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## The Role of Sustainability Accounting in Determining Waste Resulting from Production Processes Using a System SCADA

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### Abstract

The research aims to know the role of sustainability accounting in Define and reducing waste in the production process. Iraqi oil companies were chosen as a field for applying the study to determine the availability of sustainability dimensions in them, by measuring the costs of burning gas. Oil spills on soil and water explaining the financial implications resulting from this and disclosing them in a manner consistent with sustainability accounting standards. The research concluded that the dimensions of sustainability accounting contribute to reducing waste and loss in production processes through the application of a project system SCADA who collects data and monitors during the production process transporting petroleum products by oil pipelines.

**key words:** sustainability accounting, waste, production processes.

### Introduction

Sustainability accounting is one of the performance indicators that is no longer limited to the financial aspect only, but rather extends to the extent of its contribution to achieving sustainability represented by preserving the environment, achieving social welfare, and developing the economy, and given the environmental conditions of companies, whether industrial, service, or commercial, in order to remain in the labor market and maintain. Its customers had to adapt to modern environmental developments adopting advanced systems that help monitor and control the activities carried out by the company, and these modern technological systems participate through automation, cyber security, and the Internet of things.

### The first section: Research methodology.

#### First: The research problem:-

The research problem is focused on clarifying the role of sustainability accounting in identifying and reducing waste using a system SCADA which contributes to controlling the movement of various petroleum products that are transported by oil pipelines and tank cars, So the research problem represents a lack of the unified accounting system approved by the oil pipeline company due to the lack of sustainability accounts, In addition to a weakness in the speed of identifying and treating oil product spills, which It increases the amount of waste occurring, and this is due to a clear failure to implement and disclose the dimensions of sustainability.

#### Second: The importance of research:

The research derives importance from sustainability because it addresses environmental and social problems and achieves economic benefits that are reflected in the company in particular and the

country's wealth in general, and what the system achieves. SCADA from preserving petroleum products and reducing waste to its lowest levels, which is reflected in sustainability accounting through the disclosures and treatments it provides.

### **Third: Research objective:-**

The research aims to identify sustainability accounting and the possibility of its application in oil companies and its role in identifying and reducing waste, as well as the importance of applying the system SCADAA course in the company's activities.

### **Fourth: Research hypothesis:-**

A hypothesis was developed President of research she (The application of sustainability accounting in Iraqi oil companies under the system SCADA It will reduce wastage and waste operations productivity substantially).

### **Fifth: Sample and research community: -**

The research community is oil sector companies.

The research sample is an oil pipeline company, a public company. The company adopts the unified accounting system in accounting disclosure.

### **The second topic:-Previous literature and studies.**

Study focused (Ordu-2021) on the relationship between sustainability accounting and the performance of oil and gas companies. The researcher adopted the use of a population and a statistical sample and pointed out the necessity of establishing environmental accounting units to achieve environmental disclosure. The study (Augustine-2021) also focused on integrating the economic, social and environmental aspects of oil and gas companies and the lack of a clear vision focusing on sustainability. In the current study, the proposed mechanism was adopted in accordance with international accounting and financial reporting standards in a way that achieves compatibility and consistency with the unified accounting system.

The study also focused on (Barraza-2022) to discuss the concept of sustainability and analyze the goals of sustainable development. The researcher relied on collecting data from magazines indexed on the Internet, and sheds light on practices related to sustainability performance and the importance of understanding sustainability reports. The current study presented sustainability reports for the research sample companies according to SASB standards.

The study focused on (Sri-2023) on waste management in micro, small and medium-sized companies, and the environmental accounting strategy, and the researcher adopted the questionnaire. The current study addressed the three dimensions of sustainability, not just the environmental dimension. It also addressed waste at the level of giant companies in the field of oil and gas.

### **The third topic: -Sustainability accounting standards - theoretical background.**

#### **First: Sustainability accounting:**

#### **1- The concept and definition of sustainability:**

The concept of sustainability was created to address the balance of benefits to society in the economic, social and environmental fields. Sustainability represents a good framework for efforts to reach a good standard of living through economic and social development and the preservation of environmental resources without depleting them (Al-Qeeq,2010: 2).

