with fertilizers and pesticides in Iraq are minimal, and in general, the country does not suffer from the problem of fertilizer pollution. The reason is that the Iraqi trinIraqsuffers from a lack of nutrients on the one hand.

On the other hand, the use of fertilizers is still below the required levels, as the problem of adding fertilizers is limited to water pollution. Underground and rivers where fertilizers added to the soil are exposed to drift due to heavy rainfall and erosion. Some of the filter into groundwater through the mud. Arable land in Iraq is now suffering from significant environmental degradation due to the lack of modern technology compatible with natural conditions (Adamo, Al-Ansari, Sissakian, Knutsson, & Laue, 2018). They have caused considerable damage to the area of arable land and what is now known as desertification, namely aerodynamic drift, water drift, and increased soil salinity and hardening. The following table can explain it:

Table 4. The area affected by desertification and its proportion in Iraq

Type of desertification	Hardship	The affected area (hectares)
Air drift	Light-medium Very severe.	1431000 635000
Water drift	Light-medium Very severe.	4691000
Soil salting	Light-medium Very severe.	1322000 6679000
Soil hardening	you touch you plaster	16771000 8600000
Total area and proportion affected by desertification		92.2%=40129000

This problem was exacerbated by the military operations of the wars waged by Iraq, especially the recent Gulf War, in which the Allies used depleted uranium (Comfort, 2020). Experts consider it one of the most dangerous sources of pollution of the Iraqi environment and soil because of its severe adverse effects on human health and multiple diseases. Due to the long movement of wind and rain, we will have very complex contamination in the ground that led to the spread of depleted uranium dust on the soil crust. Its effects on sustainable human development. The basic dimensions of environmental pollution (pollution, air, water, and soil) have become threatening the lives of humans, animals, and plants in the world in general and Iraq in particular. The pollution, air, water, and soil are based on linking human well-being with the environmental factors surrounding it on the one hand. The need to develop and exploit natural sources, on the other hand. The Iraqi government and the Iraqi people should reconsider

dealing with the environment and establish proper Planning to use its resources (Kibaroglu, 2019). Referring to the potential consequences of improper exploitation of natural resources and their future access is more dangerous. Therefore, it is necessary to study the damage caused by air, water, and soil pollution. An optimal environmental policy seeks to balance the benefits to society from economic activities associated with breakdown or what is known as an equal marginal benefit to the marginal cost of environmental pollution.

5. Economic Impacts of Environmental Pollution

Many adverse economic effects of environmental pollution can be shown below:

5.1 The High Temperature

Air pollution causes the world's air to warm, and this temperature rise is due to the so-called "glass greenhouse effect (Lu et al., 2017). This rise has many changes, including:

A- **Change In Places of Rainfall**: the number of rain increases and its abundance in one area and decreases in another region, as the change in the rainfall system will increase the problem of land degradation and desertification in the Arab region in general Iraq in particular (Fartm, 2020). It is because of its social, economic, and ecological costs. The General Authority for Environment has shown Iraqi air and seismic monitoring varied greatly in rainfall between the provinces of Iraq. It was the highest limit of this precipitation in Nineveh province (455.5) and the lowest in Qadisiyah province of 124.0 in 2014 when compared with the rest of Iraq provinces for different years, and the following table shows this:

Table 5. total rainfall for selected provinces in Iraq (2003-2018)

Province	2003	2004	2005	2006	2007	2008	2009	2010	2011	2017	2018
Nineveh	227.6	357.1	294.5	511.2	193.8	195.7	223.8	240.6	294.7	278.6	455.5
Kirkuk	183.6	312.1	249.4	458.4	173.1	134.9	225.8	267.2	221.8	292.1	394.3
Diyala	173.9	240.6	222.0	205.2	233.2	197.9	164.7	206.9	167.2	301.9	355.4
Baghdad	64.3	...	129.4	162.3	99.2	59.1	67.5	92.5	96.0	184.4	296.7
Karbala	59.7	62.6	68.0	96.2	40.1	76.0	31.1	84.5	98.2	78.6	185.5
Al , Qadisiyah	109.2	56.6	100.6	106.9	43.6	44.2	46.2	49.1	81.4	98.8	124.0
Dhi Qar	...	98.6	105.7	245.8	112.5	65.5	56.9	57.6	85.1	116.2	175.2
Misan	7.8	...	158.2	251.4	125.1	90.6	175.9	128.3	110.7	212.1	324.6
Basra	...	...	95.5	174.1	139.2	67.1	89.8	31.9	65.3	115.3	....

