



Green Accounting as a Driver of Sustainable Development: A Study on a Sample of Highly Polluting Industrial Companies in Iraq

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Abstract. The research aims to clarify the impact of implementing green accounting on achieving sustainable development, and to elucidate the nature of the relationship between the level of accounting environmental disclosure and sustainability indicators in highly polluting industrial sectors, primarily: chemical industries, energy and refineries, metal industries, and high-emission food industries, serving as an empirical model for highly polluting industrial companies in Iraq. The study was conducted on (160) large and medium-sized industrial enterprises. It focuses particularly on highly polluting industrial sectors and the resulting inflation of apparent economic efficiency indicators and the concealment of real costs borne by communities and the environment. The results revealed a wide gap between traditional economic efficiency and true green efficiency, reflecting efficiency inflation caused by the concealment of environmental costs. Furthermore, the gap analysis revealed that Iraqi industrial companies suffer from complete structural gaps in six international standards for environmental disclosure, most notably the GRI 305 standard for measuring emissions, the IFRS S2 standard for climate risk disclosure, and the ISO 14001 certification for environmental management systems. Accordingly, we recommend that major industrial companies establish independent environmental accounting units under the supervision of the Ministries of Planning and Environment, allowing for an accurate and fair application of the 'Polluter Pays' principle based on isolated data for each facility.

Keywords: Green Accounting, Sustainable Development, Environmental Disclosure, Highly Polluting Industries.

1. Introduction

The ecological impacts of industrial practices have emerged as perhaps the singular most critical challenge to modern economic development. The rising trend of air, water, and soil pollution, coupled with their additive burden as health, social, and economic costs, underlines the inability of established accounting frameworks to represent a complete view of organizational performance [1]. As this system is mainly based on the maximization of capital and shareholder value, it usually neglects society; the imposition of environmental costs and industrial activities are generally not included in these cost analyses.

Against this background, green accounting is an emerging feature of contemporary accounting that integrates environmental costs and impacts into a company's financial statements, moving environmental factors from marginal issues to the centre stage in economic decisions. Green accounting (also known as environmental accounting) is an accounting system that incorporates both direct and indirect environmental costs into financial results. More than simply capturing the economic value created by business activities, it also includes the environmental damage caused in realizing that value. It comprises expenses incurred for emission containment and treatment; solid and liquid waste management; and the social damages wrought by industrial pollution. This is particularly important because it helps to reduce information asymmetry between companies and external stakeholders while enhancing corporate accountability beyond shareholders, to society and the environment [2].

The notion of green accounting gives concrete form to sustainable development. Standard economic indicators usually overstate performance in heavily polluting industries, and environmental externalities associated with production are not included when valuing non-market services. As a result, investment and planning decisions are often made based on poorly defined information that ultimately prevents future generations from meeting their own needs—the very principle of sustainable development. Thus, it is not even possible to achieve sustainable development within an accounting system that ignores environmental costs. On the other hand, Green Accounting is a practical tool for integrating economic development with environmental protection [3].

This problem is perhaps most acute in Iraq, especially in Baghdad Province. The industrial sector in the province comprises 160 large and medium-sized industrial enterprises employing more than 46,537 workers, most of whom are in the chemical and cement industries. They are among the worst and most polluting sectors in the country. Even though they account for a sizable portion of the gross domestic product (GDP), their real costs on the environment and public health are largely hidden beneath an appearance of economic output to surrounding areas. The difficulty faced by the Iraqi government was reflected in Environmental Protection and Improvement Law No. (27) of 2009, which obliges institutions to take into account the environmental effects of their activities, manage and treat waste generated from these activities, and publish relevant environmental data in the annual Report of the institution. However, many hurdles remain in place to enforce this law effectively; Iraq still does not have a comprehensive accounting system that can translate environmental liabilities into quantifiable and reportable monetary units. Here, the problem crystallizes in the substantial gap between what the traditional accounting system shows regarding the economic efficiency of highly polluting industrial companies [4], and the real environmental costs it conceals, which are placed on the shoulders of society and the environment. While heavy industries top the lists of production efficiency, their financial statements do not reflect the actual environmental impact resulting from their emissions and pollution, specifically in the highly polluting industrial sectors focused on by this study, such as chemical industries, energy and refineries, metal industries, and high-emission food industries.

