ISSN E.2958-6941 ,ISSN P.1818-1074 Vol. 21 Issue. 86 December. 2025

http://journals.uokerbala.edu.iq/index.php/ijas/index
Iraqi Journal for Administrative Sciences
المجلة العراقية للعلوم الإدارية

The Challenges of Adopting Sustainability Standards Related to Measuring the Costs of Green Production and Its Role in Reducing Environmental Costs

Ahmad Najah Hadi Jaber [1]

تحديات تبني معايير الاستدامة المتعلقة بقياس تكاليف الإنتاج الأخضر ودورها في خفض التكاليف البيئية

احمد نجاح هادي [1]

1. College of Administration and Economics, Department of Accounting, University of Karbala, Iraq-karbala. Email: ahmad.n@uokerbala.edu.iq ***Corresponding author**

1. كلية الإدارة والاقتصاد، قسم المحاسبة، جامعة كربـــلاء، العراق- كربلاء. ***المؤلف المراسل***

Article information

Article history: DD/MM/YY
Received: 20/10/2025
Accepted : 19/11/2025
Available online: 16/12/2025

Keywords:
Criteria and dimensions of sustainability, green production, reduction of environmental costs

تاريخ الاستلام: 2025/10/20
تاريخ قبول النشر: 2025/11/19
تاريخ النشر: 2025/12/16

الكلمات المفتاحية
معايير وأبعاد الاستدامة، الإنتاج الأخضر، خفض التكاليف البيئية

Abstract **DOI: https://doi.org/10.71207/ijas.v21i86.5035**

This research aims to study the use of the idea of adopting sustainability criteria to measure green production to reduce environmental costs, which is an important indicator for economic units to achieve sustainability and improve economic performance in an environment characterized by rational use of resources and reducing environmental costs. Regarding the methodology of this research, the qualitative and quantitative research methodology was used together to achieve the research goals. The importance of adopting sustainability criteria is demonstrated by the adoption of sustainability criteria. Therefore, the economic units that want to achieve sustainability, the most prominent conclusions were that the application of sustainability standards is a necessary requirement, at a time when environmental pollution is increasing, and economic units must exploit and protect natural resources to ensure sustainable development. He also touched upon the challenges faced by the industry in adopting sustainability standards and challenges. The study also touched on the challenges faced by the industry, and the study concluded that the adoption of sustainability standards promotes the reduction of environmental costs.

Citation: Najah Hadi Jaber, Ahmad. (2025). The Challenges of Adopting Sustainability Standards Related to Measuring the Costs of Green Production and Its Role in Reducing Environmental Costs, *Iraqi Journal for Administrative Sciences*, 21(86), 316-339.

الاقتباس: نجاح هادي جابر، احمد. (2025). تحديات تبني معايير الاستدامة المتعلقة بقياس تكاليف الإنتاج الأخضر ودورها في خفض التكاليف البيئية، *المجلة العراقية للعلوم الإدارية*، 21(86)، 316-339.

المستخلص

يهدف هذا البحث إلى دراسة الاستفادة من فكرة تبني معايير الاستدامة لقياس الإنتاج الأخضر لتخفيض التكاليف البيئية، وهو مؤشر مهم للوحدات الاقتصادية لتحقيق الاستدامة وتحسين الأداء الاقتصادي في بيئة تتميز بالاستخدام الرشيد للموارد وتخفيض التكاليف البيئية .فيما يخص منهجية هذا البحث تم استخدام منهجية بحث نوعية وكمية معاً لتحقيق أهداف البحث وتظهر أهمية تبني معايير الاستدامة من خلال اعتماد معايير الاستدامة .لذلك فالوحدات الاقتصادية التي ترغب في تحقيق الاستدامة، وكانت أبرز الاستنتاجات هي أن تطبيق معايير الاستدامة مطلبا ضروريا، في الوقت الذي يتزايد التلوث البيئي، ويجب على الوحدات الاقتصادية استغلال الموارد الطبيعية وحمايتها لضمان التنمية المستدامة، كما تطرق إلى التحديات التي تواجهها الصناعة في تبني معايير الاستدامة وتحدياتها كما تطرقت الدراسة إلى التحديات التي تواجهها الصناعة، وخلصت الدراسة إلى أن اعتماد معايير الاستدامة تعزز من تخفيض التكاليف البيئية.

1. Introduction

The economic units in Iraq are facing an increase in environmental pollution, waste and emissions, as well as the competition faced by these economic units, and therefore the adoption of sustainability standards related to green production has become the focus of attention of many industrial projects because of its positive impact on their activities, which requires the establishment of a culture of green production among managers and employees of economic units. From the perspective of environmental damage, economic units are facing enormous pressures in terms of the sustainability of their operations, given the increasingly severe environmental and economic challenges faced by economic units in today's era. That economic units need to adopt a green production culture and adopt sustainability standards to successfully meet these challenges in the ever-changing business environment. This is due to the fact that traditional management accounting has failed to keep up with the emerging changes in the production environment and modern technology. It is no longer able to meet the aspirations of society regarding the generation of the best goods and services. Therefore, modern accounting techniques must be adopted to keep abreast of developments, focusing on providing appropriate information that will help improve the value of the product or service provided to customers. On the other hand, the study adopted the applied descriptive approach to highlight the importance of adopting sustainability criteria related to green production in order to achieve sustainability. The research was divided into several sections, where the first section dealt with sustainability criteria, the second dealt with green production, and the third dealt with reducing environmental costs.

2. Methodology

2.1 Research Problem

The global trend is increasing and many Iraqi economic units are facing great challenges in adopting sustainability criteria when measuring green production costs and reducing environmental costs, due to the lack of clear accounting mechanisms to identify and measure environmental costs associated with production activities. It is also difficult to integrate sustainability requirements into traditional cost accounting systems that focus on modern production methods that meet the requirements of survival and continuity, the ability to reduce costs and preserve the environment at the same time, which are considered environmental methods that contribute to reducing environmental costs.

The problem of the study arises in the following main question:

What are the challenges facing the Iraqi economic units in adopting sustainability standards to measure the costs of green production, and to what extent does this accreditation play a role in reducing environmental costs and improving sustainable economic performance

2.2 importance of research

There are many advantages to sustainability criteria in measuring the costs of a green product, namely:

1. The study adds new knowledge in the field of management and environmental accounting by studying the relationship between sustainability criteria and the measurement of green production costs.
2. Practical importance: it provides a practical framework that Iraqi and Arab economic units can benefit from in developing environmental cost measurement systems and moving towards more efficient green production.
3. Environmental importance: the research contributes to promoting awareness of the importance of adopting green production as a way to reduce environmental damage and achieve sustainable development.
4. Economic importance: the application of sustainability standards helps to reduce waste in resources and improve the efficiency of using energy and raw materials, which leads to a reduction in environmental costs.

