



**UNIVERSITI PUTRA MALAYSIA**

***CORPORATE CARBON STRATEGIES, CARBON ACCOUNTING  
AND PERFORMANCES OF ISO14001-CERTIFIED COMPANIES IN  
MALAYSIA***

**NUR FATIN KASBUN**

**SPE 2021 10**



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AND PERFORMANCES OF ISO14001-CERTIFIED COMPANIES IN  
MALAYSIA**

By

**NUR FATIN KASBUN**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra  
Malaysia, in Fulfillment of the Requirements for the Degree of  
Doctor of Philosophy**

**October 2020**

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Doctor of Philosophy

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**NUR FATIN KASBUN**

**October 2020**

**Chair : Associate Professor Ong Tze San, PhD**  
**Faculty : School of Business and Economics**

The concern over environmental protection and corporate sustainability issues has increased in recent years, especially when carbon dioxide (CO<sub>2</sub>) emission has been scientifically proven as the ultimate reason for climate change. Likewise, the accounting role has evolved over time emphasizing different growth of information including carbon accounting utilization. However, despite the growth of interest to achieve sustainability by mitigating CO<sub>2</sub> emissions, businesses are still uncertain about the kind of carbon strategies and tools that could enhance firm performances particularly corporate carbon performance. Companies are reluctant due to the perception that the sustainability effort is too complex to comply. On top of that, in Malaysia, the poor record of companies' participation in carbon emissions mitigation programs; and the world climate pledge that Malaysia ratified is far from being achieved. Based on these critical reasons, carbon emissions mitigation is a critical effort as carbon emissions affect business activities and behavior. This study examined the carbon dioxide traits that incorporated into organizations' corporate strategy which later emerged as one of the corporate strategies. The study also determined the importance of carbon accounting in capturing carbon information and consequently enhanced the organizations' carbon and financial performances. Due to scarce empirical studies in this perspective, this study examined the direct and indirect effects of the constructs, which comprise of corporate carbon strategies, carbon performance, carbon accounting's mediating role, and government's carbon initiatives moderating role. This study integrates resource-based theory, legitimacy theory and stakeholder theory in the establishment of the research model. The data collection was executed using a questionnaire; a total of 140 questionnaires returned and 136 usable responses were collected from managers of companies certified with ISO 14001 EMS by SIRIM Malaysia. The data collected were subjected to a partial least square structural equation modeling (PLS-SEM) analysis using the Smart PLS 3.2.7 software version.

The results indicated that carbon strategies directly influence the implementation of carbon accounting; carbon accounting directly improves carbon performance, and carbon performance directly enhances organizations' financial performance. In addition, carbon accounting is found to exert a full mediation effect on the relationship between carbon strategies and carbon performance. Meanwhile, government carbon initiatives do not exert moderation effect on the relationship between carbon accounting and carbon performance. However, contrary to the prediction, the results failed to validate carbon governance as one of the carbon strategies that influences carbon accounting implementation. The results also showed that carbon accounting failed to exert a full mediation effect on the relationship between carbon governance and carbon performance. As for the control variables effects in the post-hoc analysis, the results showed that only organizations' ownership has the control effects on financial performance. This study has integrated a resource-based theory as the over-arching theory; it explains that a managerial structure determines which strategic resources of a business organization can be utilized to achieve sustainable competitive advantage. Correspondingly, this study found that the sampled companies utilize their business resources by incorporating carbon strategies through carbon accounting to achieve a superior carbon performance. This study validated the predictive role of corporate carbon strategies and carbon accounting's mediating role; it also revealed the significant paths leading to a superior firm performance among the SIRIM Malaysia ISO 14001 EMS certified companies. Altogether, the findings of this study provide useful insights for Malaysian companies and the government in becoming carbon neutral organizations, industries, and nations.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia  
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**STRATEGI KARBON KORPORAT, PERAKAUNAN KARBON,  
DAN PRESTASI SYARIKAT-SYARIKAT DIKTIRAF PENSIJILAN ISO14001  
DI MALAYSIA**

