Studies in Economics and International Finance
ISSN: 2583-1526
Vol. 2, No. 1, 2022, pp. 25-36

https://DOI: 10.47509 /SEIF.2022.v02i01.02

ARF INDIA
Academic Open Access Publishing
www.arfjournals.com

IMPACT OF CARBON ACCOUNTING AS A REFLECTION TO CLIMATE CHANGE IN MANUFACTURING INDUSTRIES

Okafor, M. C.[1], Opara, Chinwe Confidence[2] and Christy Twaliwi Zwingina[3]

[1]*Department of Accounting, Michael Okpara University of Agriculture, Umudike*
[2]*Department of Banking and Finance, Michael Okpara University of Agriculture, Umudike*
[3]*Department of Business Administration, Bingham University*

ARTICLE HISTORY
Received : 20 January 2022
Revised : 27 February 2022
Accepted : 11 March 2022
Published : 30 June 2022

TO CITE THIS ARTICLE
Okafor, M.C., Opara, Chinwe Confidence & Christy Twaliwi Zwingina (2022). Impact of Carbon Accounting as a Reflection to Climate change in Manufacturing Industries. *Studies in Economics & International Finance,* Vol. 2, No. 1, pp. 25-36. *https://DOI: 10.47509 / SEIF.2022.v02i01.02*

Abstract: Climate change has been a global issue in the 21st century. A change in climate around the world is the trigger for global warming. The negative effect of global warming could be catastrophic for human kind. The development of technology and the rise of industries all over the world are the inevitable situations of global warming and climate change. The very real impact of both situations is on the environment. Lately, there is often a flood disaster that is almost evenly distributed throughout the world, not to mention landslides or other natural disasters. Indirectly, these disasters are the result of climate change which causes global warming happening around the world. Carbon accounting creates a competitive advantage for companies. Policy makers in companies and institutions nowadays are relying on carbon accounting to take decisions regarding climate change and environmental conservation. The important of this study is to demonstrate the significance of carbon accounting as a reflection to climate change in manufacturing industries and how it relates to risk management. The study also shows the readiness of industries in managing carbon accounting to mitigate the impact of climate change on the environment and raising the awareness of investors.

Keywords: Climate change, carbon accounting, global warming, risk management, manufacturing industries, accounting.

1. INTRODUCTION

Climate change has been a global problem in the 21st century. At the end of the last century, the world began to pay attention to the problems related to climate change, especially after the industrial revolution and air pollution resulting from

manufacturing industries and the emergence of the effects of climate change. Therefore, the obligation of companies to contribute to the preservation of the environment and the need to reduce pollution and account for climate change has arisen. A change in the climate around the world is the trigger for global warming. The development of technology and the rise of industries are unavoidable situations of climate change. The negative effect of global warming could be catastrophic for humanity. Global warming is the increase in the average temperature of the earth's surface due to an increase in the amount of greenhouse gas emissions in the atmosphere followed by climate change. Global warming and climate change are the result of human activities, especially those related to the use of fossil fuels (petroleum and coal), as well as other activities related to forests, agriculture and livestock. Human activities, directly or indirectly, cause a change in the natural composition of the atmosphere, that is, an increase in the amount of greenhouse gases worldwide.

Global warming is the increase in the average temperature of the atmosphere, the land and the oceans. it is a significant change in climate, such as air temperature or rainfall over a period of 30 years or more. Climate change is a projection of the continuation of global warming.

Today's countries seek to limit global climate change, the danger of which increases day by day, since climate change greatly affects the environment and people's daily lives in addition to its danger for economic development (XU, YS 2019). There is increasing empirical evidence that the key cause of global change is carbon emissions, which significantly affect the nature of human life Howard-Grenville *et al.*, (2014), argue that growing organizations and industrialized production have amplified the climate change process, so how to successfully minimize carbon emissions has been the priority of all companies. Many studies show that companies do not disclose complete carbon information, depending on the management of the company. policies. Ascui, (2014), understood how carbon accounting had been approached in social and environmental accounting and reviewed several previous studies in the field of carbon accounting and concluded that it is necessary to increase research in this area.

Carbon accounting is the process of calculating the amount of carbon released by industrial processes, the reduction target, establishing systems and programs to reduce carbon emissions, and reporting on the progress of the program (Louis *et al.* 2010). With carbon accounting, companies can know the level of carbon emissions they produce from the measurement results, then company management can establish strategies to reduce carbon emissions and inform stakeholders of the company.

