


The Role of Strategic Management Accounting Tools in Developing Accounting Measurement and Disclosure for the Effects of Climate Changes

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Abstract:

This research aims to study climate changes and know the international efforts made to reduce the negative effects of climate changes, and the impact of climate changes on management accounting and how to account measure and disclosure of information on greenhouse gas emissions, and to identify the role of strategic management accounting tools in developing the accounting measurement and disclosure of the effects of climate changes. The current study is the first, to the researcher's knowledge, to specifically examine the role of strategic management accounting tools in developing accounting measurement and disclosure for the effects of climate changes.

The results of the research showed that strategic management accounting, with its tools and methods, can help establishments identify and measure costs associated with climate changes, in addition to the possibility of allocating and distributing them to activities, products or the stages that cause them instead of merging them with the additional costs elements of the establishments, which methods and tools of strategic management accounting have contributed to their measurement and disclosure, and perhaps the most important of which is the sustainable balanced score card, which works to rationalize all internal and external decision-making processes related to the economic and environmental activity of these establishments.

Keywords :Climate changes, Global warming, Strategic management accounting, Accounting measurement and disclosure, Sustainable balanced Score Card.

1. Introduction:

Climate change and global warming are among the most important and difficult existing problems and the most dangerous. The reports of the Intergovernmental Panel on Climate Change (IPCC), an international organization affiliated with the United Nations, and the World Meteorological Organization (WMO) have confirmed that greenhouse gas emissions resulting from factories and fuel combustion as a source of energy and other main sources of the climate change problem (Kariffa, 2010).

The phenomenon of climate change is defined as an imbalance in the usual climatic conditions such as temperatures, winds and rain that characterize each region of the Earth. The magnitude of long-term climate change will lead to enormous impacts on the natural biological systems, global temperatures will also lead to changes in weather types such as wind patterns and precipitation, in addition to increasing the likelihood of extreme weather events, leading to unpredictable and wide-ranging environmental, social and economic consequences. (Ragab, 2012).

The process of accounting measurement of greenhouse gas emissions is one of the necessary accounting rules, as the International Financial Accounting Standards Board (IASB, 2011) and the American Financial Accounting Standards Board (FASB, 2010) have embarked on a joint project for the measurement of greenhouse gas emissions regarding carbon emissions rights trading regimes. The two councils were concerned with accounting issues related to the cover and trading system only, specifically the recognition and measurement of the purchased liabilities and allowances, opinions were presented to display the assets and liabilities of the cover and trading system in the financial.

Accounting disclosure is considered an important way to increase the efficiency of the capital market as a result of the information that disclosure provides that the capital market needs. Information is the lifeblood of the capital market, and it also helps reduce the degree of uncertainty and reduce the problem of information asymmetry. but in the recent period the financial problems and crises have increased as a result of insufficient information disclosed compulsorily, so many parties called for the need to expand accounting disclosure.

Climate change and global warming are among the most important and difficult existing problems and the most dangerous. Therefore, large numbers of companies began to report on their performance on climate change, and to adopt some strategies that help reduce companies' contributions to the global warming process and reduce the emissions associated with it. Also, stakeholders are increasingly requesting data and information on the greenhouse gas emissions of companies in order to be able to judge the company's performance towards climate changes, especially the global warming phenomenon (Al-Washmi, 2017) .

Many studies have proven the importance and role of each of the strategic management accounting methods in enhancing and increasing the competitiveness of enterprises, as each method of strategic management accounting increases the capabilities of the enterprise in achieving its strategic goals in light of the size and type of risks to which the enterprise is exposed, the extent to which enterprises respond to the result of the work of strategic management accounting methods is determined according to the situations or events experienced by the enterprise (Al-Shishiny, 2013).

Based on the foregoing, it is necessary to know the problem of climate change and the problems associated with it or the risks associated with climate change and its accounting effects, and the accounting measurement and disclosure of information related to greenhouse gas emissions, and to identify the role of environmental cost accounting in measuring the costs of environmental pollution, and to identify the role of strategic management accounting tools in developing accounting measurement and disclosure of the effects of climate change.

Where managerial accounting performs an important role in influencing the accounting measurement of the effects of climate changes through its multiple tools that contribute to reducing costs, achieving customer satisfaction and making effective strategic management decisions such as pricing decisions and others, which leads to increased sales, increased profitability, and others.

Therefore, the research problem is to identify the role of strategic management accounting tools in developing accounting measurement and disclosure of the effects of climate change.

The research aims to study the impact of climate changes on management accounting and to analyze the importance of accounting measurement and disclosure of information related to greenhouse gas emissions, and to identify the role of strategic management accounting tools in developing accounting measurement and disclosure of the effects of climate changes.

The importance of the research appears through the topic it deals with, where the research derives its scientific importance from the importance of the research topic as it is from modern research in accounting thought, and from the importance of the problem that the research topic addresses, where the success of institutions is related to their ability to adapt to the environment in which they are located and to preserve it from pollution processes and the risks of climate change, in addition to contributing to recognizing the importance of providing advanced and innovative mechanisms and methods that are compatible with the requirements of a clean and sustainable environment in general, and reducing costs and related environmental obligations, as well as achieving the targeted financial return for organizations.

Here, the importance of the research appears by trying to study the role of strategic management accounting tools in developing accounting measurement and disclosure of the effects of climate changes, and its practical importance in its multiple applications, which is considered as an incentive to try to exploit its multiple advantages in advancing the accounting profession, in addition to learning about the climate summit that Egypt will host in November 2022.

The research depends on the inductive approach by perusing and studying the writings and studies included in the accounting thought, and related to the research topic directly or indirectly by relying on the sources represented in books, references, periodicals, reports, conferences related to the topic of research and how to benefit from them in addressing the research problem. And the deductive approach, which depends on deductive logical thinking, to try to identify the role of strategic management accounting tools in developing accounting measurement and disclosure of the effects of climate change.

The research does not deal with analysis and discussion of the concepts of strategic management accounting and all its tools, but it selects from them enough to complete the

discussion of the concept and tools in their relationship to the issue of climate change, some strategic management accounting tools that do not affect the phenomenon of climate change have been excluded, and the research deals with the phenomenon of climate change in the world in general and in Egypt in particular.

2. Climate changes and global warming:

2/1 Climate Changes:

The phenomenon of “climate change” is defined as an imbalance in the usual climatic conditions such as temperature and wind patterns that characterize each region on earth. The magnitude of long-term climate changes will have huge effects on the natural vital systems, and the increasing temperatures will lead to a change in weather types such as wind patterns and others, in addition to the occurrence of several possible extreme weather events; This leads to extensive and unpredictable environmental, social and economic consequences. As human activities represented by the industrial and technological revolution led to an increase in the rate of greenhouse gas emissions and an increase in their concentrations in the atmosphere (Hassan, 2010).

Climate changes are one of the most important results of global warming, especially the rise in temperatures, which in turn increases the problem of air pollution, as the surface temperature of the earth affects the movement of air up and down, and the rise of pollutants follows the continuous heating process of the lower layer of the atmosphere on the earth's surface during daylight hours (Al-Washmi, 2017).