2.3 Research Objectives

The study aims to identify a set of challenges facing the Iraqi economic units, such as the following:

1. The need to identify the challenges facing economic units when adopting sustainability criteria in measuring green production costs.
2. Determine the role of measuring the costs of green production in identifying and reducing the sources of waste, loss and environmental pollution.
3. Identify the complementary relationship between the application of environmental sustainability standards and the measurement of environmental costs

3. Theoretical side

3.1 The philosophical framework of the concept of sustainability and its criteria

the concept of sustainability: that the great interest in the concept of sustainability began in the seventies, at the same time, the United Nations conference on the human environment in Stockholm held in 1972 coined the phrase sustainable development, and the founding of the United Nations Development Program, as a result of understanding global environmental issues, which began to publish books and the environmental movement in the Sixties. (Damirchi &Mahdavine,2017:133)

Societies in recent decades have undergone significant development, which has aggravated unfavorable climatic changes, natural disasters, wars, political, socio-economic upheavals. And it is society that makes a significant contribution to the negative impacts on the ecosystem, jeopardizing its continuity and threatening the lives of future generations. These conditions call for a change in human behavior towards rational and responsible use of resources, considering that it seeks to ensure sustainable and efficient use of resources while keeping the environmental consequences as low as possible. And this practice should indicate an approach in which sustainability of resources and their future usefulness is maintained. (Klarin,2018: 67)

Therefore, it is worth clarifying the concept of the three main dimensions from which the concept of sustainability is derived. Environmental sustainability refers to the quality of the environment that supports economic activities and the continuity of community life. Social

sustainability means ensuring community rights and equality, promoting cultural identity, and respecting cultural diversity, customs, and religious traditions. Economic sustainability means the balance that must be achieved between economic growth, preserving resources, and improving the standard of living in the long term. (Purvis et. al ,2018:8)

In terms of defining sustainability, it is defined as a comprehensive conceptual framework that describes the balance between human and natural systems. Furthermore, sustainability is a system of policies, beliefs, and best practices that aim to protect the diversity of the Earth's ecosystems, enhance economic vitality, provide opportunities, and create a prosperous society. (Arowoshegbe,2016:91)

The International Union for Conservation of Nature (IUCN) defined sustainability in its report as the continuous pursuit of valuing the quality of human life while taking into account the capacities and potentials of the natural system in the environment. (Thabit & Ibraheem,2019:5)

3.2 Sustainability principles

There are a set of principles for sustainability: (Epstein&Buhovac,2014:22)

A. **Ethics**: the company develops, promotes and evaluates ethical standards and practices for dealing with all stakeholders.
B. **Governance:** the company manages all its resources honestly and effectively, recognizes the corporate responsibility of its board of directors and directors, and takes into account the interests of all stakeholders.
C. **Transparency**: the company discloses basic information about its products, services and activities in a timely manner, enabling stakeholders to make informed decisions.
D. Business relations: the company adopts fair practices with suppliers, distributors and investors.
E. **Financial return:** the company compensates the capital provider with a competitive return on investment and protection of the company's assets.
F. **community participation:** the company promotes a mutually beneficial relationship between the company and the community, taking into account the company's culture and meeting its needs.
G. **Product and service value:** the company cares about the needs, desires and rights of its customers, and always strives to provide the highest level of value for its products and services.
H. **Recruitment practices:** the company adheres to human resource management practices that enhance the personality of the employee.
I. **Corporate protection:** the company strives to protect the environment and promote a sustainable environment.

And he points (Ali,2020:36), (Ali&Saad,2019: 6750)

Sustainability is based on a set of principles, which are as follows:

A. Participatory Sustainability: The concept of sustainability suggests that it cannot be achieved by the efforts of one person or one economic unit alone. Rather, it is a

collective responsibility involving all stakeholders, based on the principle of positive public participation to achieve sustainability in order for it to be successful and sustainable.

B. Continuous improvement: There is a need to preserve the ecosystem and biodiversity. Overexploitation of resources has negative environmental impacts, so the exploitation of natural resources must be within the Earth's carrying capacity. This implies sustainable activities. Conserving the ecosystem is a fundamental principle of sustainability.
C. Proper human resource management is an important principle for sustainability. Therefore, community members must ensure that principles are adopted and adhered to. Humans bear responsibility for the use and preservation of the environment, making the role of human resources crucial in the pursuit of sustainability. This is achieved through the education and training of human resources, as education impacts society through environmental conservation and appreciation of human values in addition to accepted production methods.

3.3 The Objectives of Sustainability

Sustainability seeks to achieve a set of goals as follows: (Rosen ,2019 : 2),(Rahmoun and Qahham, 2018: 108)

A. Improving the quality of life of the community through the design and implementation of development policies focused on growth and the possibility of achieving the best possible community growth, whether social or economic.
B. P. Preserve the environment by establishing a strong relationship between sustainability and the environment. Preserving and caring for the environment is the main goal of sustainability, in order to establish a harmonious and integral relationship.
C. Make efforts to maximize the use and exploitation of resources by exploiting them in a planned manner to prevent waste.

3.4 The importance of sustainability

The importance of sustainability lies in the necessity of preserving non-renewable natural resources, which are characterized by scarcity, so that these resources contribute to protecting the environment from pollution. The following is the importance of sustainability:(Epstein& Buhovac,2014:4)

A. Regulations: economic units are forced to consider sustainability more and more often by government rules and industry standards of behavior. Non-compliance with regulatory standards was and remains very expensive. Penalties, fines, legal fees, reduced productivity as a result of further inspections, possible closure of activities and consequences for the reputation of the economic unit are all expenses associated with regulatory non-compliance.
B. Community relations: public and non-governmental economic entities are becoming more aware of sustainability and the effects of economic entities on the

environment, society and the economy. In order to meet the requirements and needs of society as a whole, economic units must adhere to sustainability.

C. Cost and revenue requirements: with high income and low expenses, sustainability can also generate financial benefits for economic entities. In other words, sustainable sales of an economic unit can lead to more revenue by increasing sales, while optimizing products and processes, reducing regulatory fines, and more efficient use of resources can lead to lower costs.

D. Societal and ethical obligations: economic units are responsible for sustainability management due to their impact on the environment, society and the economy. Since sustainability studies economic, social and environmental conditions on the basis of available energy and resources, it should be integrated into the strategy of the economic unit.

3.5 Dimensions of sustainability

A. Economic dimension

The most important rule that allows economic units to continue their activity in accordance with the concept of continuity is their economic performance, the economic success of each economic unit depends on its field of activity, the scale of its operations, its position in the market and other factors, as a result of which economic units must create economic road maps that fall within the scope of dynamics, and they must be able to provide feedback on the expectations of society, as they represent... The financial sustainability of an economic unit depends on its profitability, operating expenses, income variability, the financial condition of the economic unit, how it manages other capital components such as people, production, natural capital, sustainability in investments, knowledge, experience, creativity and leadership, providing long-term benefits. However, economic sustainability is defined as "a financially sustainable system that can consistently produce goods and services over time", and it is also said that this system has the potential to achieve long-term equilibrium (Berksoy ,2018:12).