Based on this, the problem revolves around two main questions:

First: What is the impact of implementing green accounting on achieving sustainable development in highly polluting industrial companies in Iraq?

Second: What is the nature of the relationship between the application of green accounting and sustainable development indicators in refineries and highly polluting industries in Baghdad?

The importance of this research stems from two complementary dimensions; scientifically, it contributes to filling a clear research gap represented by the scarcity of empirical Iraqi studies that address the issue of green accounting in heavy industries with an integrated quantitative and analytical methodology (especially long-term studies that evaluate the cumulative impact of environmental costs). Professionally, the study presents an applicable practical model for similar companies in Iraq, and a reference for regulatory authorities in developing environmental disclosure legislation, in addition to its contribution to guiding investors toward sustainable decisions that reflect the true environmental performance of enterprises [1].

To address these dimensions, the research objectives were defined around core axes seeking to: clarify the concept of green accounting and its implementation mechanisms in these companies, measure direct and indirect environmental costs and include them in an integrated accounting system, detect the gap between traditional economic efficiency and environmentally-adjusted green economic efficiency [2], analyze the impact of green accounting implementation on sustainable development indicators (economic, social, and environmental), and finally, propose an accounting environmental disclosure model that enhances corporate sustainability in light of international standards [3].

Based on all the aforementioned review of the problem, its dimensions, and its goals, the hypotheses were formulated to be the driver and primary arbiter of this study as follows:

H1: There is a statistically significant impact of implementing green accounting on achieving sustainable development in highly polluting industrial companies.

H2: There is a statistically significant positive relationship between the level of accounting environmental disclosure and sustainable development indicators in highly polluting industrial companies in Iraq.

2. Theoretical Framework

2.1 Green Accounting

Green accounting, as a relatively modern and emerging branch of accounting, seeks to include environmental factors in the evaluation of company assets and other financial accounts [4]. It includes

the study of environmental and economic sustainability. Companies are encouraged to disclose environmental information within a broader description of their operations, provided that this information is presented through annual sustainability reports [2]. Green accounting also forms the basis for an economic approach to environmental regulation, including large-scale behavioral environmental regulation.

In its simplest form, green accounting can be defined as the compilation and disclosure of all current and future environmental costs incurred by the company, along with identifying how these costs affect its performance. It involves identifying various obligations arising from the jurisdiction of environmental bodies regulating the industry, related to the company's past, present, and future works and activities [5].

Endiana et al. (2020) state that the principles of green accounting are basic guidelines that govern and direct the precise practice of green accounting. These principles establish the dimensions and, thus, cover an essential criterion of green accounting and represent a fundamental basis for developing international standards in this regard [6]. They also provide a number of clear and quantifiable attributes that, when measurable, form the basis for evaluating green accounting practices and environmental performance. Based on the multidimensional principles of general concepts and principles of accounting [7], as outlined in the environmental accounting guidelines, green accounting is a structured investigation.

These features comprise integration (lick coordination among the components of accounting system), stakeholder participation (to involve different groups of people and organizations as well as statute), materiality (considering only the information that is relevant and significant), consistency(UI ensures permanence) or coherence through all steps, transparency by openness where information can be welcome, conservatism (many establishments prefer prudence in scores with an importance) and timeliness which must to consider planning, scheduling of all elements within accounting plans transparently printed into the financial statements [8]. Together, these principles form a consolidated framework for the efficient execution of green accounting. They provide the foundation for improving the accuracy and efficiency of environmental accounting practices while supporting the continued development and advancement of this important accounting approach [9].