Oleh

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Keprihatinan terhadap isu perlindungan alam sekitar dan kelestarian korporat telah meningkat dalam beberapa tahun kebelakangan ini terutama apabila pelepasan karbon dioksida (CO<sub>2</sub>) terbukti secara ilmiah sebagai penyebab utama perubahan iklim. Begitu juga dengan peranan perakaunan yang berkembang dari masa ke masa menekankan pertumbuhan maklumat yang berbeza termasuk penggunaan perakaunan karbon. Namun, di sebalik pertumbuhan minat untuk mencapai kelestarian dengan mengurangkan pelepasan CO<sub>2</sub>, perniagaan masih tidak yakin dengan jenis strategi dan alat karbon yang dapat meningkatkan prestasi perusahaan terutamanya prestasi karbon korporat. Syarikat enggan kerana persepsi bahawa usaha kelestarian terlalu kompleks untuk dipatuhi. Di samping itu, di Malaysia, rekod penyertaan syarikat yang kurang baik dalam program pengurangan pelepasan karbon juga tercatat; dan ikrar iklim dunia yang disahkan oleh Malaysia masih belum dapat dicapai. Berdasarkan sebab-sebab kritikal ini, pengurangan pelepasan karbon adalah usaha penting kerana pelepasan karbon mempengaruhi aktiviti dan tingkah laku perniagaan. Kajian ini meneliti sifat karbon dioksida yang diterapkan ke dalam strategi korporat dan muncul sebagai salah satu strategi karbon korporat. Kajian ini juga mendapati kepentingan perakaunan karbon dalam mendapatkan maklumat karbon dan seterusnya meningkatkan prestasi kewangan dan prestasi karbon organisasi. Disebabkan kajian empirikal yang kurang dalam perspektif ini, kajian ini meneliti kesan langsung dan tidak langsung dari konstruk yang terdiri daripada strategi karbon korporat dan prestasi karbon serta peranan pengantaraan perakaunan karbon dan peranan penyederhanaan inisiatif karbon kerajaan. Kajian ini menggunakan teori berasaskan sumber, teori legitimasi dan teori pihak berkepentingan dalam pembentukan model penyelidikan. Pengumpulan data dilaksanakan menggunakan soalan kaji selidik; 140 maklumbalas dikumpulkan dengan 136 maklumbalas berguna terkumpul dari pengurus syarikat yang diperakui dengan ISO 14001 EMS oleh SIRIM di Malaysia. Kemudiannya menjalani analisis pemodelan persamaan struktur separa persegi (PLS-SEM) menggunakan perisian Smart PLS versi 3.2.7.

Hasil kajian menunjukkan bahawa strategi karbon secara langsung mempengaruhi pelaksanaan perakaunan karbon, perakaunan karbon secara langsung meningkatkan prestasi karbon, dan prestasi karbon secara langsung meningkatkan prestasi kewangan organisasi. Di samping itu, perakaunan karbon didapati memberikan kesan pengantaraan sepenuhnya terhadap hubungan antara strategi karbon dan prestasi karbon. Manakala, inisiatif karbon kerajaan tidak memberikan kesan penyederhanaan terhadap hubungan antara perakaunan karbon dan prestasi karbon. Namun, bertentangan dengan ramalan, hasil kajian gagal mengesahkan tadbir urus karbon sebagai salah satu strategi karbon yang mempengaruhi pelaksanaan perakaunan karbon. Hasil kajian juga menunjukkan bahawa perakaunan karbon gagal memberikan kesan penuh pengantaraan terhadap hubungan antara tadbir urus karbon dan prestasi karbon. Bagi kesan pemboleh-ubah kawalan dalam analisis kemudiannya pula, hasil menunjukkan bahawa hanya pemilikan organisasi yang mempunyai pengaruh kawalan terhadap prestasi kewangan syarikat. Kajian ini menerapkan teori berasaskan sumber sebagai teori menyeluruh, di mana ia menjelaskan bahawa struktur pengurusan menentukan sumber strategik yang boleh digunakan organisasi perniagaan untuk mencapai kelebihan daya saing yang lestari, sejajar dengan kajian ini untuk melihat syarikat sampel menggunakan sumber perniagaan yang dimiliki mereka dengan menerapkan strategi karbon untuk mencapai keunggulan prestasi karbon melalui perakaunan karbon. Kajian ini mengesahkan peranan ramalan strategi karbon korporat dan peranan pengantara perakaunan karbon, dan mendedahkan kepentingan yang membawa kepada prestasi syarikat yang unggul di kalangan syarikat yang diperakui dengan ISO 14001 EMS oleh SIRIM di Malaysia. Secara keseluruhan, penemuan kajian ini memberikan pandangan berguna bagi syarikat Malaysia dan kerajaan untuk menjadi organisasi, industri dan negara yang kurang karbon dan berkecuali.