I knew (WCED, 1987) Sustainable development is that which meets the needs of the present without compromising the ability of future generations to achieve their own needs.

## **2- Sustainability accounting:**

As defined by the Sustainability Accounting Standards Board (SASB) “refers to measuring, managing, and reporting sustainable activities that maintain or enhance a company's ability to create value over the long term” (SASB, 2017: 29).

## **3- Objectives of sustainability accounting:**

According (SASB, 2017:4) the objectives of sustainability accounting have been identified as follows:

- 1- The main goal of sustainability accounting is to disclose and measure the three dimensions of sustainability (economic, environmental, and social) in the organization, which is reflected in achieving sustainable development.
- 2-Corporate reporting must go beyond financial statements to facilitate the measurement and reporting of sustainability information to enhance decision-makers' understanding of key opportunities and risks.
- 3- Sustainability accounting has both predictive and confirmatory value and can be used as a complement to financial accounting to support decision-making or to evaluate past performance and future plans.
- 4- Help provide a more complete view of a company's performance in relation to key factors likely to impact its ability to create long-term value.

## **4- Dimensions of sustainability accounting:**

There are three dimensions to sustainability accounting:

### **1- Economic dimension:**

Decision makers need to make economic decisions that achieve environmental safety by setting physical limits on environmental damage resulting from economic activities. For example, imposing pollution taxes that are proportional to the amount of environmental damage caused, which is the best way to achieve maximum economic well-being while preserving environmental aspects (Muhammad And others: 2015,348).

### **2- Environmental dimension:**

It is the ability of the environment to continue to function properly, and leading the Code of Ethics means redefining the relationship between man and his surrounding environment. The goal of environmental sustainability is to protect the raw material resources used to meet the needs of the individual, reduce costs through economic efficiency, prevent the generation of waste, and benefit the organization by building Competitive advantage among competitors (Al-Zubaidi and Hamza, 2021: 83).

### **3- The social dimension:**

Disagreements about the nature, content, and limits of corporate social responsibility have hampered the development of sustainability accounting concepts in this area because public contributions, society, and human resources are included in the social dimension. Although the scope of corporate social responsibility is dynamic and there is no consistent guidance material, it

is recognized that companies fulfill their social responsibilities. Through consumer protection, community interaction and employee-related activities (Thaslim& Anthony, 2016).

### **5- The importance of sustainability:**

Determine the importance sustainability accounting is as follows :( SASB, 2019)  
(Hashim, 2011: 247)

- 1- Concern with social well-being, as well as the preservation of natural resources.
- 2- It takes into account human needs to improve their quality of life and works to take into account the rights of future generations to the available natural resources.
- 3- Reducing the factors that lead to environmental pollution and reducing the problems that lead to confronting development processes in developing countries.

### **6- Conditions for achieving sustainability in companies:**

It requires companies to achieve positive value that contributes to increasing the economic value of the country by resolving issues related to environmental and social activities, community service, and environmental protection activities imposed by government authorities, and through companies' success in reducing costs and enhancing Competitiveness, increasing sales value, maintaining customer and company reputation, and increasing profits generated through the activities carried out by the organization (Schaltegger, et al, 2012).

### **Secondly: -Wastage in production:**

#### **1- The concept and definition of waste:**

Indicates (Elbeck, 2018:119) refers to the concept of waste as “every human activity that consumes its resources without any actual benefit, such as the movement of workers or the movement of a commodity from one point to another without any real reason, or the occurrence of expectations at some stage due to a delay in a previous stage, or goods and services that do not match the needs of customers.”. As explained (Al-Jubouri, 2021: 76), waste “is the philosophy that leads to the concepts of reducing waste in logistical operations through the concept of lean, and it is identical with the philosophy of the Japanese company Toyota, but with different implementation approaches in terms of equipment, tools, machines, and techniques.” Also, lean management is based on arranging inventory and relies on customer requests to take production orders, i.e. what is called production on time, by eliminating waste in the company, which is represented by unnecessary movement of the worker, excessive production and errors, waiting lines, and excess inventory. (2022.Perdomo-Verdecia et al)

And he knew (Chiarini & Vagnoni, 2013:3) Waste is “any extra step that does not address and does not add value”.