2/2 Causes of climate changes:

According to the US Environmental Protection Agency, climate change may result from the following (<https://ar.wikipedia.org>) (Hassan, 2010):

1. Human: Scientists may attribute that the main cause of climate change to human, who in the past used grazing methods and not rationalized the use of the possibilities available to him, which led to the emergence of desert areas in which life does not come except in the winter and spring seasons, in addition to the disappearance of many trees, plants, animals and fish due to his misuse of the potential available to him, which led to the disruption of the environmental climate.
2. Natural phenomena: such as: volcanoes. Scientists attribute the cause of volcanoes to those hot liquid materials under the surface of the earth, as they lead to the emission of carbon dioxide that causes high temperatures and climate changes, in addition to earthquakes and the high temperatures emanating from it.
3. Global warming: The trend towards industry has led to the need for different types of fuel. The burning of billions of fuels has led to the emission of carbon and nitrogen oxides into the air, and these gases are among the most important causes of global warming that led to climate change. These gases have led to an increase in the earth's temperature by 1.2 degrees compared to levels before the industrial revolution.

2/3 The difference between climate changes and global warming:

Global warming can be defined as the gradual increase in the temperature of the lowest layers of the atmosphere surrounding the Earth as a result of an increase in green greenhouse gas emissions, this is due to the accumulation of carbon dioxide and other gases, which acts

like a plate of glass in a greenhouse, and it allows the passage of solar radiation through it and warms the earth, but it prevents the heat loss that is produced by the back radiation (Abdel-Baqi, 2010) (Al-Washmi, 2017).

People usually use the two terms interchangeably, as they denote the same thing, as global warming refers to the increase in the average temperature near the surface of the Earth, climate change refers to changes that occur in the layers of the atmosphere, such as temperature, precipitation, and other changes that are measured over decades or longer periods.

With regard to the efforts that have been made to reduce global warming, the United Nations Convention on Climate Change, which is being concluded, where the protocols were concluded, including the Kyoto Protocol, which is binding (37 industrialized countries and the European Union) with the so-called Clean Development Mechanism to reduce greenhouse gases, which requires developed countries to implement projects that would reduce greenhouse gases in developing countries (Ragab, 2012).

2/4 International efforts to reduce the negative effects of climate changes:

Given the nature of climate changes as a phenomenon that transcends borders, the efforts that have been made to confront it are dominated by international cooperation, and the United Nations has played an important role in this field, as it has devoted its efforts to support the issue of climate change on the international scene since 2007, and has organized many meetings and conferences, including the following (Abdel-Zaher, 2015):

- A high-level meeting on climate change in September 2007 before the start of the meetings of the sixty-second session of the United Nations General Assembly, which discussed strengthening discussions to reach consensus to develop a comprehensive multilateral framework on climate change beyond 2012.
- The United Nations Conference on Climate Change in Indonesia in December 2007, which adopted a road map on how to reach a post-Kyoto agreement, in addition to a timetable for concluding the negotiations within a deadline not exceeding 2009.
- The United Nations Conference on Climate Change, which was held in Poznan, Poland, from 1 to 12 in December 2008, in which it discussed ways to enhance understanding about a common vision for a new climate change system, strengthen international commitment, reduce emissions from deforestation, technology transfer and adaptation, in addition to the adoption of the consensus document on the common vision of long-term cooperation within the framework of the international agreement.
- The United Nations Conference on Climate Change on September 22, 2009 at the United Nations Organization in New York with the aim of mobilizing and mobilizing the political will necessary to reach an agreement that is equitable and effective, it also organized Climate Week from 2 to 25 September, in which NGOs, companies, governments, artists and academics participated, and its aim was to raise awareness and stimulate action to reach a global agreement on climate change.
- "Cancun" conference on climate change, which was held in Mexico during the period from November 29 to December 10, 2010, in which about 193 countries and about 15,000 people participated from government delegations, environmental experts, non-governmental

organizations, businessmen and the media, and the conference talks concluded with the adoption of a package of resolutions to help countries progress towards a low-emissions future, which senior officials described as a victory in a battle against one of the most prominent challenges of the era, the set of decisions was called the "Canyon Agreement" and included pledges to reduce emissions and ensure greater accountability.

3. The importance and efforts of accounting measurement and disclosure of greenhouse gas emissions and the role of environmental accounting and environmental cost accounting:

3/1 Accounting measurement and disclosure:

The issues of climate changes and global warming and their developments have placed more responsibilities and challenges on the accounting profession in general, considering that economic projects are the main responsible for environmental pollution while performing their various operational activities, it is assumed that accounting as an information system discloses the environmental performance of the project and translates its environmental contribution within the published financial statements and reports. In light of the environmental issues, the categories used for accounting information have evolved from mere shareholders to broader categories who are all stakeholders to include society in general, including environmental management and control bodies, environmental pressure groups, bodies supervising business sectors and others (Quraifa, 2010).

3/1 Accounting measurement of greenhouse gas emissions:

The process of accounting measurement of greenhouse gas emissions is one of the necessary accounting rules, as the International Financial Accounting Standards Board (IASB, 2011) and the American Financial Accounting Standards Board (FASB, 2010) have embarked on a joint project for the measurement of greenhouse gas emissions regarding carbon emissions rights trading regimes (Ragab, 2012).

The two boards were concerned with accounting issues related to the cover and trading system only, specifically the recognition and measurement of the purchased liabilities and allowances, opinions were presented to display the assets and liabilities of the cover and trading system in the financial statement, whereas, the IASB prefers the total presentation of assets and liabilities with no objection to a linked presentation (i.e., a presentation of total assets and liabilities with net emissions assets or net emissions liabilities). While the American Financial Accounting Standards Board decided that the assets and liabilities should be presented in the form of a linked presentation with no offsetting between those assets and liabilities.

Establishing limits for the report on greenhouse gases is necessary to ensure the accuracy of the measurement, and then emissions sources can be classified into three ranges, which are as follows (Ahmed, 2020).

First range: direct emissions that occur within the company's regulatory limits (fuel combustion, transportation, process emissions such as cement and waste treatment, volatile emissions such as air conditioning, and methane leaks)

Second range: indirect emissions that result from the generation of purchased electrical energy, such as consumption of electricity, thermal energy, steam and cooling.

Third range: indirect emissions that occur from the company's economic activities on a large scale (such as materials and fuels purchased, extracting and processing activities related to transportation, travel for trade, distribution, and recycling).

3/1/2 The effect of accounting measurement of greenhouse gas emissions on the company's financial statements:

Greenhouse gas emissions affect the financial statements and this can be clarified as follows (Ahmed, 2020):

➤ The impact of greenhouse gas emissions on the company's balance sheet, through:

- The effects arising from improving buildings to environmentally sustainable buildings by installing filters to reduce and purify the emitted gases.
- Introducing a range of new environmentally friendly products that do not emit much greenhouse gases; Which actually affects energy and profit growth, in order to mitigate the effects of those emissions.
- Carrying out write-offs for assets affected by these emissions, as well as costs flowing through the supply chain to increase the cost of inventory, and a decrease in the value of assets may occur if future cash flows are significantly negatively affected.
- The emergence of a group of assets related to greenhouse gas emissions, and emissions assets refer to the emissions resources from which companies expect to achieve future economic benefits such as: emission reduction equipment purchased for energy conservation, emissions reduction, and low carbon energy technologies, in addition to the emergence of carbon liabilities, which are the current liabilities of the company's previous emissions of greenhouse gases, which are expected to lead to more cash flows such as:

- Unpaid carbon taxes due to high carbon emissions, long-term and short-term loans arising from financing low-carbon projects, long-term payment representing the obligation to incur environmental damage during the production process, and when the carbon obligations are amortized or amortized, this should be included in the profits and losses for the period.
- in general, the balance sheet is affected by the effects of greenhouse gas emissions; this effect appears in the following positions: intangible assets, tangible assets, inventories, accounts receivable and other assets, cash in hand, prepaid expenses, equity, receivables, and liabilities.