2.2 Objectives of Green Accounting

The objectives of green accounting represent the main areas of activity that require convergence between green accounting and the environment. These objectives should form a system of strategic priorities and action policies at global or regional levels. Green accounting objectives generally include conducting feasibility studies on introducing green accounting, mapping current pathways for its use, and adding green accounting to educational curricula or professional development for accountants [10]. It is 'one of the contemporary accounting concepts that supports the environmental orientation in the company or institution by identifying, quantifying, measuring, and disclosing the environment's contribution to the business process.' Green accounting describes efforts to integrate environmental benefits and costs into economic decision-making processes or the financial outcome of any company. Environmental accounting relates to a company's environmental impact, while national green accounting seeks to achieve this at the state level. 'Environmental accounting collects, analyzes, evaluates, and reports environmental and financial data intending to reduce environmental impacts and costs. This form of accounting is pivotal to many aspects of government policy as well. Consequently, environmental accounting has become an essential aspect of green business and responsible economic development.' This means that green accounting collects, analyzes, estimates, and reports environmental and financial data [4].

2.3 Relationship Between Green Accounting and Sustainable Business Practices

The growth of the global economy has relied primarily on conserving and exploiting natural resources. However, environmental degradation has become the focus of the modern world [11]. Therefore, it is necessary to consider natural resource costs and biodiversity loss in addition to financial indicators. The term 'green' refers to something related to the environment. Accordingly, there is an urgent need to establish a double-entry accounting and reporting system that takes biodiversity and the living environment as assets, including the recognition, consumption, and loss of these assets [12]. From here, the issue of 'green accounting' emerged. Green accounting is also known as the Environmentally Adjusted National Accounting (SNA). It combines the traditional national accounting system, which takes only economic transactions into account, with a separate system that accounts only for environmental damage [13]. In green accounting, transactions involving natural resources or changes in them are expressed monetarily [14]. The basis of sustainable business is

good management practices and sound financial viability [15]. Sustainable development can also be viewed through the following brief definitions:

- Providing a high standard of living—environmentally, economically, and socially—for all people now, enhancing this for future generations.
- Reducing the depletion and pollution of natural capital, restoring what has been damaged, and recycling.

Adopting voluntary corporate codes of conduct consistent with the above, and seeking to implement sustainability standards and sustainable business [16] [17].

'Sustainable business is a future-oriented organization that achieves ethical profits, has a clear positive impact on society and the environment, and adopts a multilateral approach' [6]. Sustainable business can also be defined as: 'An organization whose operations and policies meet the legal, commercial, and public expectations of stakeholders; reduces its impacts and then charges them to... stakeholders.' Falih Chichan & Alabdullah (2021) add that sustainable business practices, in their broadest sense, are those practices that focus on ensuring economic growth while protecting the environment and social well-being[18], while green accounting refers to methods for identifying, measuring, and reporting the costs of environmental preservation (benefits of environmental degradation) and environmental degradation (cost of environmental loss) in the traditional accounting system [19].

2.4 Challenges and Limitations of Green Accounting

Despite praise for its ability to promote environmental sustainability and responsible business practices, green accounting is not without challenges and limitations. With growing awareness of the importance of environmental accounting and sustainability disclosures, demand for the transparency and credibility of green accounting has increased [20]. As a result, stakeholders have become driven to hold companies accountable for their sustainability practices and disclosures. Enacting regulations that require environmentally focused disclosures is a relatively recent global trend [21]. Therefore, environmental and sustainability accounting principles have not yet been fully defined and developed. Some companies are not equipped to account for their environmental impacts accurately. In other cases, there is hesitation to take responsibility for broader impacts; companies may engage in 'greenwashing' campaigns where they attempt to portray a positive environmental image

without substantial changes in business practices [22][23].