#### **2- Types of waste:**

##### **1- Waste as a result of excess production:**

Producing items before they are actually needed leads to defects that are difficult to discover, and waste occurs in this type of production due to poor planning and the use of traditional cost accounting methods, where the number of units produced must be increased to cover indirect fixed industrial costs, poor communication, or automation in the wrong places (Kazim, 2014:4).

##### **2- Waste resulting from storage:**

Waste must be eliminated in the production process because waste costs the company a lot of money, and the space allocated for storage and storage costs do not add value. It causes delays in delivery from suppliers, imbalance in the production line, long preparation times for equipment and machinery, etc., and imposes unjustified costs on the company. (Krajewski, et.at.,2013: 329).

### 3- Waste resulting from defective products:

In order to reduce or avoid the occurrence of defective products, it is necessary to move from inspection processes that separate defective products from non-defective products to the stage of source inspection, as well as good training for workers (Al-Jubouri and Elias, 2018:142).

### 4- Waste resulting from waiting times for production:

The culture of reducing waste means reducing the increase in waiting times for the passage of semi-finished products and raw materials, reducing the long hours that individuals spend on the line before each production process and the time that individuals spend at work waiting for the work to finish and avoiding waiting times, through performing continuous periodic maintenance. After completing the work, the equipment and machines must be permanently ready. They must also employ individuals with work experience or who can train current individuals, through workshops either outside or inside the company. (Hines & Rich, 2013: 55).

### 5- Waste as a result of excessive movement:

Unnecessary movements in the production process, meaning the operator needs to bend and move a lot during work, and as a result, these actions carried out by the worker can lead to poor productivity and most likely to quality problems (Hines & Rich, 1997:94).

### 6- Waste resulting from operations activities:

“This type of waste can be addressed by establishing standard operating procedures for each machine, and training the personnel working on that with the aim of reducing incorrect operations with minimal damage.” (Bhasin, 2015:4).

### 7- Waste resulting from transportation:

Transportation leads to damage or damage to the quality of products, so the distances between work centers and stations can be reduced, in addition to eliminating the movements that the individual worker makes by taking a piece without adding positive value to the final product (Hines & Rich, 1997:94).

### **Third: - System project SCADA:**

The SCADA system project was chosen to be implemented, which is a data collection and control system (SCADA) (Supervisory Control and Data Acquisition) It is a computer system for monitoring and controlling operations that connects all of the company's work sites to a digital electronic system through which it is possible to monitor and follow up on the quantities of liquid gas received, whether through pipelines or tank cars, as well as accurately follow up on the quantities disbursed. The nature of these processes changes according to the systems prepared for them, and is connected to This system is located directly at the main center of the company, the research sample, the Oil Pipeline Company, a public company, and in the operations room of the Ministry of Oil, for the purpose of complete control and monitoring of all stages of transportation, storage, distribution, and all other production operations carried out by the company. This system also helps in converting all systems from mechanical to electronic, as well as monitoring Various maintenance operations and the quality control process and to achieve the highest levels of safety, (SCADA) is widely used in the oil and gas sectors, that capacity SCADA to collect data in multiple and remote oil and gas sites, it reduces the number of employees in the operation and supervision process and leads to improving the complex guidance and coordination of operations. The goal of introducing the SCADA system is to transform operations data into effective and timely decisions to contribute to the decision-making process by combining. The latest technological developments



and the basics of various sciences that enter into the oil industry. Despite the challenges witnessed by the oil industry, the focus is still on integration and automation due to its importance in increasing production, better planning, and finding ways to compete in global markets. Therefore, the system SCADA It is used to simplify operations, as better control and coordination of complex site operations means lower oil or gas production costs. In addition, the system helps SCADA In addressing issues of communication, security, mobility and the Internet of Things using the latest technologies, it includes capabilities SCADA (1) Collect data in real time (2) Control operations remotely (3) Store historical data.