• The impact of greenhouse gas emissions on the company's income statement, through (Ahmed, 2020):

- Greenhouse gas emissions affect organizational costs and revenues by reducing sales, profits, which may result in some losses.
- Including costs of achieving carbon reduction targets, prevention costs such as investment reduction, low carbon energy technologies, costs of monitoring carbon emissions, carbon tax losses, carbon emissions penalties, as well as expenditure costs on fixed assets, purchased or built; to conserve energy and reduce emissions as a capital expenditure.

- This is in addition to carbon revenue including government subsidies, compensation received, tax exemptions, and income from consuming environmental protection equipment to access clean energy or control pollution.
- The profit and loss account are mostly affected by the effects of those emissions, and is also affected by the relevant adaptive measures; this effect appears in the following centers: sales, energy costs as part of material costs, material costs, employees' expenses, selling expenses, insurance costs, operating income, other operating expenses, depreciation, disposal costs, interest, extraordinary revenues, and extraordinary expenses.
- Looking at the profit and loss account, staff costs are affected due to reduced staff productivity or staff shortages. Material costs are also affected due to the difference in purchased materials, increased maintenance costs, and insurance costs that are part of other operating costs.

3/1/3 Accounting disclosure of greenhouse gas emissions information:

The greenhouse gas protocol consists of two main parts: the accounting and reporting standard, and the project protocol. If the company is developing an inventory of greenhouse gas emissions, it uses the accounting and reporting standard, but if the company itself is developing a greenhouse gas project, the project protocol can be used to measure the greenhouse gas emissions reductions for its project.

With regard to the first part of the accounting and reporting standard, it included the main principles of accounting and reporting on greenhouse gases, which were as follows (Khalil, 2014):

Suitability: Ensuring that the stock of greenhouse gases reflects the company's emissions of these gases in a way that serves the needs of users in making their decisions at the internal and external levels of the company.

Inclusion: Accounting and reporting on all sources and activities of greenhouse gas emissions within the limits of the stock, and disclosure and any justifications.

Transparency: Presenting all relevant issues in a realistic manner, based on a careful review, in addition to disclosing any relevant assumptions and providing references and data sources used for accounting methods.

Accuracy: Ensuring that the quantitative measurement of greenhouse gas emissions is consistent, not more than or less than the actual levels of emissions, and the uncertainties are reduced as much as possible, and sufficient accuracy is achieved to enable users to make their decisions.

The disclosure of carbon emissions is also a voluntary tool to improve internal and external decision-making, because the data resulting from that disclosure will support the company's strategic position by knowing the opportunities, risks and threats resulting from carbon emissions, and carbon emissions disclosure helps in improving decisions about resource and capital allocation (Andrew & Cortese, 2011).

The accounting disclosure of emissions is an exciting challenge for accounting, as the absence of standards dealing with the disclosure of emissions has led to a diversity of accounting practices, which makes the financial statements of companies difficult to compare, in addition to the presence of many concerns about the true and fair picture presented by the

financial statements, examples of some accounting practices related to emissions disclosure that are widely applied at the international level are as follows (Khalil, 2014):

- **Carbon Disclosure Project (CDP):** In 2000, the Carbon Disclosure Project was launched in Britain, with the aim of collecting as much climate-related data as possible from companies and putting it in a public domain to rationalize investor decisions related to climate.
- **The Greenhouse Gas Protocol (GGP):** The Greenhouse Gas Protocol Initiative is a multi-stakeholder partnership in companies, NGOs, governments, academics, and others, convened by the World Business Council for Sustainable Development and the World Resources Institute in 2004, with the aim of developing internationally recognized standards and protocols for accounting and reporting on greenhouse gases, and promoting their widespread adoption.
- **Specifications and Guidelines for Report on Greenhouse Gas Emissions ISO 14064:** In 2006, the International Organization for Standardization issued the standard ISO 14064 entitled “Greenhouse Gases” and it was divided into three parts.
- **Climate Disclosure Standards Board (CDSB):** In 2012, the Climate Disclosure Standards Board established a framework for reporting on climate change, as this framework includes a set of climate change disclosure requirements that could guide companies in this regard.
- **The Global Framework for Climate Risk Disclosure (GFCRD):** In October 2006, a group of institutional investors from around the world issued the Global Framework for Climate Risk Disclosure, a new statement regarding the disclosure that investors expect from companies about the risks and opportunities arising from climate change.
- **Guidelines of the US Securities Exchange Commission for the disclosure of climate change:** issued by the US Securities Commission in 2010 as one of the non-financial disclosure requirements.
- **Joint Project of the International Accounting Standards Board (IASB) and the American Financial Accounting Standards Board (FASB):** The American Financial Accounting Standards Board and the International Accounting Standards Board have been working since 2008 to develop comprehensive accounting guidance for emissions trading systems. The two Boards were concerned with accounting issues related to emissions trading and how the assets and liabilities resulting from it are presented in the financial statements.

3/ 2 Disclosure and report on greenhouse gas emissions:

3/2/1 Gains of accounting disclosure of greenhouse gas emissions:

There are many gains that accrue to companies from their disclosure of greenhouse gas emissions, and it can be divided into internal gains and external gains, as follows (Nameer, 2014):

Internal gains, which are: Developing strategies and policies to reduce emissions, Increasing the financial value of the company, Improving the company's financial performance, and Improving decision-making systems.

External gains, which are: Strengthening the company's reputation, Increasing the company's ability to attract capital, focus on transparency, achieving a competitive advantage for the company, and Improving compliance with laws and legislation.

3/2/2 Methods of accounting disclosure of greenhouse gas emissions:

The first trend: Disclosure of carbon emissions within the annual financial reports:

This trend depends on the view that the supplementary disclosures to the annual financial statements must include the report on any information that may be necessary to represent the fair financial and economic reality of the company. From this point of view, the annual financial reports must also reflect the company's social and environmental responsibility, as this helps in the proper evaluation of the administrative performance at the overall level of the company, as the disclosure of social and environmental responsibility is equally important for the disclosure of the financial position and business results.

The Second trend: Disclosure of carbon emissions in separate reports from annual financial reports:

This trend depends on the view that the accounting system for environmental and social responsibility in general, and carbon accounting in particular, is in a system independent of the financial accounting system, which requires preparing separate reports for it.

3/2/3 How to report on climate changes (Environmental disclosure frameworks for greenhouse gas emissions):

The accounting disclosure of emissions is one of the most important contemporary accounting challenges, as the absence of rules and standards dealing with the disclosure of emissions has led to a diversity of accounting practices, which makes this information not comparable, in addition to the existence of many concerns about the extent to which these disclosures represent the true and fair form that provide.

In recent years, there have been numerous accounting publications that include guidance on how to account for greenhouse gas emissions by professional bodies and financial market regulators. Among these issues are the following (Muhammad, 2019):

- **First:** The Greenhouse Gas Protocol: It is a partnership contract between the World Resources Institute and the World Business Board for Sustainable Development. This partnership works with companies, governments, environmental protection groups, NGOs and academics, in order to activate credible programs to address climate change.
- The guidelines contained in the accounting and reporting standard for companies are designed to achieve the following objectives:
Assisting companies in preparing greenhouse gas inventory lists in a correct and fair manner, through the use of a unified approach and principles - Simplify and reduce the costs of compiling greenhouse inventory lists- Providing the business community with information that can be used to build an effective strategy to manage and reduce greenhouse gas emissions- Providing information that facilitates participation in voluntary and mandatory greenhouse gas programs - Increasing consistency and transparency in accounting and reporting on greenhouse gases for various companies and greenhouse gas programs.