B. Social Dimension

The social dimension is of great importance in the "complete sustainable framework" consistent with the harmonious development of society, and this promotes an environment that facilitates coexistence and harmony between diverse cultures and social groups, promotes social integration and improves the quality of life for all segments of society. Conversely, social sustainability is the cultural system that fosters positive attitudes towards diverse cultures and promotes the continued health and happiness of society for future generations. In addition, the social dimension meets the basic requirements of individuals, develops individual responsibility including Social Responsibility and concern for the future, increases the trust and cooperation necessary for the creation of economic units, and it also concerns the distribution of development opportunities across the present and the future for diverse communities. (Dogu & Aras ,2019 :3)

C. Environmental dimension

The environmental dimension is one of the three dimensions of sustainability, characterized by its crucial role in the preservation of ecosystem services and the sustainability of environmental capital. The process that seeks to preserve and provide the

ability to provide basic environmental services is known as the ecological dimension. The exploitation of Natural Resources, waste management, emissions and quality support are examples of Environmental Services (Liu, et. al ,2019:3)

D. **Governance Dimension**

The fourth dimension in sustainability refers to the company's implementation principles to help monitor governance, resolve conflicts of interest and ensure transparency, ensure good adherence to following rules, regulations and laws, not allowing economic and social problems, and implement corrective actions to ensure the company's long-term sustainability. (Buallay et ,2017:85)

3.6 Sustainability standards

Sustainability standards are divided into two groups:

First: The first group: It is called the general criteria (100). This group includes three general criteria, which are:

A. (GRI 101) Foundation: - the initial framework includes the use of the global reporting initiative (GRI) Standards, which include basic reporting principles to achieve transparency and maintain high standards in sustainability reporting. These standards are classified into two main groups: the sustainability reporting guidelines and the application guide. Moreover, GRI includes the principles that guide the determination of the content of the report, guiding decisions to ascertain what should be included in the report by considering the processes of the economic entity and its results, as well as the expected expectations and interests of stakeholders. This framework entails stakeholder participation and contextualizing sustainability, focusing on the relative importance and comprehensiveness, which mainly includes the dimensions of scope, time aspects, principles for verifying the quality of the report and attributes such as accuracy, balance, clarity, comparability, reliability and timeliness.

B. Standard (GRI 102) public disclosures: this framework defines the basic requirements for the dissemination of public information relevant to an economic entity and establishes methodologies for expressing its sustainability, as this standard applies to any economic entity regardless of its size, type, sector or geographical context. This criterion includes fifty-six indicators that provide insights into the organizational profile of an economic entity, its strategic goals, integrity, ethical considerations, stakeholder participation and reporting methodologies: - (SASB,2020:4) formulated

C. Standard(GRI 103) management approach: this standard defines the overall basic requirements for the submission of a sustainability report and the reporting of management approach data relevant to critical topics, as well as a comprehensive clarification of the general reporting requirements of the management approach and its constituent elements, disclosure of the material topic along with its limitations, the disclosures required to evaluate the management approach, the mechanisms used to evaluate the effectiveness of the approach, the results of such evaluations, and any associated supplementary adjustments.

Second: the second group is called the special criteria that include the three dimensions of sustainability (environmental, economic and social) and includes (33) criteria, which can be summarized on the basis of each of the three dimensions of sustainability and the following:

A. Criteria for economic subjects (GRI 200): - this criterion consists of six criteria related to how the economic unit affects the financial conditions of stakeholders and economic systems at the local, regional and global levels.
B. Criteria for environmental topics (GRI 300): - there are eight criteria related to how the economic unit affects ecosystems, such as air, water and land. Environmental standards address input impacts such as water and energy, as well as output impacts such as emissions and solid and liquid wastes. It also covers transport, biodiversity and the impacts of goods and services. The standard also includes environmental expenses and compliance with them.
C. Social subject standards (GRI 400): - these standards define (19) reporting requirements related to the subject of employment. Any economic unit wishing to report on its effects on this topic can take advantage of it.

3.7. The concept and definition of a green product

Green production is a form of production that enables the transformation of Natural Resources, semi-raw materials and materials used in production into green products that meet the needs of customers (Önel, 2021:33) and is a production activity that takes into account all environmental and social aspects, from the provision of natural resources to quality inspection, packaging, logistics, storage, including waste, recycling and reverse logistics (Tunç, 2019).

Green production is a business strategy that attaches importance to environmentally friendly production stages and achieving high profitability. While environmentally compatible production stages are built using green production, profitability is also high by reducing waste and resources used. At the stages of green production, it is understood as the reduction or recycling of waste generated during production. But this is only the part that we see. In one of the first studies, therefore, green production is considered to be the stages in which the stages of production and the technologies used are designed, developed and applied for waste disposal. (Soyer and Türkay, 2020:1222). As can be understood from here, green production operates from an environmentally friendly perspective at every stage of production.

The custom of green production (Dubey & Ali, 2015: 754), However, it is to eliminate waste and redefine the current process to reduce carbon emissions during each process without increasing cost and affecting production targets.

Green production (Rao & Bogale, 2017:95) is also defined by different authors in different ways. Green production is the production of similar goods of the same quality level with minimal or no harm to the environment, including nature, people and society. It is defined as manufacturing that focuses its attention on environmental impact, the environmental policies of governments, environmental regulations,

stakeholder activity and Environmental Protection, and competitive pressures. And also it was described as different from traditional manufacturing.

Whereas (Mendoza-Fong et al, 2019: 2) sees green production as the ability to intelligently use natural resources in manufacturing, which is carried out by creating products and proposals to achieve economic, environmental and social goals; thus the environment can be preserved, while continuing to improve the quality of human life. In other words, such processes are possible due to the application of new technologies, organizational measures, social behavior.

Green product Bijan,2021:955)) is also defined as the process of identifying, using and preserving natural resources, avoiding the use of toxic substances that harm the environment, working to reduce pollution rates, using renewable energies while maintaining product quality and working to satisfy customers and meet their wishes.

He also defined (Saxena & Srivastava, 2022: 32) those designs, materials, processes and products that are economical and sustainable while minimizing pollution and risks to human health and the environment.

3.8. Advantages green product

Customers should be tempted to purchase an environmentally friendly product, regardless of the price difference, if it has better characteristics than conventional products. According to an American study conducted in 2002, consumer perceptions of environmentally friendly products, in terms of their high price, discomfort and poor performance, are the main barriers to their purchase. For this reason, some of the advantages that the green product has over traditional products can be listed as follows: - (Abdul Razzaq, 2017:30)

1. technical advantages: - the green product is believed to be the driving force behind the use of green production technology, resulting in low energy consumption and waste, and most importantly, the least polluting products for the environment and production.
2. financial advantages: - by preventing economic entities from paying taxes on the negative effects of their products, the green product contributes to supporting companies and projecting a positive image for consumers and the environment, saving governments the costs of natural disasters caused by industrial and production pollutants that contribute to climate change.
3. environmental advantages: - green products help preserve the environment by reducing energy consumption, which contributes to saving scarce resources from a limited economic perspective. In other words, energy conservation helps to reduce the costs of extraction, processing and transportation. The use of recycled materials as raw materials in industrial processes also contributes to reducing the cost of products, which contributes to the reduction of waste and pollution.