Source: *Iraq Environment Statistics 2018, Ministry of Planning, Central Bureau of Statistics, Iraq,2018*

This change will lead to a change in agricultural areas worldwide, adversely affecting global agricultural production. It is reflected in global food production. High temperatures may lead to the spread of desertification and the decline of forests in areas where drought is widespread. The agricultural land is exposed to erosion and becomes unfit for agriculture. The increased forest fires are estimated to destroy about 90% of forests in China and 35% of the forest area in European countries due to the intensity of sand winds. For Iraq, the total area affected by desertification (40129,000)/ ha. At the same time, the entire area was 92.2%, according to the data from the previous table.

5.2 The Increasing Greenhouse Gas emissions

Some greenhouse gases, such as carbon dioxide, pose a significant threat to the ozone layer, causing cosmic warmth (Olivier & Peters, 2017). The emission of these gases from fuel combustion, industrial activity, and the efficiency of the combustion process, in general, destroy this layer, resulting in harmful UV radiation leaking into the ground and these rays (Sadatshojaie & Rahimpour, 2020). Therefore, it has a significant risk to humans, animals, and plants. Other types of gases such as sulfur oxides cause acid rain, which returns to the ground with rain, dust and snow, and Agricultural land. Therefore, increasing these emissions has a significant impact on the pollution of the Iraqi environment (Chaichan, Kazem, & Abed, 2018). After drying much of the marshes between the Tigris and Euphrates rivers, Iraq has made tremendous progress in maintaining biodiversity. However, it is run as a natural wastewater treatment system, which means that some concentrations of pollutants can not be measured owing to a lack of monitoring instruments or failures in parts of the machinery. An further hurdle to environmental action is the lack of analytical requirements in Iraq. The CO2 emission index provides a realistic picture of Iraq's environmental situation.

5.3 The Costs of Air Pollution

Air pollution has had a severe negative impact on global health, as deteriorating air quality contributes to respiratory diseases and disorders such as chronic bronchitis and cancer, which lead to premature death (Martinez et al., 2018). The World Bank study suggested that the cost of urban air was (2%) of GDP (Sefair, Espinosa, Behrentz, & Medaglia, 2019). The cost of deaths is estimated at 20,000 people who die each year from air pollution, causes, morbidity, and lost revenue from potential tourism (Loizeau et al., 2018). In rural areas, the population uses biomass fuel for cooking and heating purposes, leading to indoor air pollution, threatening the health of the people of these areas. Especially women and young children who spend most of their time Inside homes compared to what men spend at home, health costs in indoor areas related to air pollution range from (0.15_45%) of GDP to an estimated 1.9% of the country's economy.

6. The Environmental Pollution In Iraq

The Iraqi environment has faced various challenges and rapid population growth on the top (Jarah, Zhou, Abdullah, Lu, & Yu, 2019). It is the main challenge to sustainable development and the significant waste of environmental elements. The lack of reliance on modern methods of treating pollutants resulting from wars that have cast a shadow over the reality of environmental pollution. It has negatively affected the environment in general and can be limited to the most important of these challenges:

1. There is no precise identification of the locations of elements of environmental pollution. They include radioactive decay due to the lack of comprehensive monitoring, control, and monitoring systems for the quality of the environment and corruption of all environment elements, especially in major cities.
2. The increased use of small generators to meet domestic, commercial, and industrial needs. The continued shortage of electricity supplies from the national grid has damaged the surrounding environment due to burning large quantities of fuel of various kinds under mostly inefficient internal combustion engines.
3. The need to pass and update existing environmental legislation, laws, and limitations to suit and keep pace with international developments in this area, particularly climate change.

4. Local environmental institutions lack material, human, technical, and expertise in this area, with Iraq's weak and limited participation in the international ecological activity.
5. The emergence of a disconnect between the environmental and economical and social dimensions. The failure to integrate the ecological dimension into development activities leaves it far from sustainable development goals and mechanisms.
6. Lack of serious studies to assess the environmental impact of strategic projects. The lack of experienced homes in preparing and evaluating studies on environmental pollution.
7. The lack of environmental awareness among the citizen in general and the investor in particular. They neglect environmental standards to calculate the unique economic benefit and the ineptness of some of the technology imported to the Iraqi environment.
8. The lack of integrated economic Planning balances the requirements of the ecosystem on the one hand and the level of thoughtful exploitation of natural resources in advancing sustainable development on the other.
9. Sandstorms have increased due to the significant decline in green spaces resulting from lack of vegetation, rain, and overgrazing of sheepherders and logging. Especially after the chaos, the country went through during the period of regime change.

7. Towards A Strategy To Address Environmental Pollution

Two may not disagree that clean air, clean water, and land that have not been corrupted are goals that everyone wishes. But the question arises, how willing are we to push for those goals? Furthermore, what threat does humanity face from our lack of respect for the boundaries of our natural environment? Therefore, an appropriate strategy that includes environmental considerations in the development plans of different sectors must be developed to address air, water, and soil pollution.