- **Second:** The Climate Disclosure Standards Board (CDSB): The Board was established, which consists of an international coalition of a group of commercial, non-governmental and environmental organizations.

The Climate Disclosure Standards Board aims to develop an internationally acceptable framework that can be used by companies in disclosing information about opportunities and risks related to climate change, with the same accuracy as financial information, and this in turn, helps them provide investors with useful environmental information by including it in the companies' key financial reports, this enhances the ability of investors to allocate capital efficiently in the financial markets, and it also takes advantage of government agencies to ensure that companies comply with environmental regulatory legislation.

- **Third:** The International Organization for Standardization ISO 14064 Standard: In 2006, the International Organization for Standardization issued the ISO 14064 standard entitled "Greenhouse Gases, which was divided into three parts:
 - The first part: it relates to the company's description of its stock of these gases, including a description of the company, the period for which the report is prepared, the person responsible for drafting the report, and regulatory obstacles, in addition to disclosing direct and indirect greenhouse gas emissions separately for each of them.
 - The second part: clarifies the requirements of projects related to greenhouse gases in terms of determining and controlling the quantities of emissions, making reports on emissions reduction operations, and improving the process of removing gases from the atmosphere.
 - The third part: Provides requirements and directions for conducting validation of information related to greenhouse gases.
- **Fourth:** The Global Framework for Disclosure of Climate Risks: A group of leading investment institutions from around the world issued a new statement regarding the disclosure that investors expect from companies in October 2006, and investors need this information in order to analyze a company's business risks and opportunities posed by climate change, as well as consolidated climate efforts so that it is easier for companies to provide and to increase the ability of investors to analyze and compare companies .
- **Fifth:** The Institute of Chartered Accountants in Australia (ICAA 2008): The institute recommends the application of the greenhouse gas protocol standards, with a focus on the disclosure of carbon emissions, specifically on the following points:

Disclosure of carbon emissions for the purposes of monitoring legal claims through developments in the measurement, registration and certification of these emissions - Disclosure of compensatory carbon reductions and clean development mechanisms- The impact of emissions trading systems on the financial statements, this disclosure is what the auditor takes into account when auditing the financial statements.

- **Sixth:** The Canadian Institute of Certified Public Accountants (CICA): In 2005, the Canadian Institute issued a summary of disclosure of the financial implications of climate change and other environmental issues in the management discussions and analyzes report, and the Institute drew the directors' attention to their responsibilities to review and verify disclosures related to climate change.

3/3 Environmental accounting for climate changes phenomenon:

3/3/1 Environmental accounting methods for climate changes:

Climate changes means the change in the earth's temperature due to the change in the volume of solar activities, or because of economic activities, which affects the volume of carbon dioxide emissions. The earth's temperature increased during the period from 1900 to 2005 by 1.4 degrees, and it results from the annual rise in the Earth's temperature to the so-called change in the volume of the total warmth during a certain period of time.

It has become common knowledge that there are two methods of coping with the negative effects of climate change, namely (Al-Obaidi, 2019):

Mitigation method, and adaptation method.

Therefore, the general framework for environmental accounting for climate change includes two main approaches:

- A. Environmental accounting approach to mitigate the environmental impacts of climate change.
- B. Environmental accounting approach to adapt to the environmental impacts of climate change.

3/3/2 Accounting measurement methods for costs associated with climate changes:

Environmental costs are measured as follows (Al-Obaidi, 2019)::

- A) Quantitative measurement, which is of limited use in the case of environmental accounting because prices are not available and therefore depends on the survey and alternative evaluation.
- B) Non-quantitative measurement, which includes several sub-methods, namely:
 - The polluting elements are arranged according to the extent of their impact on human health, and it depends on the existence of a causal relationship between pollution and the effect it causes.
 - Determine the size of the deviation from the legal standards to determine the extent of the impact on the environment, so there will be two stages of comparison:
 - 1- Comparing the environmental costs of the current period with the previous periods.
 - 2- Comparing the actual environmental costs with the standard costs of environmental costs. For example, the permissible quantities of pollution elements are determined and symbolized (K T M), then the actual quantities of pollution elements are determined (K C F), then the elements of pollution that are not allowed to be removed are determined and symbolized (K C G), it is defined as the excess amount of pollution, and is calculated as follows: $K C G = K C F - K T M$.

From the above, it can be concluded that in many cases it may be better to rely on both quantitative and non-quantitative measurement to provide information that reflects the reality of the company's environmental performance, as quantitative information reflects the results of measuring environmental processes, which can be expressed in a monetary form, while descriptive or non-quantitative information, it expresses the effect of processes that cannot be measured in quantitative terms.

4. Assessing the extent of the need for strategic management accounting tools to develop accounting measurement and disclosure for the effects of climate changes:

Strategic management accounting does a prominent role in providing the information needed to make long-term strategic decisions, and given the intense competition that exists between different establishments in the current era of the openness of global markets to each other and as a result of the rapid development of information technology, and in response to changing customer needs, this necessitated a request for more accurate information and more quickly to take the appropriate strategic decisions at the appropriate time to remain in the circle of competition.

This part of the research explains the role of strategic management accounting tools in developing the accounting measurement and disclosure of the effects of climate changes by addressing the phenomenon of global warming as one of the manifestations of climate changes, as it is one of the most widespread forms of climate changes. As the industrial environment and its emissions of carbon dioxide and other harmful gases and substances lead to a rise in the temperature of the atmosphere and thus increase global warming, which in turn leads to climate changes.

4/1 The extent to which strategic management accounting is distinguished in developing accounting measurement and disclosure about climate changes:

4/1/1 The concept of strategic management accounting:

The modern concept of strategic management accounting implies the importance of the participation of accountants in strategic management, and the use of modern administrative methods that would provide financial and non-financial, internal and external information (competitors, suppliers, and customers) as an entry point to provide appropriate information, and improve the efficiency and effectiveness of decision-making related to achieving the strategic objectives of the enterprise, and improving performance and operations (Arafa & Melegy, 2021).

The strategic management accountant's methods lead to controlling the business risks that these companies may be exposed to, such as (demand volatility, price volatility, production inputs, climate change risks), which may cause increased costs or fluctuating profits. Hence comes the role of strategic management accounting methods, as a key factor in increasing companies' profits, through cost management and rationalization.

4/1/2 Gains and areas of using strategic management accounting in light of climate changes:

Strategic management accounting contributes to many applied fields for making administrative decisions in business establishments, such as: allocation and control of costs, optimal use of operating waste, performance evaluation, product design, estimating costs associated with climate change, pricing products, preparing budgets, evaluating investments, evaluating environmental performance, and sustainability reports.

Thus, there are many gains that result from the application of the management accounting system in relation to climate changes in business organizations, the most important of which is reducing costs, supporting competitive advantage and improving the reputation of

the organization, contributing to achieving social benefits, working to rationalize pricing and product development decisions, and supporting decisions in the future.