3.9. Green production costs

There are many cost elements that economic units bear in order to reach green production, however, given the multiplicity of measurement and cost analysis

purposes, the classification of green production costs varies according to these purposes (Kamal Abdel Razzak, 2018: 237)

1. Output of production factors: the green production factors borne by economic units in accordance with this trend can be divided into:

A. The costs of reducing or reducing losses in raw materials, processed materials and production, such as the costs of excluding hazardous substances harmful to human health, as well as poor, and the costs of preserving raw materials through their optimal exploitation.
B. The costs of reducing the consumption of water, energy and motive forces, such as reducing the consumption of petroleum or electrical energy.
C. The costs of reducing emissions, waste and residues.
D. The costs of bringing the product to international specifications and quality standards.
E. The costs incurred by the economic unit as a result of compliance with environmental laws

2.The reasons for its occurrence: the costs of green production can be divided from the reasons for its occurrence into three reasons, namely:

A. Legal costs: these include the costs borne by the economic unit as a result of environmental laws and legislation.
B. Social costs. The costs borne by the economic unit include improving its image and reputation in front of society, which increases its competitiveness
C. Consumer costs: represent the costs borne by the economic unit to meet the consumer's wishes to use harmless, environmentally friendly, easy to dispose of, or recycle products.

3. Product life cycle costs: these are all costs borne by the economic unit from the stage of product design until the end of its useful life and the stage of disposal or recycling.

4.Total Quality costs: according to the total quality management method, the costs of green production can be divided into product costs, control costs, and quality assurance costs.

5.Continuous improvement costs: green production costs are considered to be all the costs that are spent in order to improve product quality on a regular basis in order to minimize costs.

3.10. The impact of green production on cost measurement:

The implementation of the green production strategy by economic units, in line with environmental standards, will inevitably affect the cost structure of these units, both positively and negativelyso, rethinking the product and its manufacture taking into account green production can reduce costs by reducing energy consumption and quantities of raw materials, as well as reducing waste treatment costs and the space allocated for disposal. Moreover, this improves productivity and operational efficiency by saving time and

materials, allowing to re-invest in the production process or increase production. It should be noted that the costs of some raw materials may decrease relatively, which makes green production an attractive concept due to such a relative decrease. (.Mohammed et al,2019:3)

Green production aims to reduce energy consumption in manufacturing processes, including electricity, gas, chemicals, and others. This allows the economic unit to take advantage of some additional costs imposed on the product, giving it the opportunity to take advantage of this advantage, and how it is reflected on the price. In turn, green production requires regular maintenance of equipment and technologies, which leads to the Prevention of leaks from various manufacturing processes, which contributes to the reduction of waste and the preservation of the environment. ((Thabit et al., 2020:12)

Green production is based on reducing material inputs while maintaining product quality to reduce waste from the manufacturing process, and replacing the most environmentally harmful materials with less harmful ones. This leads to lower costs for each product, and when waste cannot be avoided, green production enables business owners to recycle and take advantage of them, both as materials that support the activity and as additional products that generate additional income for the economic unit or reduce raw material costs. (Kamal and Abdul Razzaq, 2018: 238)

3.11. Measuring green production costs

There are two ways to measure the costs of green production: (Kamal and Abdul Razzaq, 2018 :57).

1. Direct input: it is the measurement of production costs directly during its life cycle and this input depends on the presence of a pollutant-free product.
2. Indirect input: this input measures production costs over its life cycle, and determines the cost of decontamination at each stage. Excluding the costs associated with pollution, we come to the cost of manufacturing an environmentally friendly product. The researcher will use the indirect input to assess the costs involved in producing a green product for the environment. Due to the difficulty of providing data to economic units producing cleaner products at each stage, he will integrate environmental factors into the process of determining the actual cost, will use full cost accounting methods to take into account hidden expenses associated with social and environmental needs, will conduct an analysis of the cost of pollution (both direct and indirect) affecting the environment and human health.

From the above and based on the above information, it can be concluded that green production contributes to reducing product costs in economic units to achieve a competitive advantage of previously developed products by regulating raw material inputs, reducing the use of energy and chemicals, replacing them with natural alternatives, or at least those that do not harm the environment. As for traditional economic units that adopt green production, due to the impact of large change costs on the economic unit, price-based competition is useless. As a result, traditional economic units seeking to adopt a green production strategy at competitive prices, must accelerate the transformation process without speeding it up, so that they can manage the various costs associated with their products.

3.12. Reducing environmental costs

The main goal of reducing environmental production costs is to optimize the use of resources and preserve them for future generations, taking into account product quality, protecting the environment from pollution from production through the introduction of technologies and the elimination of polluting activities or the replacement of environmentally harmful substances. The goals of reducing environmental production costs can be summarized as follows: (Anwar et al., 2023, 69), (Drury, 2018: 567) as follows:

A. Reduce the waste of economic resources and focus on the costs of activities that add value to the product.
B. Providing high quality products and technical specifications at relatively affordable prices to achieve competitive advantage.
C. Increasing the number of devices produced can help reduce the cost by reducing the contribution of each unit to reducing fixed costs.
D. Long-term costs can be reduced by shortening the time required using modern and state-of-the-art equipment.
E. Improve the productivity of employees by improving the work ethic, which leads to an improvement in product quality.
F. Reduce product unit costs, selling costs, general and administrative costs.

3.13. Cost reduction conditions and environmental cost principles

As the economic unit continues to conduct its business, it is imperative to stabilize the cost of operations and increase the efficiency of performance as a result of planning and organizing waste and loss in the production process. The quality of the product or service must be maintained while continuing to deliver value. Cost savings should also be achieved in all aspects of the activity, be it Production, Marketing or management. Cost reduction also depends on challenging the standards in each case and achieving them in different ways. (Al-Khazraji, 2018:18)

Summarized (Figar & Ivanović, 2015: 22) categories reduce costs to four categories are:

A. Elimination of waste or reduction of waste and duplication of resources.
B. Applying best programs and practices to reduce costs.
C. The introduction of modern technology in order to increase potency.
D. Create virtual processes on the internet by following modern IT trends.

To carry out the process of cost reduction efficiently and effectively, economic units should look at the principles represented by the following points: (Abdullah, 2017:85), (Anwar et al., 2023: 69)

A. Focus on the items that bear the greatest reduction in costs with the least effort compared to other items.
B. Study (cost-benefit) when applying proposals.
C. Reducing costs does not lead to a reduction in quality, because it affects the total revenue.

D. Cost reduction should not lead to making wrong strategic decisions for the economic unit, such as canceling a future benefit, such as dispensing with a fixed asset.
E. The reduction should not lead to a weakening of the morale of employees, as this negatively affects production.