Difficulty in accessing environmental data poses another challenge to fully achieving green accounting principles. Different environments necessitate different measurement and accounting strategies [6], and there is dissatisfaction with traditional accounting treatments of natural capital vulnerabilities. Industrial interests, including chemical and extractive industries, tend to expose the natural economy and its limits. Consequently, there is a need to develop a more realistic and accessible natural accounting framework, in coordination with Keynesian and post-Keynesian national accounting models. Another challenge relates to the methodological limitations of sustainability indicators [24] [25]. Despite established interest in sustainability indicators, the intended project has been partially frustrated by the inherent limitations in the types of statistics and resulting indicators proposed. Therefore, there is a need to study and develop indicators to measure sustainability trends so they do not fall victim to practical or theoretical obstacles. These steps do not offer guarantees, but they may facilitate meaningful research aimed at making further progress within pure accounting traditions [26] [27].

The third limitation relates to the institutional context in which development progresses. Where the need for green accounting has appeared most urgent since the late 1980s, significant, albeit largely uncoordinated, efforts have been made to build indicators and accounts for the natural environment [28][29]. However, this project has achieved little success, and there remains a growing need for wider acceptance in scientific and political circles.

2.5 Practical Side

The practical side of this research relies on the quantitative descriptive-analytical approach, as it is employed in analyzing data for large and medium industries in Baghdad Governorate for the year 2025 issued by the Central Statistical Organization, and reframing it within the green accounting system to reveal the gap between traditional economic efficiency and green economic efficiency adjusted for actual environmental costs. Three connected pathways guided the present study:

The first pathway: Diagnostic analysis —this dimension identifies pollution-prone sectors and analyses their economic, productive, and operational reality.

The second pathway: Environmental cost modeling, i.e., we estimate external environmental costs that do

not already appear in conventional financial statements

The third gap analysis contrasts the performance obtained under the traditional accounting system with the performance modified according to green accounting principles, in an attempt to determine the magnitude of deviations in relation to sustainable development needs.

The industries used in this study were selected using two criteria. The first criterion was that they were modern economies by traditional accounting standards and therefore representative of candidates to study the phenomenon dubbed productivity inflation. The second criterion was the classification of pollutants into gaseous, liquid, and solid pollutants, as supported by data from the Ministry of Environment and the Ministry of Industry/Minerals.

3. Geographic Distribution Of Industrial Production Facilities And Pollution

Statistical studies show significant variation in the distribution of industrial facilities by district within Baghdad Province. This variability not only indicates a disparity in the gradient of economic activities but also an accumulation of environmental pressures within specific areas. Consequently, environmental issues worsen, and the room for balanced sustainable development shrinks.

The first table depicts the calculation for the debt ratio of the Al-Karkh district, which comprises 29.47% of the province's total industrial output and has a significant share through indicators of industrial activities among governorates in Iraq. Nevertheless, the large concentration of industries in this district has been responsible for more air and water pollution. Meanwhile, Al-Rusafa is the most industrialized district in terms of the number of industrial centers, as it includes 41 industrial facilities, which represent 25.6% of the total. The urgency and necessity for a green accounting system in the district becomes evident in this phenomenon.

Table (1): Distribution of Large and Medium-Sized Industrial Centers in Baghdad Province and Their Environmental Classification (2025)

Region	No. of Facilities	Workers	Total Wages (IQD)	Total Production (IQD)	Value Added (IQD)	General Efficiency (%)	Classified Pollution
Abu Ghraib	17	3,720	23,406,634	12,886,738	5,140,577	3.51%	Medium
Adhamiya	9	6,070	47,738,428	5,291,112	822,907	3.74%	Low
Rusafa	41	13,136	122,931,132	693,035,028	103,982,339	14.67%	High
Tarmiyah	7	2,447	24,998,960	51,305,932	35,611,423	7.45%	Medium
Kadhimiya	15	7,253	61,102,127	270,797,045	233,969,212	16.72%	Medium
Karkh	10	11,701	223,801,792	1,748,642,299	749,239,597	29.47%	Very High
Mahmoudiyah	24	838	4,130,641	101,691,513	44,789,402	16.93%	High
Mada'in	37	1,372	7,643,250	34,868,698	23,108,223	7.50%	Low
Total	160	46,537	515,752,964	2,918,518,365	1,196,663,680	100%	—

Source: Ministry of Planning, Central Statistical Organization, Directorate of Industrial Statistics, 2025, with pollution [31] classification added by the researchers.