1.1. Statement of Problem

Climate change has been a global problem. It is an inevitable impact of the rapid development of the industrial world and the rapid growth effect of technology.

The negative effect of global warming has turned into a disaster for humanity. change caused by global warming, floods, landslides and other natural disasters often occurred around the world. It is necessary to use all the methods and techniques that mitigate climate change. What is important about this study is to demonstrate carbon accounting and how it relates to climate risk management, as well as to show the impact as a reflection of climate change in manufacturing industries.

1.3. Objective of the Study

The general objective of this study is to present the impact of carbon accounting as a reflection of climate change resulting from industrial activities. The specific objectives are the following:

1. Present the impact of carbon accounting as a reflection of climate change in manufacturing industries.
2. Present the impacts of the climate change risk assessment on organizations.
3. Analyze the cost and benefits of carbon accounting as a reflection of climate change.

2. RELATED LITERATURE REVIEW

2.1. Conceptual Frame

The need to take the natural environment into account in accounting decisions was felt from the 1960s and 1970s, giving rise to environmental accounting. In the late 1980s and 1990s, Reference suggested that accounting literature and practice should include environmental and social aspects such as waste and energy reporting, compliance and ethics audits, social and environmental reporting. , impact assessment and recognition of environmental assets and liabilities. In the 1990s, Elkington introduced the concept of "Tripple Bottom Line (TBL)", arguing the need for companies to report not only on financial transactions, but also on their social and environmental performance. Subsequently, due to legislation on carbon and greenhouse gas emissions, internal carbon and greenhouse gas accounting emerged, used to determine the obligations of companies vis-à-vis accounting for tradable rights arising from emissions taxes and greenhouse gas (GHG) emissions reporting systems. According to Haque and Islam, the pressures behind the accountability and disclosure of climate change come from various stakeholders, namely government agencies, institutional investors, environmental NGOs and media accountants. The main purpose of reporting to government agencies is to fulfill obligations related to emissions rights legislation. The reporting in terms of

responsibilities and commitments of the company mainly aims to support the image and reputation of the organization with various types of stakeholders. According to Solomon *et al.*, Among stakeholder pressures, reporting on climate change is primarily motivated by risk and risk management motivation. In other words, the need to disclose information on climate change is driven by the conviction of institutional investors that climate change is a relevant risk, the most important issue of sustainability and a relevant aspect for the clients of the l organization who need to manage climate change risk in their portfolio. investment.

2.2. Theoretical Framework

In 1993, the United Nations published the manual of national accounts; of Integrated Environmental and Economic Accounting (SEEA), at an international workshop organized by the United Nations Environment Program (UNEP) and the World Bank. SEEA publications are intended to provide a framework for presenting information relating to the environment and its impact on the economy. In 2003, the SEEA was revised and the framework used as a guide to disclose information on institutional sustainability to the public. Writing The process of this framework involves more than 60 countries made up of companies, public universities, workers and professional institutions.

Delphine Gibassier and Stefan Schaltegger (2015), demonstrate that it is possible to link two carbon management accounting approaches focused on products and organization in a combined carbon management accounting system. This has a potential impact in making carbon management accounting more efficient in terms of performance measurement and external communication in organizations. Several international agreements and protocols have been concluded to mitigate climate change which has played a role in introducing carbon accounting to global markets. Among them are as follows:

1. ***The Kyoto Protocol (2005):*** The Kyoto Agreement was signed in Japan by 175 countries around the world in addition to the countries of the European Union (CPA Australia, 2008; Jecttoon, 2010), which is an international amendment on the currency climate. The countries that have ratified it are committed to reducing emissions of carbon dioxide and other greenhouse gases. This protocol was ratified by 181 States, signed on December 11, 1997 and entered into force on February 16, 2005. The official name of this agreement is "Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC)".

2. Al Doha Conference (2012): As the end of the first phase of the Kyoto Protocol approaches, the United Nations has sought to meet with the industrialized countries of the world by inviting a conference in the Qatari capital Doha, in November 2012, to agree on the second phase of the Kyoto Protocol on reducing

carbon emissions and preserving the environment, and it was decided to launch the second phase of the Kyoto Protocol which starts from 2013 as of December 31, 2020 (UNFCC, 2015). The agreement establishes three stability frameworks, namely the Sustainable Development Mechanism (CDM), Joint Implementation (JI) and the Kyoto Carbon Trading System.