That use SCADA It gives a feeling of security through the sensors that are used, which in turn give an alert according to each situation. Even if the employee does not see the alert on a library screen, an alert can be sent to the employee's phone or any other device he specifies, and in this case the production process is controlled, for example. The research sample company transports dry gas product from a factory LNG It is a laboratory specialized in receiving gas from oil production fields and isolating the dry gas from the rest of the other types of gas. The dry gas is then transported to electrical power generation stations distributed throughout Iraq. One of the disadvantages of dry gas is that this type of gas cannot be transported by tank cars or trains. Or stored in special tanks. The only possible way to transfer this gas from the source (oil production fields) to the electric power generation stations is through gas transportation pipelines operating in the Oil Pipeline Company. These quantities of dry gas that are transferred are often large, and are exposed to ( 1) Electric power generation stations cause malfunctions that affect the generation stations, which requires that these stations stop working, that is, stopping the consumption of gas. In this case, these stations burn the gas that comes to them through the pipeline because it is not possible to store dry gas, and it takes a considerable period to stop pumping through the pipeline. Gas transportation pipelines belonging to the Oil Pipeline Company. (1) Many cases of violations, theft, and corrosion of oil pipelines occur due to aging, which causes breaches in the pipelines transporting the gas product. Due to the long distance of these pipelines that cover Iraq from the ports in southern Iraq to its north, identifying violations requires time and causes a large waste of gas, which causes in large financial losses due to the loss of dry gas.

So he introduces a system SCADA When applied, there are great benefits through sensors and sensors that connect pumping stations, warehouses, electrical power stations, and valves on the conveyor pipes to the system SCADA Which determines the location of the penetration or stops the electric power stations receiving dry gas and converting it to burning within seconds, which allows for instructions to stop pumping and disconnect the valves distributed on the pipelines, which contributes to preserving the gas from wasting and quickly determining the location of the penetration and sending special teams for the purpose of treatment. This is reflected in to preserve the economic and environmental aspects and reduce waste to its lowest levels.

Market research conducted by the group reveals arc consultation about systems SCADA for the oil and gas industry market that systems SCADA It is evolving to better support the growing demand for field data in the most secure ways possible. Decision makers use supervisory control and data acquisition technology SCADA To help reduce operating and maintenance costs by reducing or eliminating waste, achieving sustainability in the production process, and linking production operations to business operations for a variety of purposes, including managing business performance and taking advantage of investments in current assets and systems to improve capital expenditures, as the market reflects. SCADA the global impact of the new

economic reality on components SCADA the most cost-effective communications for both data and knowledge transfer, and has been applied in the Arab Republic of Egypt to the company Petro gas Oil Company, with (110) sites, at a cost of (200) million Egyptian pounds.

**The fourth section: -The practical side:**

**The proposed mechanism for sustainability accounting in reducing waste using the system SCADA:**

**The proposed mechanism for sustainability accounting in reducing waste and loss:**

The proposed mechanism is based on flaw exists on the ground the violations resulting from theft, vandalism, and accidents resulting from the corrosion of oil pipelines, which cause fires and pollution that affect the air, water, and land, and the resulting material losses in oil products, and the impact of this on the company's profits and the state's public treasury. this mechanism consists of the following:

- **First side: The role of sustainability accounting using a system SCADA.**
- **The second aspect: Accounting for the economic, environmental and social aspects of sustainability.**

**First side: The role of sustainability accounting using a system SCADA.**

The unified accounting system adopted in oil companies does not have sustainability accounts. Therefore, for the purpose of establishing a sustainability reserve, sustainability accounts must be added in the upcoming updates to the unified accounting system, which requires changing the percentages that are distributed from the net operating profit stipulated in the Iraqi Public Companies Law No. 22 of 1997. For the purpose of calculating the cost of the project if it is implemented in the oil pipeline company, the cost of one site amounting to (48888000) (Forty-eight million eight hundred and eighty-eight thousand dinars) based on the cost of the system project SCADA It is applied in the Egyptian Petro gas Company, whose nature of work is identical to that of the Oil Pipeline Company, a public company. Therefore, the cost of the project is calculated after determining the number of production sites that must be connected to the system SCADA.