4. Analysis of Traditional Industrial Efficiency and Its Environmental Challenges

The results of the industrial efficiency assessment, based on the three-dimensional scoring approach encompassing economic, operational, and production indicators, show that the Al-Karkh district ranked first in terms of industrial efficiency, achieving **324.22 points**, equivalent to **29.47%** of the total score. It was followed by the Al-Mahmoudiyah district with **186.25 points (16.93%)**, while the Al-Kadhimiya district ranked third with **183.90 points (16.72%)**. However, this high efficiency involves a fundamental flaw in light of green accounting, as it neglects to calculate three categories of environmental costs:

Treatment and Removal Costs: Include the costs of filtering gas emissions, treating polluted industrial water, and safely disposing of hazardous solid waste.

Societal Health Costs: Costs of treating respiratory and skin diseases associated with industrial pollution, which are borne by the government and society instead of the polluting facility.

Long-term Environmental Costs: Such as the degradation of soil and groundwater quality, loss of biodiversity, and the accumulation of pollutants in the food chain.

5. Highly Polluting Industrial Sectors: A Comparative Analysis

Chemical industries hold the highest priority in any green accounting reform, as they rank first in general efficiency with a percentage of (35.45%) of total efficiency points, while producing the highest levels of toxic emissions as documented by the Ministry of Environment. Additionally, these industries are concentrated in Karkh district, which records the highest population density, doubling the health and social impact of pollution. The food industry accounts for 27.18% of total industrial efficiency, indicating a large share of production value across various types of industrial diversity, among which this unit holds a dominant position. Sector Overview: This sector consists of 10,382 workers at 78 industrial facilities. However, emissions from combustion processes and the release of industrial effluents exert large environmental pressures that lead to a sizeable biophysical depreciation of this sector's net green value added.

The Net Green Value Added Concept

The basis of green accounting is a reinterpretation of value added in conventional terms. This approach prevents externalising environmental costs by integrating external environmental costs directly into the financial accounts of economic actors. Net green value added is therefore calculated as traditional value added minus environmental costs. This can be expressed as follows:

Net Green Value Added = Conventional Value Added – Direct Environmental Costs – Indirect Environmental Costs

Direct environmental costs — emissions control and treatment, waste management, industrial effluents during the implementation and operation phase of projects/organizations. Indirect environmental costs include costs associated with public health and social consequences, depletion of natural resources, and pollution of the land near industrial plants.

Estimation of Environmental Costs by Industrial Sectors

Based on International Labour Organization (ILO) standards, World Bank standards for environmental damage assessment, as well as data from the Iraqi Ministry of Environment on types of industrial pollutants in Baghdad, environmental costs were estimated for each industrial sector as percentages of the traditional value added, as shown in the following table:

Table (2): Estimation of Environmental Costs and Calculation of Net Green Value Added by Industrial Sector (in Iraqi Dinars)

Industrial Sector	Traditional Value Added (IQD)	Emission Treatment Cost (Est.)	Waste Treatment Cost (Est.)	Societal Health Costs (Est.)	Total Environmental Costs	Net Green Value Added	Adjustment Rate
Chemicals	732,459,129	109,868,869	73,245,913	36,622,956	219,737,738	512,721,391	-30%
Food	379,000,000	18,950,000	37,900,000	11,370,000	68,220,000	310,780,000	-18%
Metal	53,268,342	10,653,668	7,990,251	5,326,834	23,970,753	29,297,589	-45%
Electrical	5,774,563	1,732,369	866,184	577,456	3,176,009	2,598,554	-55%
Construction	24,010,355	3,601,553	2,401,036	1,200,518	7,203,107	16,807,249	-30%
Textile	1,302,819	130,282	195,423	65,141	390,846	911,973	-30%
Total	1,195,815,208	144,936,741	122,598,807	55,162,905	322,698,453	872,814,756	-27%

* Environmental costs are estimates based on World Bank and Iraqi Ministry of Environment standards. Emission costs = 15% of value added, Waste = 10%, Health costs = 5% for highly polluting industries [31].