3. Paris Agreement (2015): Negotiation to develop steps to modify the Kyoto Protocol after 2020 contributed to the Paris Agreement being reached and implemented in December 2015 (Bodansky, 2016). In 2016, 175 world heads of state signed the UN climate change conference in New York under the name of the Paris Convention on Climate Change. At the conference, it was emphasized for the second time that developed countries must commit to mobilizing 100 billion dollars annually in favor of climate problems until 2020. The Paris Agreement aims to help address and minimize climate change caused by companies human and human-managed and factories, in addition to treating the resulting pollutants. From the above, it is clear how much global attention is being paid to climate problems and the degree of international stimulus to mitigate environmental pollution.

2.3. Empirical Review

Reports from the Intergovernmental Panel on Climate Change (IPCC), which summarize the latest body of knowledge on climate change, show that the impacts of climate change, such as rising temperatures, changes in sea level and changes in the ice and snow layers are already observable (Casti, 1997). The impacts of climate change are expected to increase significantly in the future, especially due to increased climate variability characterized by changes in the frequency, intensity, spatial extent, duration and timing of extreme weather events, such as extremely hot days or heat waves (IPCC, 2012). The vulnerabilities of companies and industries can be expected to be related in particular to these trend changes in extreme weather events, rather than to gradual climate change (Wilbanks *et al.*, 2007). Any change in the occurrence of extreme weather events has the potential to cause considerable adverse impacts (Hertin *et al.*, 2003; Keef and Roush, 2005; Wilbanks *et al.*, 2007), often with significant flow effects such as outages or disruptions impacts on critical infrastructure (Wilbanks *et al.*, 2017). Insurance statistics already show higher losses due to the occurrence of extreme weather events in recent decades (Munich Re, 2012), which can be attributed to a number of underlying factors, including an increase in exposure (due to the growth of the population and industrial expansion toward increased risk). areas, such as coastal zones and cities) and adverse climate impacts (due to climate change and climatic extremes) (Munich Re, 2009). Therefore, the impacts depend on the particular sector and on those sectors and places that are sensitive to climate or depend on stable climatic conditions.

The question of how organizations should best respond to climate change has sparked much debate. The best way to avoid dangerous levels of climate change would be to take immediate action to mitigate and substantially reduce greenhouse gas emissions (Kates, 2000). However, despite some efforts, progress globally has been slow to date and greenhouse gas emissions continue to rise globally, as it now seems increasingly unlikely that climate change can be mitigated with success. Researchers and policy makers are paying increased attention to developing strategies that enable society to adapt, along with mitigation mechanisms; These strategies are commonly known as adaptation (Dow *et al*., 2013) and are aimed at initiatives and measures to reduce exposure and vulnerability to actual or expected climate change. Adaptation h can take different forms, including structural or physical changes, ecosystem measures, as well as financial mechanisms such as insurance (Noble *et al*., 2014).

Despite the importance of adapting to climate change, many companies have only begun to take an interest in the topic of climate change, often with a focus on mitigating their greenhouse gas emissions due to climate change. new legislative requirements. As the impacts of climate change become more visible, businesses will need:

i) Risk assessment function (vulnerability and adaptive capacity assessment);

ii) evaluation function (assessment of costs and benefits of adaptation); and

iii) Disclosure function (disclosure of risks associated with the impacts of climate change). He believes that accounting has a role to play in supporting climate change adaptation by fulfilling these functions and can promote a framework to preemptively prepare organizations through the design of accounting practices. The study offers a discussion of these aspects in the following sections.

RISK ASSESSMENT FUNCTION: Vulnerability and Adaptive Capacity Assessment

Both management accounting and financial accounting have a role to play as a risk assessment function to determine climate risk and how they affect value-creating activities (i.e. , to determine vulnerability of assets and operations to climate change). Investors will increasingly need information on the climate. investment risk associated with change. Although existing financial accounting standards deal with risk disclosure (e.g. IFRS 9 Financial Instruments and IFRS 13 Fair value measurement), areas such as vulnerability and adaptability are generally not covered, and there is an assessment of the risks of climate change (West and Brereton, 2013). Decision-makers, on the other hand, will need information on climate impacts as they affect organization and the adaptive capacity inherent in value-creating activities

to understand how vulnerability can be reduced. To provide this information, an understanding of the impact of climate change on an organization's value-creating activities is an important starting point for risk assessment.