**Table(1)Government production sites affiliated with the Oil Pipeline Company and associated oil sites**

the total	Valves, gas plants, oil companies, and warehouses belonging to other companies	Refineries	Warehouses	Pumping stations	the site
97	69	8	15	5	the number

Prepared by researchers based on company data

Calculating the cost of one site for the Egyptian Petro gas company in Iraqi dinars:

The cost of the SCADA project ÷ the number of sites = the cost of one site

$5377680000 \div 110 = 48888000 \text{ Dinar.}$



Calculating the total cost of the SCADA project for the oil pipeline company:

Number of sites x cost of one site = total cost of the project

$97 \times 48888000 = 4742136000$  Dinar.

Calculating the annual extinction of the project according to the unified accounting system:

Annual extinction of the project  $= 4742136000 \times 10\% = 474213600$  Dinar.

Table (2) shows the products that the pipeline company transports through oil pipelines and tank cars and to demonstrate the economic feasibility of the project and the extent to which it achieves benefits for society and the environment. Therefore, reliance was placed on the company's data that shows the waste occurring in petroleum products for the year 2019.

**Table(2) Products transported by oil pipelines**

measuring unit	product name
Thousand cubic meters/km	White products
Thousand cubic meters/km	Black products
Thousand cubic meters/km	Crude Oil
Thousand cubic meters/km	Liquid gas
Million cubic meters/km	Dry gas

Prepared by researchers based on company data

**Table(3)The amount of dry gas wastage in 2019**

The time required to locate faults, according to technical authorities, ranges from one hour to a day	27,719,255 m3 for inspection work for maintenance purposes only	The amount of waste before implementing the system SCADA
The time required to locate faults after implementing the system is seconds to minutes	Only 500 m3 for the time required to disconnect the valves by the system	The amount of waste after implementing the system SCADA

Prepared by the researcher based on company data and technical authorities

The quantity indicated in the table is only for inspection and maintenance purposes and does not represent a small percentage of the waste occurring due to acts of corrosion and vandalism, in which the waste reaches huge quantities. Creating a special sustainability account (reserve/allocated) will contribute to achieving large financial returns that can be invested in Achieving the dimensions of sustainability, and The report of the Financial Supervision Bureau for the year 2019 indicated the cost of the amounts of waste and loss in petroleum products as a result of transgressions and acts of sabotage amounting to (7170000000) (seven billion and one hundred and seventy million dinars), and the cost of maintaining oil pipelines amounted to (1100000000) (one hundred and ten million dinars), meaning total losses ( 7280000000) (seven billion two hundred and eighty million dinars) affects the company's profits and thus the share of the state's public treasury. The application of the system SCADA It achieves economic and environmental sustainability by preserving the product through quickly sensing the presence of a breach or fire, which shortens the time of detection, speeds up the treatment process, and contributes to reducing pollution that occurs due to the burning of petroleum products or their spillage on the soil or in river water, despite the fact that quantities Wastage and losses vary

annually, but these incidents and violations continue, and therefore the management's decision to implement a draft system SCADA It must be approved, as the cost of waste and wastage for one year exceeds the cost of the project.

**The second aspect: Accounting for the economic, environmental and social aspects of sustainability.**

The environmental, economic and social aspects of sustainability will be accounted for according to sustainability standards (SASB).

Sustainability according to standards (SASB) On December 31, 2019

**1\_ Standard: EM-MD-110a.1 Unit of measurement (standard ton)**

Greenhouse gas emissions (Total global scale emissions No. 1), the amount of gas emissions equivalent to ( $CO_2$ )(1975.8) tons from liquefied gas (LPG used in cooking and home heating) (22729.7891) from dry gas used in generating electrical energy resulting from burning and firing gases in the air due to inspection and maintenance.