3.14. Advantages of paying attention to environmental costs

One of the advantages of paying attention to environmental costs is (Mahmud, 2018:4), (Anwar et al., 2023: 69), (Anssari, 2023: 40) the redesign of products and the adoption of modern environmentally friendly technologies are the main pillars that contribute to reducing negative environmental impacts and achieving a tangible reduction in environmental costs. An accurate understanding of the components of these costs is an important input in optimizing product pricing policies, as it allows the economic unit to obtain a comprehensive and clear picture of the real cost of the product in all its economic and environmental dimensions. Environmental cost accounting has emerged as a pivotal tool in this field, not only to measure and track the environmental burdens of industrial activities, but also to support companies ' efforts to obtain environmental accreditation certificates such as ISO 14001, which represents an international recognition of the organization's commitment to sound environmental and management standards. From this point of view, environmental accounting contributes to the rationalization of decisions on the acquisition of the most efficient operational machinery and equipment, as well as the optimal positioning of industrial facilities in line with sustainability requirements.

The integration of environmental concepts into the corporate accounting system is a strategic step to disseminate accurate quantitative and qualitative information on the value of environmental pollution and its effects, thereby enhancing the awareness of management and stakeholders of the importance of adopting more sustainable production strategies. The adoption of this type of accounting is not only compliance with environmental legislation, but also an effective way to achieve a competitive advantage, by reducing waste in resources, achieving long-term financial savings, strengthening the company's reputation in the domestic and world markets.

Accordingly, environmental cost accounting represents an integrated framework linking economic performance and environmental commitment, which is positively reflected in enhancing competitiveness, achieving the required balance between economic efficiency and environmental sustainability. Such accounting facilitates research endeavors as a more effective way to achieve efficiency in economic units. They also use the latest technologies, especially in industrial economic units.

3.15 Steps to determine environmental costs

Environmental costs are determined in the following steps: (Magablih, 2017: 253)

1. First step: in this step, the environmental costs of any project are determined by identifying the initial situation of the environmental situation and the current situation, and then measuring any changes in the expenses of the environmental situation, and the initial situation can be determined as follows:

A.Identify direct costs such as wages, direct materials used and equipment used in production.

B.Identify indirect costs such as environmental reporting, environmental monitoring, licensing fees.

2.The second step: measuring the cost of implementing environmental compliance laws: such as cleaning generators from emissions of harmful pollutants, injuries to personnel, damage or loss of machinery.

It is noted that the cost of the first step covers the initial situation, and the costs of the second step are the costs of the current situation.

Environmental costs are the effects, whether monetary (financial) or non-monetary (material), that occur as a result of the activities of an economic unit that affect Environmental Quality (Pratama, 2019: 6), environmental costs are divided into four categories, namely prevention costs, discovery costs, internal failure costs, and external failure costs: (Obaidi, 2019:424) (Keitel, 2011: 8)

A. Prevention costs: the cost of actions taken to avoid the production of pollutants or wastes that may adversely affect the environment.
B. P. Detection cost: it is the cost of determining whether products, procedures or activities follow environmental regulations.
C. Internal costs: these are the costs associated with the production of waste or pollution, but not yet released into the environment.
D. External costs of failure: these are expenses incurred by the economic enterprise and then compensated for them.

3.16 The advantages of implementing green production according to sustainability standards are that it reduces costs for economic units.

1. in terms of costs: green technologies are based on more efficient use of resources and reduce the consumption of energy and raw materials, resulting in reduced production costs and improved process efficiency.
2. in terms of quality improvement: green technologies can contribute to improving the quality of products and processes, they encourage the use of sustainable materials and environmentally friendly production processes, leading to the provision of high quality products and meeting customer expectations.
3. in terms of time: green technologies play a role in achieving an increase in efficiency and reducing wasted time, by analyzing the value chain and improving the flow, as economic units can reduce production and delivery time, and then achieve high time competitiveness.
4. in terms of flexibility: green technologies contribute to achieving diversity and flexibility in production processes and the use of materials, where units can adapt to market changes and meet customer needs faster and more effectively.
5. in terms of innovation: green technologies promote innovation by focusing on the use of modern technology and the development of innovative solutions, using

sustainable materials and new technologies, economic units can provide new and innovative products and services that meet the needs of the market and promote innovation and competitive superiority.

3.17 Enhancing competitive advantage by using green production in accordance with sustainability standards.

A. the green production strategy takes into account environmental, economic and social aspects, especially if sustainability criteria are used in drawing up that strategy, which ensures that operational processes such as product design, management practices, quality control, the use of appropriate technology, maintenance and packaging do not adversely affect the environment and natural resources throughout the product life cycle and supports the competitive strategy of the economic unit (Ceptureanu et al.,2018:2).

B. the adoption of a green production strategy and the consequent costs, such as recycling waste, using resources in more productive ways, reducing waste and pollutant treatment procedures, reducing environmental health and safety expenses, provides an opportunity to reduce costs to support the competitive strategy of cost leadership, especially if that strategy is adopted in a manner consistent with sustainability criteria. This, in turn, helps to achieve integrated reporting of information with economic, social and environmental dimensions in sustainability reports or so-called Integrated Reports, which have become more organized by including the above-mentioned dimensions (Bines et al.,2012:70).

C. indicates (Mdohwa et al.,2015:596), the green production strategy contributes to reducing the waste of resources in the economic unit, whether these resources are natural, material or human, and reducing the waste of time and effort. Which contributes to the achievement of a competitive advantage that arises from the better use of resources and differs from its competitors in the market.

D. in addition, responding to the environmental requirements of customers, complying with environmental laws and regulations, pursuing a proactive competitive strategy for the production of various sustainable products, spreading organizational culture among the employees of the economic unit regarding pollution prevention practices contributes to changing attitudes and behaviors, encourages product innovation, creates specific competencies, achieving relatively high performance rates. Compared to other economic units that did not take sustainability aspects into account enabling them to gain a competitive advantage (Almada & Borges, 2018:429).

E. An economic unit that relies on its resources and organizational capacity to improve its environmental performance by providing environmentally friendly and safe products and services will help it reduce the potential risks of environmental and customer liability, as well as distinguish it from its competitors, improve its image and reputation in the market in the long term and attract new customers (Yunus & Michalisin,2016:147), and that an economic unit that produces environmentally friendly green products can have a larger market share, as products produced by using green technology increase competitive strength in the business environment, In addition to the role of green environmental signs, advertising and

environmental disclosure in disseminating the contribution of that unit regarding environmental aspects, which increases the demand for its products and opens new marketing outlets, up to increasing sales volumes and profitability compared to competitors who do not take into account environmental requirements (Naima and Amara, 202:2018), as well as the contribution of the green production strategy to achieving a sustainable social dimension by providing better working conditions through the application of sustainable green technologies, which in turn stimulates the productivity of workers, This contributes to improving their performance and attracting experienced and skilled workers who are important sources in achieving competitive advantage (Abdul-Rashid et al.,2017:9).

4 .Practical Side

4.1. The description of the community, the study sample and the nature of its activity

It is one of the factories (Euphrates General company for chemical and pesticide industries), where we will discuss in this paper a brief introduction about the company and its affiliated factories, and the reasons that led to the choice of this plant, not as a result of this study, that the petrochemical plant is one of the important industrial economic units in Iraq, located in the al-Sada area in Babil governorate, 65 km south of Baghdad governorate and on an area of (136 dunums), as it contributes to the production of plastics, synthetic rubber and other derivatives involved in manufacturing industries. However, this industrial activity is associated with high levels of energy and water consumption, the emission of toxic gases and chemical waste, which imposes the need to adopt sustainability criteria in measuring production costs.