Assessing the Vulnerabilities of Value-creatingactivities

Climate risks are not just a result of gradual climate change, but in particular changes in the trend of weather extremes - those types of impacts that exceed certain climate thresholds or records. In order to assess the vulnerability of their organization to the impacts of change that affect the location (s) where the organization operates, business decision makers need data regarding the future impacts of climate change on policy changes. , economy, society and technology that exacerbate or mitigate the impacts of climate change and assess the vulnerability of value-creating activities accordingly. Additional vulnerabilities can arise from the induced effects of climate change impacts that affect the supplier, buyer, or an organization's resources. Vulnerability information can be derived from hazard maps that overlay the organization's location with future climate data (Linnenlueck and Griffiths, 2014; Noson, 2015) and can be used as a baseline input for future assessments of risks in order to understand which assets and activities could be affected. . As part of a vulnerability assessment, organizations can also use scenario planning exercises that assess the vulnerabilities of assets and operations to climate change under different climate change scenarios to obtain a quantification of the likelihood of impacts. negative climatic conditions and the resulting consequences for the organization.

Assessing Adaptive Capacity

While adaptive capacity is seen as important for adapting the organization to future climate impacts and risks, many investors currently view adaptive capacity as unused resources "beyond the minimum necessary to produce a given level of organizational performance. "(Nohria and Gulati, 1996: 1246).). Examples of adaptive resources that can help with climate change adaptation are changes to organizational infrastructure (such as changes to buildings) to be able to adapt to the impacts of climate change above the ground. level that would be deemed necessary for an organization to continue to operate within its current framework. business environment (West and Brereton, 2013). For example, BHP Billiton reports that identifying and assessing increasing storm intensity and storm surge levels has resulted in an increase in the trestle height of their coal port facility in Australia (BHP Billiton, 2014). To date, building adaptive capacity to respond to the impacts of climate change has not yet been given much consideration in accounting frameworks or standards, in external financial reporting, or in planning and reporting. internal decisions. Companies like BHP Billiton are in the minority. On the contrary, the creation of adaptive capacity can lead to unfavorable accounting

treatment if it occurs in the absence of tax relief under certain accounting principles and standards (West and Brereton, 2013). In addition, investments in adaptive capacity may be viewed by investors as "unnecessary" short-term investments and seen as disadvantageous to the organization's overall competitive position. These issues are likely to change as the development of climate change adaptation standards progresses, but remain an important investment consideration in the near term.

VALUATION FUNCTION: Understanding the costs and benefits of adaptation

Since the impacts of climate change are not yet fully visible and predictable, many of the company's existing activities may appear to be falsely profitable. Appropriate provisions for potential future vulnerability and resulting losses from climate impacts are often not fully included as costs in investment and infrastructure decisions, and are also integrated and monitored in current accounting systems. For organizations, the question arises of how to derive appropriate discount rates for a portfolio of climate-affected assets. Some assets can change in vulnerability over time, for example due to changes in their life expectancy and changes in climate impacts. The free risk assessment is clearly much simpler from an operational point of view, but it also does not reflect future impacts and vulnerabilities. A common assumption in the literature on adaptation of socio-economic systems to climate change is that early investment in climate change adaptation is likely to be more profitable and will bring greater incentives in the long term, compared to a "wait and see" approach. . . However, unlike climate change mitigation (i.e. efforts aimed at reducing greenhouse gas emissions), there are no established frameworks to assess the success of adaptation and the effectiveness of different options for adaptation. adaptation over time.

While the costs and benefits of undertaking mitigation efforts can be established through mechanisms such as accounting for greenhouse gas emissions, similar approaches to adaptation do not yet exist. The difficulty here is that adaptation strategies, compared to mitigation strategies, cannot be as easily linked to financial performance benefits for organizations ... Mitigation strategies, such as emission reduction efforts that encourage Resource savings (for example, energy), correspond directly to decreasing expenditure on resource inputs, while adaptation strategies are intended to produce long-term results. finished. These aspects also make it easier for companies to evaluate themselves against others within the same industry in terms of emission reduction and carbon footprint targets and achievements.