The management accountant must also provide the organization's management with a set of financial and non-financial indicators related to the use of clean and environmentally safe technology. He must also provide a set of reports that help management rationalize decisions related to climate change and improve and develop performance in relation to climate changes and the associated costs. Thus, the role of the management accountant is as follows:

Develop strategies for the establishments, monitoring and planning the activities of the establishments, use of natural and non-natural resources efficiently and effectively, improving the performance of establishments in relation to climate change and increasing the return on it, maintaining the tangible and intangible assets of the establishments, and applying and strengthening the principles of corporate governance and internal control.

Thus, through the foregoing, the uses and gains of strategic management accounting with regard to climate changes can be concluded in the following points:

- Compliance: where strategic management accounting supports the protection of the environment through a commitment to cost efficiency with regard to compliance with laws and the policies contained therein related to climate change.
- Economic efficiency: where strategic management accounting supports the simultaneous reduction of both costs and impacts related to climate change by increasing the efficiency of the use of raw materials and energy in internal operations and finished products.
- Strategic Position: where strategic management accounting supports the evaluation and implementation of environmentally sensitive and cost-effective programs to ensure the organization's strategic position in the long term.

4/2 Possibility and how to benefit from strategic management accounting tools in monitoring, measuring and disclosing climate changes:

4/2/2 The role of strategic management accounting tools in developing the accounting measurement and disclosure for the effects of climate changes:

Tool	Tool content	The role of the tool in the process of measuring and disclosing the effects of climate changes
Product Life Cycle (PLC)	The concept of the product life cycle: The concept of the product life cycle refers to the period in which the sales and profits of the product occur throughout its life cycle, and it includes five main stages: development, introduction, growth, maturity and decline. Therefore, the fifth stage can be expressed as the so-called decline and death. Undoubtedly, every establishment	The product life cycle costs method is considered one of the important strategic management accounting methods as it reflects the objectives of continuous improvement of the quality of the environment and its preservation against climate changes, which represents a response to environmental issues such as design, re-design for the environment and its preservation from global warming and gases that cause climate change, not only for the possibility of manufacturing, as

Tool	Tool content	The role of the tool in the process of measuring and disclosing the effects of climate changes
	<p>strongly desires to extend the life of the product for the longest possible period with the continuity of profit and return from it, and not only prolonging its life without an appropriate profit return.</p> <p>Product durations are most certainly expressed in terms of both quantitative and qualitative terms. The quantitative criterion refers to the volume of sales and their stability throughout the history of the product. As for the qualitative criterion, it refers to the comparison of those sales with competitors in the market and to other measurements and indicators of market acceptance and the perceived value of the product to current customers and the extent to which that perceived mental image can be improved.</p> <p>The product life cycle stages pass the following stages:</p> <p>Product introduction stage growth stage maturity stage saturation stage Decline deterioration stage</p> <p>The Importance of Cost Measurement: There has been an evolution in management accounting methods for measuring and evaluating the performance of product design and development activities with the goal of reducing the costs of</p>	<p>well as designing for the possibility of waste disposal or recycling, and programs to reduce or prevent pollution and climate changes ... etc.</p> <p>All this leads to the achievement of many benefits and applications of importance to the management of the organization, the most important of which can be summarized as follows:</p> <p>Help rationalize the organization's administrative decisions with regard to selecting the best available alternatives, Help reduce the economic and environmental costs related to climate change during the product life cycle, helping to identify all dimensions and economic and environmental impacts associated with climate change, Assisting in identifying the causes of cost occurrence, whether those costs are economic or environmental related to climate changes, throughout the life cycle of the product, Helping to provide the organization with the opportunity to achieve a sustainable competitive advantage, and Help reduce life cycle costs associated with the acquisition, use and replacement of natural resources.</p> <p>Thus, this tool leads to calculating all costs involved in the life of the product, starting from the stage of providing and designing the product and ending with the disposal of the product. This method is considered one of the important approaches to strategic management accounting, as it takes into account the costs and returns related to climate change when comparing alternatives to implementing programs and activities, and thus recommending the best alternatives from both economic and environmental terms. The use of this method achieves many benefits, the most important of which is helping to reduce the</p>

Tool	Tool content	The role of the tool in the process of measuring and disclosing the effects of climate changes
	<p>new products or services. The most important of them is the life cycle model, which considers that product costs consist of three basic elements from the point of view of the Japanese Institute of Certified Public Accountants (JICPA), which are:</p> <p>Initial costs such as research and development costs, planning, and design.</p> <p>Ordinary costs such as industrial costs, and costs of sales and administrative activities.</p> <p>Final costs such as maintenance, repair, and disposal costs.</p>	<p>total life cycle costs associated with the acquisition, use and replacement of natural resources.</p> <p>In light of climate changes and pressures to preserve the environment, this tool depends on the use of environmentally friendly materials and the disposal of waste in a safe manner, which leads to high costs associated with the product as a result of the use of safe energy sources and environmentally friendly materials, in addition to the activities of disposing of products, which leads to high costs associated with the product and the provision of a high-cost but environmentally friendly product that does not cause climate change, despite its high cost, it increases the demand for it by a certain category of customers that support the preservation of the environment by making it safe and free of pollution, which ultimately affects profitability.</p>
<p>Activity Based Costing (ABC) System</p>	<p>The concept of activity-based cost accounting: "Cooper and Kaplan" indicated the possibility of better measuring, controlling and allocating cost by focusing on activities as cost drivers, which leads to a reduction in the cost of those activities and then a reduction in the total cost of production (Cooper and Kaplan, 1988). Activity-based costing (ABC) is intended to complete the process of allocating additional costs with greater confidence by using activities as an alternative to using cost centers in preparation for tracking activity cost on products using cost drivers as a measurement method. (ABC) is the approach that is able to link costs to activities as sources of the existence of costs,</p>	<p>This method is one of the most important methods and tools of strategic management accounting applied recently in establishments, especially industrial ones, and the basic idea of the method of distributing costs associated with climate changes according to activities is summarized in the necessity of establishments distributing costs associated with the occurrence of global warming and then climate changes, especially the indirect or additional ones on the activities that cause it, this method is one of the important methods that establishments can use to prevent and reduce environmental pollution, which causes climate change through carbon dioxide emissions and harmful gases.</p> <p>Traditional managerial accounting does not present here the idea of separating or not integrating production costs and waste treatment costs (costs associated with</p>

Tool	Tool content	The role of the tool in the process of measuring and disclosing the effects of climate changes
	<p>regardless of the idea of the current allocation of indirect costs. The activity-based cost accounting system contributes to achieving a real cost reduction, which is reflected in the correctness of decisions through the analysis of activities, which helps to get rid of activities that do not add value to the product, the idea of an activity-based costing approach depends on the direct link between the resources used on the one hand, and the activities that consume those resources on the other hand, and then the link between the costs of those activities and the final products.</p> <p>It can be said that the activity-based costing is one of the modern strategic cost management methods, as this method focuses on linking product costs with activity costs as cost drivers, so that the cost can be measured and controlled better helps management to take the right and appropriate decisions to maximize the value of the company and enhance its competitiveness.</p> <p>The Activity-Based Costing approach aims to achieve the following objectives:</p> <ul style="list-style-type: none"> • Accurate and objective measurement of the cost of the unit of activity and the unit cost of products or services. • Rationalizing administrative decisions, the most important of which are pricing decisions, as an entry point to face global 	<p>climate changes), so the costs associated with climate changes (such as environmentally friendly materials and renewable energy resources) will be distributed to producers (B), (A) , on the same basis as distributing the rest of the other indirect costs components, and this is an incorrect procedure from the point of view of strategic management accounting , because it contributes to supporting the activities, stages or products that pollute the environment most and cause climate changes at the expense of the activities, stages and products that are less polluting and cause climate changes, in other words, the application of the previous procedure, in the allocation and distribution of costs associated with climate changes, is a punitive measure for the clean and non-polluting product to the environment and does not cause climate change, because it carries an environmental cost as a result of climate change that it did not cause, this procedure thus equates the clean product with the one that is polluting or most harmful to the environment and causing climate change. This means that clean products that do not pollute the environment and do not cause climate changes will have a higher price than their real price (because they have incurred the costs of environmental pollution or climate changes or caused them), in contrast to the polluting and harmful products that cause climate change, for which a price is set lower than their real price (because part of the cost of environmental pollution and the climate changes that they caused) are borne by other clean products that do not pollute the environment and do not cause climate change; To correct the previous situation, the establishments can use the method of distributing and allocating costs associated with climate changes by activities, in order</p>