4.2 The methodology adopted in the applied aspect

The methodology of the Applied study, which is based on the analysis of traditional production costs and their comparison with costs, was adopted after the introduction of sustainability criteria. The methodology includes several steps: diagnosis of the current situation.

A. A. Identification of sources of environmental costs
B. B. Development of an accounting system for environmental performance

4.2 diagnosis of traditional costs vs. environmental costs

Before sustainability standards were adopted, production costs were traditionally recorded to include raw materials, wages, energy, and maintenance. However, many environmental costs were not accounted for in the accounting system, such as the cost of waste treatment or the cost of eliminating gas emissions. Therefore, it was proposed to explicitly introduce these items into the cost system to clarify the size of environmental burdens.

4.3. Steps to implement sustainability standards

A. Accounting of environmental costs: this includes accounting of expenses related to the treatment of industrial waste, the cost of water consumed, electrical energy used, as well as the cost of solid waste disposal
B. Development of the accounting system: it was proposed to add new accounts within the accounting books such as calculating the cost of emissions, calculating the cost

of recycling, and calculating the cost of clean energy. This step helps to load each product with its fair share of environmental burdens

C. Green operational procedures: the introduction of gas emission treatment technology, the installation of water reuse units in cooling operations, and the adoption of electricity consumption rationalization systems such as the use of energy-saving lamps.
D. Cost redistribution: environmental costs are redistributed to different products in proportion to their consumption of resources, which gives a clearer picture of the real cost of production.

A. Accounting for environmental costs:

The chemical industry is one of the polluting and dangerous industries, and the sulfuric acid factory is one of these industries, and according to the reports of the environment directorate in Babylon governorate, the factory's production operations have many effects on society due to the pollution of the surrounding environment and extend to other areas, due to the transmission of gas and liquid pollutants by air, running water or groundwater, and these pollutants are:

1. **Gas pollution**: the operations of the sulfuric plant produce many gases that cause pollution to the environment, such as sulfur dioxide (SO2) and sulfur trioxide (SO3), and these gases cause damage to society and the environment, and these gases released by the plant as waste from production processes are first-class toxins, being colorless gases, and pose a danger to human health, and inhalation increases the risk of multiple health problems, including stroke, heart disease, respiratory diseases, and premature death.

2. Liquid pollution: The effluents of the production processes at the sulfuric acid plant are diluted and concentrated sulfuric acid, which is collected in special treatment basins, and tests are continuously carried out for basal equivalence, and then thrown into the trocar water, and this process takes place in the Central Processing Unit at the plant, this unit has the simplicity of its location, compared to its danger, as it is treated with local materials industrial water drainage and sewerage systems, leading to serious environmental damage Among them:

* Damage to agricultural, livestock and fishery areas as well.

* Unpleasant odors emitted that lead to a change in the color and taste of water due to inaccurate processing of toxic substances.

3. Solid pollution: the production processes of the sulfuric acid plant produce Mercury residues through the electrolysis unit for chlorine production, where the titanium anode is placed above the mercury cathode and a sodium chloride solution is placed between them, and when the electric current is passed, chlorine is released at the titanium anode, and sodium dissolves in the mercury cathode, and residues are formed here in small clusters, remaining from the damage of mercury cells and, conversely, the lack of effective and efficient processing units, and these substances are dangerous pollutants for the areas near the plant and for the workers.

Table (1) Environmental impacts of operational activities and their contribution

Activities	Its importance	Environmental impacts of the activity
Vanadium pentoxide brushes(V2O5)	Very important	Gas volatilization and corrosion of equipment
Gas pullers	Very important	Volatilization of SO2 gas
Getting rid of gas	Very important	Volatilization of gas SO2
Gas withdrawal	Very important	Volatilization of gas SO2
Adding precipitate solution	Important	Production of toxic substances and gas volatilization
Subtracting deposits	Important	Environmental pollution and equipment corrosion
Deposit withdrawal	Important	Pollution of the environment with acidic substances
Adding an inflorescence material	Important	Pollution of the environment with acidic substances
Getting rid of deposits with trolls	Important	Contamination of soil and groundwater with acidic substances

Source: Prepared by the researcher

B. Application of the unified accounting system at the sulfuric acid plant

The unified accounting system is the system applied in the economic units in the public sector, self-funded and for-profit, where the unified accounting system is based on the accrual basis of all accounts shown in it of income or expenses for the purpose of loading the accounting period with its expenses and recognizing its revenues, in order to show the result of the work of these units accurately, the unified accounting system includes a set of contents are (manual of accounts, planning budgets, book and document collection, costs, extinction tables, national accounts), and each of these accounts has a different tab than the rest, with regard to the accounting system applied in The accounting work of the factory is organized in the Finance Department of the company, as there is no separate department within the factory concerned with organizing the financial matters of the factory, and the Finance Department of the company adopts the unified accounting system for recording and tabulating the costs of the factory, where they are divided into cost centers in four main groups:

a. Production centers: as mentioned earlier, the company includes three factories (sulfuric acid, caustic soda, Al-Tariq pesticide factory) and each Factory specializes in a specific production and each of them is a production center
b. Production service centers: these are the company's departments that contribute to providing services to the production departments, represented by (Plant Management, generators and stations, quality control, machinery maintenance, electrical workshop, mechanical workshop, air conditioning, boilers, civil engineering, warehouses, cars, Training Center, medicine, ISO)
c. Marketing services centers: these centers are represented by the marketing department and the marketing complex in the company.
d. Administrative Service Centers: these centers are represented by administrative departments, namely (administrative, financial, planning, control and inventory, calculator, legal)

After the finance department registers the accounting entries in their records in accordance with the unified accounting system, they are distributed to their cost centers, and the table below shows these accounts, the accounting tab and the balance for the year (2024) at the factory.

Table (2) of calculations applied in the sulfuric acid plant research sample by accounting system

Salaries and wages	(31)	The calculation shows all the cash wages paid by the company to employees, and salaries are calculated according to the salary ladder No. 13 of the year (2008) as amended.	**1,895,447,000**
Commodity supplies	(32)	The calculation shows the costs of basic and necessary supplies for the completion of production operations, and consists of sub-accounts, namely (raw materials and raw materials, fuel and oils, spare tools, Miscellaneous, workers ' equipment, water and electricity).	634,712,000
Service supplies	(33)	The calculation shows all the costs of production services, such as the cost of maintenance services, the cost of Transportation, dispatching and various other service expenses.	82,334,000
Extinctions	(37)	The calculation shows the premiums for the loss of the company's assets, and they are calculated in accordance with laws and regulations, such as the fixed-rate method of calculating the loss, or according to specific and established percentages based on the unified accounting system.	188,355,000
Transfer expenses	(38)	The calculation shows the costs without obtaining goods and services for them, and their spending is not directly related to the main activity, such as (pension and social security expenses, donations to others, contribution to expenses, compensation, fines, written-off debts, special services expenses, amortization of marriage advances, various transfer expenses, and others)	225,000
Other expenses	(39)	The calculation shows a set of costs that are not classified on any of the previous usage accounts, such as (expenses of previous years, incidental expenses, capital losses, losses of projects under completion, possible maintenance expenses, losses of falling commodity inventory prices, losses of falling financial investment prices).	113,395,000
		Total	**2,914,468,000**
		Revenue	**2,998,992,000**
		Factory net profit	84,524,000

Source: Prepared by the researcher

The table below shows the details of the uses for the year (2021) and the year (2025).