DISCLOSURE FUNCTION:Disclosure of risks associated with climate change impacts

Institutional investors and other stakeholders are pushing organizations for greater disclosure of climate impacts, particularly due to potential material negative

financial effects and low rates of disclosure (Stanny and Ely, 2008). The Carbon Disclosure Project (CDP) already requests information on greenhouse gas emissions, energy use, as well as risks andopportunities associated with climate change from thousands of the world's largest companies and 767 institutional investors with US $ 92 million in assets. Voluntarily disclosed information is made available for integration into policy, investment and organizational formulation. While the CDP has primarily focused on greenhouse gas emissions in the past, the scope is increasingly being broadened to cover information on the impacts and risks of climate change. In addition to the CDP, the Climate Disclosure Standards Board (CDSB) has also committed to integrating information related to climate change in the company's general reports (Climate Disclosure Standards Board, 2015). Financial information. The framework proposed that companies present this information in their reports and in accordance with Integrated Reporting requirements. (Table 1). Integrated reporting is a process that results in a regular integrated report on value creation over time. It includes information on the strategy, governance performance and perspectives of a company, in the context of its external environment, which lead to the creation of value in the short, medium and long term (Integrated Reporting, 2015). The International Integrated Reporting Council (IIRC) and the IASB entered into a memorandum of understanding to promote harmonization and clarity of corporate reporting frameworks, standards and requirements to promote coherence, consistency and comparability in corporate reporting (IASB, 2014) . While existing financial accounting standards already deal with the disclosure of risks, such as interest rate liquidity and currency risks (e.g., IFRS 6 Exploration and Valuation of Mineral Resources, IFRS 7 Financial Instruments: Information to disclosure, IFRS 12 Disclosure of Interests in Other Entities and IFRS 13 Fair Value Measurement), the IASB recently issued Agenda 7. Non-IFRS Information, which addresses issues of integrating climate change information into annual reports.

Table 1: Emerging Disclosure Requests for Risks Associated with Climate Impacts

Body	*Details*
Carbon Disclosure Project (CDP)	The CDP, on behalf of an institutional investor, requests information from thousands of the world's largest companies on their greenhouse gas emissions, energy consumption and the risks and opportunities associated with climate change. Disclosure takes place via the CDP questionnaire and is voluntary. The results are collated and presented on the CDP website (https://www.cdp.net/).
Climate Disclosure Standards Board (CDSB)	The CDSB is a consortium of global business and environmental non-governmental organizations (NGOs). CDSB's Climate Change Reporting Framework is a voluntary reporting framework designed for companies to disclose

	climate change risks and opportunities and shareholder value implications in their financial reports. The information framework is available through the CDSB website (http://cdsb.net/)
International Accounting Standards Board (IASB) International Financial Reporting Standards (IFRS).	The IASB is the independent standard-setting body of the IFRS Foundation. IFRS standards already address the disclosure of a wide variety of risks. More explicit integration of climate change risks into disclosure standards is likely in the future as the climate becomes more visible.

The Carbon Tracker Initiative, working with the former Securities and Exchange Commission (FASB) Standards Board on December 10, 2013, arguing that organizations with large fossil fuel reserves should be required to submit a financial disclosure to the carbon content. While this submission primarily reflects a concern about future demand and price changes due to legislative and / or technological changes, it nonetheless demonstrates a growing awareness of the important implications of climate change. In addition, as climate impacts become more noticeable, the asset allocation of financial institutions as well as investment and pension funds is likely to change, with implications for risk accounting in investment portfolios.

PREPARATION OF INDUSTRIES TO MANAGE CARBON ACCOUNTING

Together with accounting, managing the cost of carbon is a new era in the idea of ecologically-based economic transactions, which we call carbon accounting. Some research on manufacturing industries shows that the quality of environmental awareness in the company is low, hence the need to develop a carbon accounting standard. Carbon management reports can be used as a measure of environmental performance. In addition, Jafar and Kartikasari (2009) indicate that industry players require carbon accounting standards. With carbon accounting, companies can know the level of carbon emissions they are producing from the measurement results, then company management can establish strategies to reduce carbon emissions and report them to stakeholders. of the company. Based on the above results, it can be said that carbon accounting becomes an unavoidable requirement. The increase in waste and carbon emissions generated by manufacturing industries are the real cause of global warming which in turn causes climate change. To make people understand the importance of carbon accounting, it is necessary to socialize the person in charge of the company in the form of seminars or workshops.