Tool	Tool content	The role of the tool in the process of measuring and disclosing the effects of climate changes
	<p>competition and maintain the organization's share in the markets.</p> <ul style="list-style-type: none"> Facilitating the conduct of control over the acquisition and use of the available production resources, which helps in reducing the elements of costs. Adding more accuracy in charging the indirect costs of the activity unit Maximizing the performance of value-adding activities and excluding non-value-adding activities as an input to maximize the value and profitability of the organization. <p>The importance of activity-based costing: The importance of activity-based costing system information derives from pre-production and after-sales activities, up to the end of the product life cycle stages. Where the environmental costs resulting from the need to dispose of the product in a proper manner or to recycle it after the end of its use period are taken into account, by tracking the activity-based costing system for the costs of the resources that are used to treat the environmental risks expected from the use or disposal of a particular product, and without charging any part of those environmental costs to any other products, Hence, it can be avoided that the environmental costs associated with discontinued products are charged to existing products, which may distort the</p>	<p>to allocate the costs associated with climate changes to the products, stages or activities that cause them.</p> <p>The basic idea of this method is to allocate and distribute the costs related to climate change according to the activities that cause it (The costs of climate change are related to the use of environmentally friendly materials and renewable energy resources that do not cause carbon dioxide emissions and other harmful gases that cause pollution and the occurrence of global warming and then the occurrence of climate changes), in order to allocate the costs associated with climate change over the products, stages or activities that cause it, in addition to excluding all non-value adding activities. Thus, it is one of the important methods used by industrial establishments to prevent and reduce environmental pollution, which causes global warming and then climate changes, as it helps establishments improve their economic performance as a result of improving their environmental performance and not causing climate changes and thus helping to make appropriate and correct pricing decisions, as traditional managerial accounting does not separate production costs from waste treatment costs (Costs associated with climate change, such as the use of environmentally friendly materials, renewable energy resources, waste recycling, etc.) where the costs of climate changes are distributed to all products on the same basis as the distribution of the rest of the other indirect costs components, and this is unsound from the point of view of strategic management accounting, because it causes some products to be charged with the costs of climate changes that they did not cause, and the equality between clean products that do not cause climate changes</p>

Tool	Tool content	The role of the tool in the process of measuring and disclosing the effects of climate changes
	<p>costs of those products. Where the proper treatment of environmental costs provides an accurate understanding of the relationship between environmental costs and the decisions that pertain to each product separately, in addition to that the activity-based costing system helps the enterprise in identifying unnecessary activities as well as identifying opportunities to reduce cost and improve profit (Cooper and Kaplan, 1998).</p>	<p>and polluting products that are the most harmful to the environment and causing climate changes, and thus making wrong pricing decisions.</p>
<p>Resource Consumption Accounting (RCA)</p>	<p>The concept of resource consumption accounting: (RCA) is a cost management tool that rationalizes costs through efficient exploitation of available resources, as it aims to accurately measure the cost and provide appropriate information for management that supports the decision-making process in order to reduce production costs, achieve customer desires, and maximize the value of the facility, which contributes to supporting its competitiveness.</p> <p>The philosophy of resource consumption accounting is based on the fact that resources are the main cause of cost and that these resources must be organized in complexes called resource pools, and each resource complex has a set of inputs that are used to produce outputs that are used by other material pools or used to produce final goods and services for the customer, which helps the establishment with credible information that provides optimal</p>	<p>The use of natural resources in the production of goods and services can result in the following: Repercussions resulting from the production processes. The natural resources used in production, such as materials, part of which may be returned to nature in the form of unused waste that causes an environmental burden; it works on changing the original characteristics (quality) of the environment due to pollution, which leads to the occurrence of global warming and thus the occurrence of climate changes, Finally, the natural resources included in the composition of the products are consumed by the customers of the establishments, and this consumption may result in waste that causes climate changes.</p> <p>RCA is one of the modern administrative approaches whose goal may go beyond mere assessment and estimation of the environmental costs associated with climate change. The application of strategic management accounting can help establishments obtain all information related to and related to the natural flow of various resources from raw materials and energy in their production processes, therefore, organizations may link cost data</p>

Tool	Tool content	The role of the tool in the process of measuring and disclosing the effects of climate changes
	<p>decisions to reduce cost, increase revenue and achieve the productive capacity of work with the aim of the establishment's success in light of the intense competition market (Ahmed and Moosa, 2011).</p> <p>The resource consumption accounting system also focuses on the fact that the cost occurs at the level of resources and not at the level of activity, specifically each resource that has energy or ability to create value in addition to the interactive effect with all other resources.</p> <p>There are a set of objectives that (RCA) system seeks to achieve, which can be summarized as follows (Ahmed and Moosa, 2011):</p> <ul style="list-style-type: none"> - RCA aims mainly at the accuracy of cost measurement and the optimal utilization of the resources available to the facility in order to reduce production costs and detect idle energy in order to achieve customer desires, maximize the value of the facility and support its competitiveness. -Providing basic information about the company's resources, including: determining the available resources, the relationship between the various resources in the organization, the relationship between resources and activities, the costs of the available resources, how to make optimal use of the available resources. -Studying the impact of the nature of cost on resource consumption according to the factors of the 	<p>with resource flows in production processes to rationalize decision-making processes. The application of(RCA) as one of the strategic management accounting tools is one of the important steps in developing the environmental performance of the facilities and related to climate changes, because it includes determining the amount of resources in the stores and at the production site , in addition to the quantities entered into production, recycled quantities, and quantities consumed in production processes, resulting as unproductive outputs, as well as the products shipped and the remaining quantity as stock, (RCA) describes the flow of materials, including resources, products, waste, and other emissions, and aims to organize production from start to finish to include resource and information flows that are conducted efficiently and objectively, it is thus more than just an assessment of costs associated with climate change, because it also helps enterprises to assess the total costs of production, including costs associated with climate change.</p> <p>Based on the foregoing, the RCA system in establishments is used to reflect the resource flow system in their various production processes, in a traditional manner, with the application of the value-added chain method for all resources that represent production inputs, during the various production stages, from the beginning of production until the arrival of the product to the final consumer. It also includes the RCA system, all the materials that the facility can lose in its different stages (in its form: scrap - damaged - expired, etc.), in addition to all the resources that may come out of the production processes, because they are not</p>