7.1 Air Pollution Treatment Strategy

1. Obliging owners of air-polluting industrial facilities to install devices to dispose of various gases or exhausts resulting in productive activity.
2. Develop modern technological methods in monitoring and measuring air quality.
3. Increase renewable energy sources by relying on solar, wind, and hydropower for electricity generation.
4. Conduct in-depth studies on the components of the aerobic environment and its interaction with pollutants.

7.2 Water Pollution Treatment Strategy

1. The use of modern technology and the development of water treatment units were badly contaminated civilian water or industrial water for reuse.
2. Passing legal legislation on rationalizing the use of water resources, preserving them from pollution, and punishing violators.
3. Regular mentoring courses for farmers on rationalizing the use of agricultural fertilizers and their impact on water resources.
4. Use modern field irrigation techniques to reduce waste, increase efficiency and reduce the percentage of losses, and import advanced groundwater detection devices with highly qualified drilling equipment.

5. Work to restore marsh areas to preserve biodiversity on the one hand and act as a natural wastewater treatment system.
6. Expand water systems and improve the quality of drinking water and sewage systems incommensurate with increased population growth rates.
7. Monitoring the level of pollutants in river, lake, and dam waters by developing the measurement of some pollutant concentrations.
8. Work to educate citizens about the protection of the environment and its importance, both religiously and socially, under the rules of sharia.
9. Reducing the use of heavy products such as black oil in government and private factories, monitoring their waste, and supervising their treatment methods under environmental standards.

7.3 Soil Pollution Treatment Strategy

1. Conduct in-depth studies on soil components, particularly mechanisms that renew the soil's characteristics.
2. Work on an environmental plan to reduce the increase in exposed soil areas by increasing green spaces and taking care of them.
3. Reducing the phenomenon of increased soil salinity according to sophisticated and sophisticated methods.
4. Follow the integrated posttreatment system, which relies on the use of biological determinants and which in turn reduces pesticide use rates.
5. Work to sustain agriculture by growing some crops with characteristics appropriate to the nature of the country's climate.
6. Reducing urbanization and working to provide the right environment for rural areas repellent to the population.
7. Develop methods of measuring soil quality to identify the appropriateness of its production powers for each particular crop.

In light of the previous treatments developed for air, water, and soil pollution, there must be a tendency to educate the public to work to reduce this pollution. We note that the Iraqi arena is free of this awareness, considering that public awareness is integral to sustainable human development, which concerns future generations. Therefore, there should be an interest in the cleanliness and safety of the Iraqi environment by working to change the patterns of consumer damage to the environment and attention to the issue of recycling and reuse. It also works to introduce the consumer to the sources of pollution and how to deal with them in light of its consumption of manufactured goods and food. It is done only through concerted efforts between various institutions and governmental and non-governmental organizations such as environmental and consumer protection institutions.

Conclusions

The reliance of economic development on the development of the industrial sector has led to increased population density in cities and the emergence of urban communities. Moreover, it has led to higher industrialization rates without considering the social cost, resulting in increased pollution rates in various forms of waste and emissions and a march towards agricultural land. Thus the emergence of a new contemporary problem of desertification. Global warming, increased gas emissions, and the ozone layer's degradation are the most critical global challenges facing the environment. It has had severe impacts on the

environment. Fossil energy consumption adds large amounts of carbon to the air, and much of it remains scattered in the air. These quantities are not easy to dispose of, and their doses can be increased after 2003.

The outlook for environmental conservation changed by establishing a ministry for the Iraqi environment. It drew up a comprehensive and ambitious program that included various projects in this field to know the most critical environmental problems the country is experiencing and find appropriate solutions and treatments. Concern for the environment and achieving a sustainable balance must be the responsibility and duties of the State on the one hand and civil society institutions on the other, by working to create institutions that work to develop effective policies that balance them. Emphasizing reducing the emission of carbon dioxide and reducing its emissions in proportions consistent with the atmospheric capacity to absorb it. A certain proportion of the financial resources obtained from exploiting natural resources must be allocated to preserve the environment. Improving the country's environmental realities, reducing pollution levels, and working on an environmental plan to reduce the increase in exposed soil areas by increasing green spaces and taking care of them. To minimize water pollution, work to establish an electronic network that senses pollution on the Tigris and Euphrates rivers. Work to increase the use of renewable energy generation sources by relying on solar, wind, and hydropower to generate electricity. They should work to educate citizens about protecting the environment and its importance, both religiously and socially, under the provisions of religious law.

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