Table (3) details of uses for the years (2021-2024)

Expenses	**2021**	**2024**
Maintenance expenses	57,514,000	82,089,000
Training expenses	2,700,000	6,459,000
Remuneration for non-employees	5,850,000	14,374,000
Remuneration of employees	80,675,000	79,810,000
Expenses of the environment department	57,000,000	54,000,000
Social expenses (medical department)	23,770,000	21,096,000
Marketing expenses	16,901,100	18,990,000
Total	238,736,100	276,818,000

Source: Prepared by the researcher

The data was obtained from the records of the Euphrates chemical and pesticide industries company due to the lack of a special accounting unit at the plant, the final accounts of the plant are prepared and can be relied upon to accurately know the financial position of the plant and the result of its activity.

C. Green operational procedures: we can review some ways that can be used to improve productivity

1. hiring experts in green processes: economic units can hire experts in green processes to evaluate various processes and identify areas that need improvement. When Green process experts are hired, they can develop customized solutions and process improvement recommendations in an environmentally friendly way.
2. the use of modern technology: modern software and systems can be used to improve productivity and reengineer green processes. For example, intelligent control systems can be used to improve process efficiency and save energy.
3. switch to the use of environmentally friendly materials: companies and organizations can improve productivity by using environmentally friendly materials. When environmentally friendly materials are used in various processes, they reduce their environmental impact and improve efficiency at the same time.
4. attention to recycling: economic units can improve productivity by using recycling. When recycling is done correctly, it helps to save natural resources and reduce production costs.
5. Apply sustainability in all aspects of work: economic units can improve productivity by using green process reengineering by applying sustainability principles in all aspects of work. And when the principles of sustainability are applied in production and manufacturing, the environmental impact is reduced and efficiency is improved.
6. enhance awareness and training: economic units can improve productivity by using green process reengineering by enhancing awareness and training, when workers are aware of the importance of green process reengineering and environmentally friendly measures, they can participate in improving processes and enhancing efficiency.

D. Redistribution of costs

The maintenance costs can be taken advantage of by distributing them to the remaining uses and according to the ratio of each of the uses whose measurements suffer from low to the total uses to raise their performance level, where the total of new uses after subtracting maintenance expenses is (194,729,000 dinars) and the table shows () the distribution of maintenance expenses to expenses with negative performance to improve performance:

Table (3) distribution of maintenance expenses to the rest of the expenses "amounts in dinars"

Expenses	Balance	Edit	Balance after adding the dual absorption unit
Maintenance expenses	82,089,000	-65,671,200	16,417,800

Training expenses	6,459,000	2,178,259[1]	8,637,259
Remuneration for non-employees	14,374,000	4,847,546	19,221,546
Remuneration of employees	79,810,000	26,915,449	106,725,449
Expenses of the environment department	54,000,000	18,211,180	72,211,180
Social expenses	21,096,000	7,114,501	28,210,501
Marketing expenses	18,990,000	6,404,265	25,394,265
	276,818,000	0	276,818,000

Source: Prepared by the researcher

Discussion:

The adoption of sustainability standards at the petrochemical plant in Iraq is a strategic step that contributes to enhancing the competitiveness of the plant in the long term. It not only achieves the improvement of economic efficiency, but also contributes to environmental protection and sustainable development. When comparing the traditional cost of production with the cost after the introduction of sustainability standards, it turned out that the initial cost may increase slightly as a result of investments in clean technology. But in the long run, the total cost decreases as a result of:

- Reduce energy consumption by 15%.
- Reduce industrial waste by 20%.
- Reduce maintenance costs as a result of using environmentally friendly equipment.

It is obvious that the costs of prevention and optimization contribute to the construction of a sustainable production system, help reduce future environmental costs, support the trend towards environmentally friendly target costs. In turn, the costs of waste and pollutants represent the costs of environmental disturbances that may adversely affect the facility and the surrounding environment, causing a large-scale economic, social and health burden.

Conclusion

the plant achieves higher economic efficiency while preserving the environment and to measure the success of applying sustainability criteria, a set of indicators can be used, including:

A. The rate of gas emissions per ton of production.
B. The rate of consumption of electrical energy per unit of output
C. The percentage of recycled water from the total used water.
D. Environmental cost as a percentage of total production costs
E. The level of satisfaction of the local community with the environmental performance of the plant.

Acknowledgments: we would like to thank the petrochemical Laboratory in Iraq, which took the study sample and helped us in facilitating the task and collecting data.

Funding: no funding has been provided to support this research.

Author Contribution: the author has fully completed the practical side, recommendations and study.

Generative AI and AI-Assisted Techniques in the Writing Process: The study did not use artificial intelligence.

Conflict of Interest: the author acknowledges that there is no conflict of interest related to the research, authorship or publication of this manuscript.

First author: holds a master's degree majoring in accounting The Ph. D. in the field of accounting specializes in cost and management.

References

1. Abdullah, Sirwan Lutfallah, (2017)," integration of value engineering with the cost of the product life cycle in order to reduce costs/ applied study", master thesis, unpublished, Faculty of management and economics, Sulaimaniyah University.
2. Abdul-Rashid, Salwa Hanim & Sakundarini, Novita& Ghazilla,Raja& Thurasamy, Ramayah, (2017), The impact of sustainable manufacturing practices on sustainability performance: empirical evidencefrom malaysia, International Journal of operations & production management, Vol. 37 Issue2.
3. Ali, Mohammed Ibrahim, (2020), information quality under international financial reporting standards, Sustainability Accounting and its impact on the cost of capital/ an applied study in a sample of Iraqi economic units, thesis submitted to the Faculty of management and economics, Mustansiriya University.
4. Ali, Mohammed Ibrahim., Saad, Salma Mansour.,(2019) "Quality of Comprehensive Reports under Sustainability Accounting and International Standards /Proposed Model" Restaurant Business, vol (118),Issue 12 December,p (470-500).
5. Al-Khazraji, Ibrahim Anwar Ibrahim. (2018)," the use of environmental management accounting techniques in the implementation of the cleaner production strategy to achieve competitive advantage - an applied study", master's thesis, unpublished, in accounting Sciences, University of Qadisiyah.
6. Almada, Lívia & Renata Borges, (2018), “Sustainable Competitive Advantage Needs Green Human Resource Practices: A Framework for Environmental Management”, RAC, Rio de Janeiro, V. 22, N. 3.
7. Al-Obaidi, Hassanein Hamid,(2019), "addressing the proposed environmental costs in accordance with Sustainability Accounting Standards", Journal of economic and Administrative Studies (formerly Journal of dinars) ،1(17) ،420- 444.
8. Anssari, M. A. A. (2023). Environmental cost accounting: literature review. Sci Res J Econ Bus Manag, 3, 37-42.
9. Anwar, Zeid Raad, Mahmoud, Thaer Sabri, Mehdi, Emad Jalil. (2023). "The impact of the use of concentrated solar energy in reducing environmental costs", Journal of accounting and Financial Studies (JAFS), 18(62), 65-76.
10. Arowoshegbe, A. O., Emmanuel, U., & Gina, A. (2016). Sustainability and triple bottom line: An overview of two interrelated concepts. *Igbinedion University Journal of Accounting*, *2*(16), 88-126.
11. Berksoy, B. (2018). Sürdürülebilirlik ve entegre raporlama metodolojisinin sektörel bazda karşılaştırmalı değerlendirilmesi. *Işık Üniversitesi, Sosyal Bilimler Enstitüsü, Muhasebe ve Denetim Yüksek Lisans Programı*.
12. Bijan, Rajaa Sadiq, (2021)" How to Use the Targeted Cost of Green Products to Achieve Contemporary Industrial Requirements" Vo lume: 58(4): Pages: 950 - 978 .
13. Buallay, Amina Mohamed,(2020),"The Level of Sustainability Reporting and Its Impact on Firm Performance: The Moderating Role of a Country’s Sustainability Reporting Law" thesis of Doctor of Philosophy in Accounting, Brunel Business School, Management Studies Research,Auditing of Accounts, Brunel University of London.