Tool	Tool content	The role of the tool in the process of measuring and disclosing the effects of climate changes
	<p>basic nature of the cost and the potential nature of the variable cost.</p> <ul style="list-style-type: none"> - Activating the ability of resources to create added value for the customer, whether through the optimal use of reciprocal and non-reciprocal relations between resources and activities and between resources and each other. - Achieving the various concepts of control, by controlling the sources of cost occurrence, preventive control is achieved and by tracking the quantities of used and unused resources in order to achieve alignment between the supply of resources and demand for it, subsequent and simultaneous control is achieved, which helps to rationalize the costs of resource consumption and increase productivity. - Providing financial and non-financial information through a forward-looking operating model, which helps to predict the needs of each resource from other resources, identify idle energies and not load them on products that did not cause them to occur, and determine the volume of unexpected wasted resources. 	<p>compatible economically and environmentally (such as waste - emissions, so the application of the resource consumption accounting model in facilities requires the necessity of dividing production processes in facilities into production lines and cost centers. Thus, through the foregoing, it can be concluded that resource consumption accounting is a cost management tool as it works to rationalize costs through the use of environmentally friendly materials and renewable energy resources that do not cause carbon dioxide emissions and other polluting gases that cause global warming and then climate changes, in addition to the efficient exploitation of the available resources and the recycling of waste, which leads to an accurate measurement of costs and the availability of the necessary information to make decisions, reduce the cost of production and achieve customer satisfaction, which leads to an increase in the demand of customers to buy products that do not cause climate change and thus increase sales and profitability of the facility, which leads to maximizing the value of the facility, which contributes to supporting its competitive capabilities.</p>

5. Sustainable balanced Score Card (SBSC):

5/1 Sustainable Balanced Scorecard Concept:

The balanced scorecard is a set of accurate measures that enable managers to translate the organization's vision and mission into financial performance measures to reach strategic goals efficiently and effectively through four main dimensions: the financial dimension, the customer dimension, the internal operations dimension, and the learning and growth dimension.

The sustainable balanced scorecard is based on instilling environmental and social awareness in the various operations and activities of the institution by adding a new fifth

dimension to the traditional balanced scorecard, which is the environmental and social dimension (Alouafi & Fadila, 2021).

The sustainable balanced scorecard is defined as a set of financial and non-financial measures that provide senior management managers with a clear and comprehensive picture of the performance of their organizations and chart their future movements. It also aims as it is a modern strategic tool through which economic institutions can measure and evaluate their overall performance in general and their environmental performance in particular by integrating environmental aspects in the various activities and operations of the institution, by adding a fifth dimension to the balanced scorecard, these five dimensions are as follows: the financial dimension, the customer dimension, the internal operations dimension, the learning and growth dimension, and the environmental dimension.

5/2 The role of the Sustainable Balanced Score Card (SBSC) in the process of measuring and disclosing the effects of climate changes:

The integration of environmental indicators in the balanced scorecard leads to achieving interdependence between them and the mission of the institution as a whole, in addition to the possibility of their implementation and application throughout the institution through the achievement of an integrated strategy for sustainable development.

There are three different ways to use the Balanced Scorecard for Environmental and Climate Change purposes. It can be used to focus on management by objectives, as an information system, or to depict the cause-and-effect relationship between different measures, however, the Balanced Scorecard is more than just an information system or a tool for setting goals and developing a clear picture of the relationship between environmental measures, it is considered as a regular entrance to the implementation and application of environmental standards, as if environmental standards are not included in the balanced scorecard when applied in the institution, its role may be reduced to become just an informal part in determining organizational goals.

The balanced scorecard has made environmental issues a part of daily administrative measures when preparing performance reports, through the balanced scorecard, organizations are able to improve their environmental performance by highlighting the causal relationships between concern for environmental issues and cost reduction (Alouafi & Fadila, 2021).

Also, adding an independent dimension to environmental performance as a fifth dimension in the balanced scorecard, by adding a new aspect related to environmental performance. This environmental dimension aims to integrate environmental indicators into the Balanced Scorecard by defining five objectives, namely:

- 1- Rationalizing the use of raw materials.
- 2- Rationalizing the use of toxic substances.
- 3- Rationalizing the use of energy needed for the production process.
- 4- Preventing waste and harmful emissions (solid, liquid or gaseous).
- 5- Increase recycling opportunities.

With regard to the first three objectives, we find that they focus on the inputs of the production process from raw materials and energy necessary for the production process, and to achieve these goals, it is necessary not to use more materials or energy than necessary and to

search for ways to reduce the use of toxic substances that harm the environment, and therefore performance must reflect these two points, then some of the suggested measurement could be: Quantities of toxic substances used, productivity measures for each of the three objectives, and the cost of toxic (harmful) raw materials as a percentage of the total cost of materials.

With regard to the fourth objective of reducing waste and harmful emissions, it can be achieved in two ways: using technology to dispose of toxic waste once it is released, and avoiding waste production by identifying the fundamental causes of its occurrence, and then re-designing products and processes to prevent these causes so that they are more efficient and more environmentally friendly, which is known as designing for the environment, and performance measures for this objective are as follows:

Quantity of toxic chemical waste produced, harmful emissions to permissible levels, the ratio of the generated waste to the total waste, the percentage of reduction in packing materials, the degree of compatibility with the permissible levels of waste and harmful emissions, the ratio of avoided pollution to the total pollution that occurred in the same period, and the ratio of environmental pollution to the volume of production in a specific period.

With regard to the fifth objective of increasing recycling opportunities, it focuses on the need to be conservative in the use of non-renewable materials, by reusing or recycling, as this process reduces the need to use additional raw materials, it also reduces environmental degradation and pollution by reducing the requirements for waste disposal by the end-user of the product. The performance measures for this objective include the following:

Amount of recycled raw materials, the number of product components, the percentage of raw materials included in the products that can be recycled, percentage of units reused or recycled.

In addition to the previous standards related to the five objectives of the environmental dimension, there are some general standards and indicators that reflect the extent of the institution's interest in the environmental dimension of its activities, which are:

The ratio of what was spent on pollution reduction research to the production budget, the ratio of environmental protection costs from pollution to production costs, the ratio of environmental protection costs from pollution to the annual revenues of the current activity, the ratio of the capital costs of environmental protection to the total costs of environmental protection, the ratio of the costs of protecting the external environment (the environment surrounding the establishment) to the total costs of protecting the environment, and ratio of the mandatory costs of environmental protection to the total costs of environmental protection.

From the above, it can be said that the sustainable balanced scorecard collected the objectives of measuring and evaluating environmental performance in an independent perspective, as well as specifying the measurement indicators for these objectives, and this in itself is an important and useful step in the process of using the strategic tools of managerial accounting in the evaluation of environmental performance and climate change.

Thus, the Sustainable Balanced Scorecard tool improves environmental performance and climate change as it helps to exploit opportunities in markets with intense environmental competitiveness, therefore, maintaining and evaluating environmental performance in light of global warming and existing climate changes through the sustainable balanced scorecard

periodically facilitates the spread of environmental concepts related to climate changes in the internal operations of the institution, which results in the innovation and development of environmentally friendly products that do not cause pollution that leads to global warming and then climate changes.

The sustainable balanced scorecard works to achieve customer satisfaction, as the institutions' fulfillment of the desires of their customers requires them to maintain their long-term survival and continuity in light of climate changes, its continuous and effective activity in the field of environmental protection and climate changes is the most prominent element of its continuity related to the acceptance and satisfaction of its customers with what it offers them and its activities that preserve the environment and do not cause global warming and climate changes.