5. RECOMMENDATIONS AND CONCLUSION

Based on the findings, the study recommends that:

1. Manufacturing industries should establish frameworks for evaluating adaptation successes and effectiveness of different adaptation options overtime as early investment in climate change adaption will likely be more cost-effective and bring greater incentives in the long run compared to "wait and see" approach.
2. Costs and benefits of undertaking mitigation efforts can be established through greenhouse gas emissions mechanisms as such approach has not yet exited for adaptation.
3. Companies, in order to achieve objectives in terms of carbon footprints and emission reductions, should adopt mitigation and adaptation strategies as these will make it easier for them to evaluate their progress and benchmark themselves against others in the same industry.
4. As part of a vulnerability assessment, organizations can also use scenario planning exercises to evaluate vulnerabilities of assets and operations to climate change under different climate change scenario in order to achieve a quantification of the likelihood of adverse climate impacts and resulting consequences for the industry.
5. Provision of information and understanding of how climate change impacts on organization's value-creating activities is an important starting point for risk assessment. Therefore, both managerial and financial accounting has a role to play as investors require information about climate change related investment risks.

Undoubtedly, climate change will have a significant future impact on standards and regulation, also affecting the accounting functions: implementation of the aforementioned methodologies by companies and industries as recommended shall create a best practice approach for organizations to understand how climate impacts can be accounted for and deliver decision makers.

References

ASX, (2014). Corporate Government Principles and Recommendations (3rd edition). Available at: *http://www.asx.com.au/regulation/corporate-government-council.htm.*

Beams, F. A., and P. E. Fertig, (1979). Pollution control though social cost conversion, *The Journal of Accounting* 132, 37-42.

Bodansky, D, (2016). The Paris Climate Change Agreement: A New Hope? *American Journal of International law,* 110.

Carmela Gulluscio, Pina Puntillo, Valerio Luciani and Donald Auisingh. Climate change accounting and reporting: A Systematic Literature review.

Clarkson, P, Li, Y, Richardson, G, & Vasvari, F. (2008). 'Revisiting the relation between environmental performance and environmental disclosure: an empirical analysis', *Accounting Organization and Society,* vol. 33, no. 4-5, pp. 303-27.

Climate Disclosure Standard Board, 2015, About CDSB. Available at: *http://www.cdsb.net/about-cdsb.*

Cogan, D. G., (2006). Corporate Government and Climate Change: Making the Connection (Ceres, Boston, MA).

Cook, A. (2009). Emission rights: From costless activity to market operations. Accounting Organization, and Society, 34(3), 456-468.

Cotter, J., D. Stokes, and A. Wyatt, (1998). An analysis of factors influencing asset writedowns, Accounting & Finance 38, 157-179.

Elkington, J., (1997). Cannibals with Forks: The Triple Bottom Line of 21st Century Business (Capstone, Oxford, UK).

Global Reporting Initiative, (2015). An Overview of GRI. Available at: *https://www.globalreporting.org/information/about-gri/what-is GRI/Pages/default.aspx.*

Ibrahim R.I. Elmadhoun, Dr. Gaddan Naresh Reddy. The Role of Carbon Accounting in Managing the Climate Change Risks. Literature Review.

J. Howard-Grenville, S. J. Buckle, B. J. Hoskins, G. George, (2014). Climate change and management, *Academy of Management Journal*, 57, 615-623.

Lovell, H., & MacKenzie, D. (2011). Accounting for carbon: the role of accounting professional organizations in governing climate change. *Antipode,* 43(3), 704-730.

M. Windsor, C., & Wahyuni, D. (2011). An investigation of voluntary corporate greenhouse gas emissions reporting in a market governance system: Australia evidence. *Accounting, Auditing & Accountability Journal,* 24, 1037-1070.

Martina K. Linnenluecke, Jacqueline Birt and Andrew Griffiths. The role of accounting in supporting adaptation to climate change.

Matisoff, D. C. (2013). Different rays of sunlight: Understanding information disclosure and carbon transparency. *Energy Policy,* 55, 579-592.

McKinsey & Company, (2007). Costs and Potentials of Greenhouse Gas Abatement I. Germany, McKinsey & Company, Inc., D"usseldorf.

Moorhead, G., & Griffin, R. W., (1995). Organization Behaviour, (Boston: Houghten Mifflin).

Prof. Dr. Sri Iswari, CA Director of Postgraduate School, Universitas Anlangga Surabaya, Indonesia. Carbon accounting reflection as a response to face the climate change.

Sengupta, P. (1998). 'Corporate disclosure quality and the cost of debt', *Accounting Review,* vol. 73, no. 4, pp. 459-74.

United Nations Framework Convention on Climate Change. (2015). Kyoto Protocol. Retrieved from *http://unfccc.int/kyoto_protocol/items/2830.php.*

Wegener, M., Elayan, F. A., Felton, S., & Li, J. (2013). Factors influencing corporate environmental disclosure. *Accounting Perspectives,* 12, 53-73.