Environmental Accounting Disclosure Model

The research proposes the adoption of an environmental accounting disclosure model complementary to traditional financial statements, including four main elements:

Environmental Cost Statement: Environmental costs are classified into: preventive costs (filters, water treatment), remedial costs (cleaning existing pollution), and regulatory compliance costs.

Environmental Performance Indicators: Including the amount of emissions per production unit, waste recycling rate, and water consumption ratio.

Environmental Liability Budget: This aspect forecasts future environmental duties strictly as an environmental liability in the balance sheet.

Corporate Sustainable Development Index: This is a composite indicator that assesses and represents corporate performance in the economy, ecology, and society.

Rethinking Industrial Productivity Based On Green Parameters

The traditional productivity of the industrial sector and the green productivity in each district are compared in Table (3).

Region	Traditional Econ Efficiency	Green Econ Efficiency	Traditional Prod Efficiency	Green Prod Efficiency	Green General Efficiency (%)	Ranking
Karkh	52.31	31.40	176.98	106.19	22.14%	1
Kadhimiya	80.93	72.84	63.86	57.47	18.25%	2
Mahmoudiyah	81.16	64.93	95.36	66.75	16.12%	3
Rusafa	9.02	8.12	87.49	78.74	13.44%	4
Tarmiyah	30.69	27.62	27.18	24.46	8.11%	5
Mada'in	37.67	35.79	31.97	30.37	7.98%	6
Abu Ghraib	6.68	5.35	10.69	8.55	4.24%	7
Adhamiya	1.54	1.39	6.46	5.81	2.62%	8

Source: Authors' own calculation for Central Statistical Organization 2025 with usage of the proposed environment cost model.

Interpretation of Results from the Re-evaluation of Additional Green Time

The green reassessment yields the following three basic observations:

The Productivity Inflation Paradox: Results show that green accounting practices cause the industrial efficiency of the district Al-Karkh to decrease by about one-third. This decrease is mostly due to the presence of chemical and petroleum industries in the district, which create high environmental costs.

The Phenomenon of Sectoral Disparity: This green adjustment differs not only by sector. While the adjustment rate in the electricity sector peaks at 55% and 45% for the metallurgical industry, it amounts to only 18% in the food industry.

Hidden Externalities Environment Facts: The chemical sector registered the highest score in economic efficiency (87.21 points), due to transferring environmental costs onto society and not incorporating them into production costs. It clearly violates the "polluter pays" principle embodied in the international agreements on sustainable development.

Analysis of the Environmental Disclosure Gap

A comparison between the requirements of international environmental disclosure standards and practices by Iraqi industrial companies sheds light on the presence of a significant structural gap. This divide hinders the industrial sector's ability to play its role effectively in helping attain sustainable goals.

Table (4): Gap Analysis of Iraqi Industries International Environmental Disclosure Requirements

Environmental Disclosure Standard	International Requirements (GRI/IFRS S2)	Current Status in Iraq	Gap	Impact on Value Added	Priority
Carbon Emissions Measurement	Annual quantitative disclosure (GRI 305)	Not applied	Full Gap	30% Efficiency inflation	Very High
Waste Treatment Costs	Inclusion in financial statements	Partially recorded	Partial Gap	18% Efficiency inflation	High
Environmental Management System	ISO 14001	Not accredited	Full Gap	Not measured	High
Climate Risks	IFRS S2	Not applied	Full Gap	Not measured	Medium
Annual Environmental Report	GRI Sustainability Report	Non-existent	Full Gap	Costs are not reflected	Very High
Fines & Environmental Liability	Full disclosure	Absent	Full Gap	Hidden obligations	High

Source: GRI Standards (Global Reporting Initiative), IFRS S2, ISO 14001, and reports from the Iraqi Ministry of Environment.[32]

Confounding

The present study provides a comparative inferential analysis enabling the assessment of industrial efficiency in Baghdad Province, after addressing potential confounding variables and both structural and geographical biases. The main findings and the respective analytical insights are summarized below.