In the event of implementing a project SCADA the amount of burning gas will decrease, which will reduce waste and achieve sustainability dimensions because the sensors will be able to sound an alarm and determine the location of the breach or sabotage, which will shorten time and help quickly isolate and treat the fire are

**2\_ Standard EM-MD-110a.2: Unit of measurement (no/discussion)**

The company has not developed a short- or long-term plan to reduce greenhouse emissions resulting from inspection and maintenance operations or violations and vandalism, and there are no devices to measure the amount of pollution resulting from the combustion of gases.

**3\_ Standard EM-MD-120a.1:**

Emissions from the following pollutants: (1) Nitrogen oxide  $NO_x$  (except nitrous oxide  $NO_x$ ) (2) Sulfur oxide  $SO_x$  (3) Volatile organic compounds (VOCs) (4) Particulate matter (PM10).

The study was based on (Umukoro&IsmailK2017) in calculating sulfur dioxide  $SO_2$  Which was based on World Bank reports and General Electric Company reports, which estimated the amount of gas  $SO_2$  111 standard tons/year for every 10 m<sup>3</sup> of burned gas, and because the company is located next to the dour a Refinery Company, i.e. within the geographical area, even though it does not disclose emissions of pollutants, the dour a Refinery Company causes pollution in an amount (total gas  $SO_2$  Emissions from the company's refineries are 134 standard tons/year, according to Ali's study, 112:2021. As for the rest of the emissions of pollutants, there are no disclosures from the company.

**4\_ Standard EM-MD-160a.1 Unit of measurement (no discussion)**

Environmental impacts: The Company does not have a future plan, policies and practices to preserve the environment before pollution occurs, which was established by the International Finance Corporation regarding environmental and social sustainability.

**5\_ Standard EM-MD-160a.2:**

Land owned by a company and located within reserves: (zero %). There are no disclosures by the company.

**6\_ Standard EM-MD-160a.3:**

Disturbed and damaged land owned by a company: There are no disclosures by the company.

**7\_ StandardEM-MD-160a.4:**

Biodiversity sites owned by a company: There are no disclosures by the company.

**8\_ StandardEM-MD-520a.1:**

Competitive behavior: Total financial losses as a result of legal action related to pipeline systems (728 billion dinars).

**9\_ StandardEM-MD-540a.1:**

The number of oil pipeline accidents reported for the year 2019 is (59) resulting from corrosion, vandalism, and (30) fires inside and outside the company.

**10\_ Standard: EM-MD-540a.2:**

Natural gas pipelines and hazardous liquids that were inspected. The company performs regular maintenance of oil pipelines: (34) pipes were maintained for corrosion incidents in the year 2019.

**11\_ StandardEM-MD-540a.3:**

Accidents resulting from modern railway transportation: zero.

**12\_ StandardEM-MD-540a.4: Unit of measurement (no/discussion)**

Discussing management systems in safety culture and emergency preparedness throughout the value chain and throughout the project life cycle: There is no plan to manage the emergency safety culture for the projects you undertake.

**Researcher VI: Conclusions and recommendations:**

**Conclusions**

- 1-There are no special accounts for sustainability in the unified accounting system adopted in oil companies.
- 2-The reality of sustainability accounting in oil companies and the sustainability reports presented by them do not reach the stage of integrated disclosure, as they do not have specific goals and results.
- 3-Reducing waste and losses in production processes through implementing a system project SCADA achieve sustainable projects.
- 4-Sustainability accounting meets the needs of present and future generations as a result of the optimal exploitation of available resources through its dimensions.
- 5-The application of sustainability accounting standards results in providing integrated reporting of the company's performance.

**Recommendations**

- 1-Companies should propose adding sustainability accounts to the unified accounting system.
- 2- It is necessary to know the benefits achieved from sustainability and the large profits achieved if sustainability accounting is applied in the research sample company and in the rest of the oil sector companies.
- 3- The necessity of implementing a draft system SCADA for its many benefits, in addition to what was mentioned, it controls the movement of petroleum products even in tanker cars and prevents theft and tampering with the loads of these cars.
- 4- The need to pay attention to meeting the needs of current and future generations.
- 5-Sustainability accounting standards must be applied in order to achieve integrated reporting of the company's activities.

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