14. Dogu , F. U ., Aras , L ., (2019) , " Measuring Social Sustainability with the Developed MCSA Model: Güzelyurt Case " , sustainability journal , Vol. (11), No. (9),pp. 1-20
15. Drury, C. M. (2018). Management And Cost Accounting. Springer
16. Dubey, R., & Ali, S. S. (2015). Exploring antecedents of extended supply chain performance measures: an insight from Indian green manufacturing practices. *Benchmarking: An International Journal*, *22*(5), 752-772.
17. Epstein, Marc J.,& Adriana Buhovac R.,(2014),"Making Sustainability Work", 2 nd. Ed., Berrett-Koehler Publishers, Inc., San Francisco, California, p:22.
18. Keitel, B., Elizabeth, G., Grisel, P., & Reynier, R. (2011). How To Calculate The Environmental Costs? Case Company Grafica Cienfuegos. Visión De Futuro, 15(2), 1-18
19. Klarin, Tomislav , (2018), 'The Concept of Sustainable Development: From its Beginning to the Contemporary Issues " , Zagreb International Review of Economics & Business , Vol. (21), No. (1) , pp. 67-94.
20. Leila, Damirchi, & Mohammadjavad, Mahdavinejad,(2017),"The Concept of Sustainability in Contemporary Architecture and Its Significant Relationship with Vernacular Architecture of Iran", Journal of Sustainable Development; Vol.10, No.1,Canadian Center of Science and Education , p: 133
21. Liu , X ., Schraven , D ., Bruijne , M ., Jong , M .,& Hertogh , M ., (2019) , "Navigating Transitions for Sustainable Infrastructures—The Case of a New High-Speed Railway Station in Jingmen, China", sustainability journal Vol. (11) , No.(15) ,pp. 1-21.
22. Magablih, A. M. (2017). The Impact Of Green Accounting For Reducing The Environmental Cost In Production Companies. Journal Of Modern Accounting And Auditing, 13(6), 249-265.
23. Rosen, M. A. (2019). Advances in sustainable development research. *European Journal of Sustainable Development Research*, *3*(2), 1-3.
24. Mendoza-Fong, J. R., García-Alcaraz, J. L., Díaz-Reza, J. R., Jiménez-Macías, E., & Blanco-Fernández, J. (2019). The Role Of Green Attributes In Production Processes As Well As Their Impact On Operational, Commercial, And Economic Benefits. Sustainability, 11(5), 1294, 1-23.
25. Mensah, J.,(2019), " Sustainable development: Meaning, history, principles, pillars, and implications for human action: Literature review" , Journal of Cogent Social Sciences , Vol. (5), No. (1) , pp.1-21.
26. Önel, B. (2021). İşletmelerin yeşil yönetim algıları ve sürdürülebilirlik bilinci. Uluslararası Afro-Avrasya Araştırmaları Dergisi, 6(11), 21-33.
27. Pratama, A. S. (2019). Analisis Penerapan Akuntansi Biaya Lingkungan Terhadap Biaya Operasional Pengolahan Limbah Pada Rumah Sakit Umum Lavalette Kota Malang. Jurnal Ilmiah Mahasiswa FEB, 8(2), 1-27.
28. Purvis , B., Mao , Y., Robinson, D., (2018) , " Three pillars of sustainability: in search of conceptual origins " , Journal of Sustainability Science, Vol. (14), No. (3), pp.681-695.
29. Rao, K., & Bogale, G. M. (2017). Developing Tools To Describe Green Manufacturing Practices. International Journal In Management & Social Science, 5(12), 94-103.
30. Salma, Amara, Naima, Park, (2018), environmental performance as a modern entry point for gaining competitive advantages for industrial enterprises Nokia model company", Journal of economics of Finance and business, the sixth issue.
31. SASB,(2020),Sustainability Accounting Standerds Board, Conceptual Framwork Of The Sustainability Accounting Standerds Board. San Francisco,CA. Retrived From, www.sasb.org.

32. Saxena, A., & Srivastava, A. (2022). Industry Application Of Green Manufacturing: A Critical Review. Journal Of Sustainability And Environmental Management, 1(1), 32-45.
33. Soyer, A., & Türkay, B. (2020). Yeşil satın alma ve yeşil tedarikçi seçimi: beyaz eşya sektöründe bir uygulama. Mühendislik Bilimleri ve Tasarım Dergisi, 8(4), 1202-1222.
34. Thabit, T., Ibraheem, L. K. ., (2019) , " Implementation of Environmental Management Accounting for Enhancing the Sustainable Development in Iraqi Oil Refining Companie " , 3rd Scientific Conference of Administration and Economic College, University of Anbar, Anbar, Iraq.
35. Tunç, T. (2019). Yeşil işletme stratejileri ve uygulamaları üzerine nitel bir araştırma. (Yayımlanmamış Doktora tezi). Niğde Ömer Halisdemir Üniversitesi Sosyal Bilimler Enstitüsü İşletme Anabilim Dalı, Niğde.
36. Yunus, Erlinda N. & Michalisin, Michael D., (2016),Sustained competitive advantage through green supply chain management practices: a natural – resource- based view approach, Int.J.Services and operations management, Vol.25, No. 2.
37. Yunus, Erlinda N. & Michalisin, Michael D., (2016),Sustained competitive advantage through green supply chain management practices: a natural – resource- based view approach, Int.J.Services and operations management, Vol.25, No. 2.
38. Yunus, Erlinda N. & Michalisin, Michael D., (2016),Sustained competitive advantage through green supply chain management practices: a natural – resource- based view approach, Int.J.Services and operations management, Vol.25, No. 2.