Therefore, the institution must control the quality of the products in terms of adherence to the standard specifications for the production of an environmentally friendly product that does not cause climate change, in addition to the presence of an effective environmental control system, and all this works to increase customer satisfaction and increase their demand for products that do not cause climate change, which increases the company's sales and profitability and ensures its survival in a highly competitive environment.

Hence, it is possible to clarify the dimensions of the balance levels between cards / objectives / measures / measurement results in light of the sustainable balanced scorecard in measurement and disclosure of climate changes through the following hierarchical form:

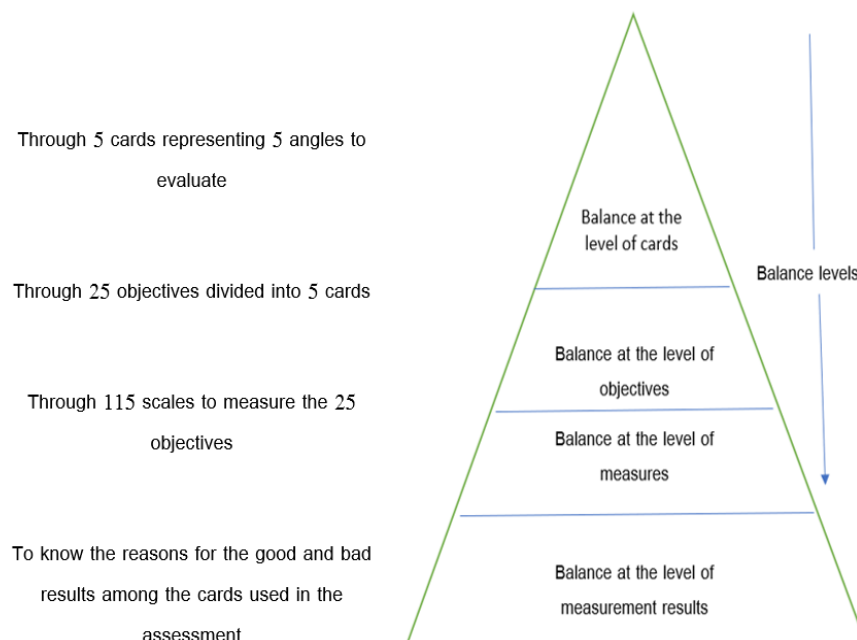


Figure 1 (Dimensions of balance levels between cards / objectives / measures / measurement results in light of the sustainable balanced scorecard).

The question that imposes itself now is how can these cards representing the balanced measurement model of performance be applied in the field of measurement and accounting

disclosure about climate changes? Or in other words, what is the formula or applied formulas to achieve this desired balance?

5/3 Designing “evaluation matrices” models for the sustainable balanced performance in the field of climate changes:

The matrices of measurement and disclosure of climate changes using the balanced performance measurement model in an applied manner must include the main success factors, which are the objectives that pertain to each card, and the proposed measures to assess the extent to which each objective is achieved, as follows:

- 1- Evaluation matrix for the innovation and creativity card in developing the means to prevent climate change.
- 2- Evaluation matrix for the internal technical operations card.
- 3- Evaluation matrix for the results disclosure card for decision makers in the rational use of the means to confront climate change.
- 4- Evaluation matrix for the financial evaluation card on the results of prevention and response to climate change.
- 5- Evaluation matrix for the sustainable balanced scorecard.

However, the evaluation procedures and the executive steps that are applied do not differ from one card to another, and the procedures are clarified in the following item.

5/4 Procedures for applying the balanced measurement model for sustainable performance in the field of accounting measurement and disclosure of accounting changes:

In order to reach tangible results from the application of the balanced measurement model for sustainable performance, this is done through the following methodological steps:

- **First:** Determining the target values for each of the scales that express each of the specific objectives during the evaluation period for each card.
- **Second:** Determining the basic values for each of the measures that express each of the objectives specified in each card, and these values can be expressive of the values that have been reached during a period or previous periods, and these are the values that are supposed to be reached under normal conditions.
- **Third:** Determining the current values of each of the measures that express each of the specific objectives, for the period under evaluation.
- **Fourth:** Values are given among the target values, and the basic values are called the intermediate values that are higher than the basic values, as well as the values that are less than the basic values, and the intermediate values are called the lower than the basic values for each of the measures, and all these values represent the potential levels of activity.
- **Fifth:** Scores are determined that express each of the assessed values, whether they are target, basic or intermediate (higher/lower) values. Let these scores be from 1-10 so that they are arranged in descending order until the target values take a greater degree than the higher intermediate values, greater than the basic values, greater than the lower intermediate values if higher measure values are desirable, while they are arranged ascending so that the target values take a lower score if higher measure values are desirable.

- **Sixth:** The corresponding score is determined for each value that expresses the actual performance in each scale (Rt).
- **Seventh:** The relative weights (W) of the main success factors (objectives) are determined, and the relative weight of the objective is distributed over the set of measures that fall under each objective, in a way that reflects the importance of the objective and the importance of the measure from the point of view of the beneficiary of the assessment, and in light of the extent to which the objective and the measure contribute to supporting the general strategy of the organization.
- **Eighth:** The actual performance score that was determined in the sixth step is weighted by the relative weight that was determined in the seventh step ($RtW=Rt*W$).
- **Ninth:** The degree of achievement of each of the objectives included in the card is measured through the sum of the actual performance scores weighted by relative weight (the eighth step), where “F” refers to the main factor (the objective) $\sum_{f=1}^n Rt * W$ to measure the level of its achievement, and “n” refers to the number of measures that fall under this basic factor (the objective under measurement), that is, that ($F_n= 1,2, 3, \dots n$).
- **Tenth:** The degree of achievement of each card is measured by aggregating the actual performance scores weighted by the relative weight that was reached in the ninth step. $\sum_{p=1}^f F_n$ Where (P) refers to the card to be measured, that is, ($P_n= 1,2, 3, \dots F_n$).

The accounting evaluation matrices, in the light of the previous ten procedures, take the following models:

5/5 Matrix model of accounting measurement and disclosure of climate changes: -

The main success factors (Objectives)	D1	D2	D3	D4	D5	Grades and final evaluation in the card
(Objectives)	Egypt launched the National Climate Change Strategy 2050, and the strategy works to achieve five main objectives: <ol style="list-style-type: none"> 1- Achieving sustainable economic growth through low-emissions development in various sectors 2- Building resilience and adaptability to climate change. 3- Improving the governance and management of work in the field of climate changes. 4- Improving the infrastructure for financing climate activities. 5- Strengthening scientific research, technology transfer, knowledge management and awareness to combat climate changes. 					

The main success factors (Objectives) metrics	D1	D2	D3	D4	D5	Grades and final evaluation in the card
O11..... O1n	O21..... O2n	O31..... O3n	O41..... O4n	O51..... O5n		
M111.....M1nm	M211.....M2nm	M311.....M3nm	M411.....M4nm	M511.....M5nm		
Statement of values, weights, and degrees						
Target Values						10
Potential activity levels						9
						8
						7
						6
						5
						4
						3
						2
						1
					0	
Values that express current performance						
The degree corresponding to the current performance						
The relative importance of success factors						
The current performance score is weighted by relative weight						
Goals achievement percentages	%	%		%		%
The relative development of the level of achievement of each goal	%	%		%		%

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