Inferential Summary and Bias Isolation

Statistical indicators adjusted to the environment show that what seems like high levels of efficiency displayed by industrial facilities around Baghdad, especially in Al-Karkh and in the chemical industry, are not real operational efficiency. Instead, this seeming productivity is actually the result of a structural confounding effect that arises because environmental costs are hidden beneath official financial statements. By adjusting for this variable and removing both sectoral and geographical biases, the gap analysis found that real efficiency had reduced to between 18% and 55%, which is registered as deferred environmental costs.

There is a clear contradiction between the excellent position of classical economic performance (35.45%) and growing negative environmental effects, stressing the need for a transition from a brown economy to a green economy model presented by this finding. Additionally, this statistical analysis confirmed that the absence of green accounting standards acts as an intervening

variable that distorts financial data and causes incomplete investment planning.

Corrective Measures and Proposed Interventions

This integrated policy pack is designed to eliminate confounding controls and reduce measurement errors for superior sustainability reporting, based on the proposed analytical model (see below for statistical/proof/statistical implementation).

Control measurement error and isolated bias: International green accounting standards (GRI, IFRS S2) implemented by the Ministry of Industry and the Securities Commission to unify evaluation frames/set accurate, unbiased measurement system of economic performance [30].

Neutralization of sectoral mischief: Create independent environmental accounting bodies at large-scale industrial enterprises under the enabling oversight of the Ministries involved, especially Planning and Environment. It would help speed up the accurate and equitable application of the "polluter pays" principle with appropriate disaggregated data at each industrial facility.

Reinforced behavioral modification and judicial systems: Establish dynamic penalties in environmental management by releasing industrial permits depending on the realization of environmental requirements under the umbrella of reducing GHG emissions and alleviating pollutants in the Baghdad basin.

Offsetting fiscal arrangement: Implement a Green Development Fund, partially financed by the government and private sector (via value-added

revenue deduction), to offset negative environmental impacts and help fund sustainable infrastructure.

Minimizing human measurement error: Through partnerships between universities and the Association of Accountants, invest in developing skill-oriented training programs to improve the quality of sustainability reports and make them bias-free.

The researchers assert that the shift in Baghdad's industrial sector from standard efficiency benchmarks to environmentally adjusted indicators is not an option but a pressing requirement for planning policy. This shift is necessary to improve the accuracy of development decisions and align them with sustainable development objectives.

Proposed Phased Implementation Model

The current study suggests three phases for a gradual and effective transition from conventional accounting to an environmentally integrated system through the implementation of green accounting.

In the first phase (Years 1–2): Statutory requirement for high-polluting industries such as chemical, petroleum refining, and cement to prepare voluntary environmental costs information attached to their annual reports. This stage aims to set the basic structure in a preliminary form and help industrial enterprises get accustomed to green accounting.

Phase II (Years 3–5): Expand this higher threshold with mandatory issuance and renewed industrial licenses that are contingent on the submission of a yearly sustainability report, applicable to all large industrial enterprises. The objective of this phase is to incorporate environmental reporting into the industrial regulatory framework and increase corporate liability for environmental damage.

Phase III (Year 6–10): Make Green accounting standards a part of Iraq's non-federal unified accounting system and make ISO 14001 Environmental Management System Certification compulsory for all big industrial enterprises. This final stage aims to institutionalise green accounting frameworks and strategies in a way that continues their sustainability and alignment with national development goals.

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