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In loving memory, Maru.



This thesis was submitted to the Senate of the Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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## TABLE OF CONTENTS

	<b>Page</b>
<b>ABSTRACT</b>	i
<b>ABSTRAK</b>	iii
<b>ACKNOWLEDGEMENTS</b>	v
<b>APPROVAL</b>	vi
<b>DECLARATION</b>	viii
<b>LIST OF TABLES</b>	xiii
<b>LIST OF FIGURES</b>	xv
<b>LIST OF APPENDICES</b>	xvi
<b>LIST OF ABBREVIATIONS</b>	xvii
<b>CHAPTER</b>	
<b>1 INTRODUCTION</b>	<b>1</b>
1.1 Introduction	1
1.2 Background of the study	1
1.3 Problem statement	7
1.4 Research questions	9
1.5 Research objectives	10
1.6 Definitions of constructs	10
1.7 Significance of the study	12
1.8 The alignment of problem statement, research questions, and research objectives	13
1.9 Chapter summary	15
<b>2 LITERATURE REVIEW</b>	<b>16</b>
2.1 Introduction	16
2.2 Carbon accounting	16
2.2.1 Definition(s) of carbon accounting	16
2.2.2 Transformation of carbon accounting	19
2.2.3 Carbon accounting past research	21
2.3 Corporate carbon strategies	23
2.3.1 Carbon governance	27
2.3.2 Carbon risk management	29
2.3.3 Carbon reduction target	31
2.3.4 Carbon standard	33
2.3.5 Carbon stakeholder collaboration	35
2.4 Government carbon initiatives	37
2.5 Corporate carbon performance	40
2.6 Financial performance	41
2.7 Research gaps	43
2.8 Underpinning theories	46
2.8.1 Resource-based theory	46
2.8.2 Legitimacy theory	47
2.8.3 Stakeholder theory	49
2.9 Chapter summary	51
<b>3 RESEARCH METHODOLOGY</b>	<b>52</b>
3.1 Introduction	52
3.2 Conceptual framework	52

3.3	Hypotheses development	54
3.3.1	Corporate carbon strategies and carbon accounting	54
3.3.2	Mediation effects of carbon accounting	57
3.3.3	Carbon accounting and carbon performance	60
3.3.4	Moderation effects of government carbon initiatives	61
3.3.5	Corporate carbon performance and financial performance	63
3.4	Research paradigm	64
3.5	Research design	64
3.6	Research population	65
3.7	Sampling method, sampling frame and sample size	66
3.8	Research instrument	67
3.9	Control variables	67
3.10	Measurement and operationalization of variables	68
3.11	Questionnaire description	72
3.12	Exogenous and endogenous variables measurements	72
3.13	Questionnaire preliminary test and pilot test	73
3.14	Data collection procedure	73
3.15	Response rate	74
3.16	Statistical tools for data analysis	74
3.16.1	Statistical package for the social sciences (SPSS)	74
3.16.2	Partial least squares structural equation modeling (PLS-SEM)	75
3.17	Data processing	76
3.18	Non-response bias assessment	76
3.19	Common method bias assessment	76
3.20	Descriptive statistics	76
3.21	Data normality assessment	77
3.22	Collinearity analysis	77
3.23	Model assessments	77
3.23.1	Measurement model assessment	78
3.23.2	Structural model assessment	78
3.24	Chapter summary	79
<b>4</b>	<b>RESULTS AND DISCUSSIONS</b>	<b>80</b>
4.1	Introduction	80
4.2	Profiles of data	80
4.2.1	Survey responses	80
4.2.2	Data screening	80
4.2.3	Non-response bias	81
4.2.4	Common method bias	81
4.2.5	Descriptive statistics on sample companies	82
4.2.6	Descriptive statistics on survey respondents	83
4.2.7	Descriptive statistics on constructs	84
4.2.8	Data normality and distribution	87
4.2.9	Collinearity statistics	87
4.3	Measurement model	88
4.3.1	Specification of measurement model scales	88
4.3.2	Confirmatory factor analysis of construct validity	90
4.3.3	Convergent validity for first-order constructs	90
4.3.4	Discriminant validity for first-order constructs	92

4.3.5	Construct validity for second-order constructs	93
4.3.6	Summary of measurement model	94
4.4	Structural model	94
4.4.1	Hypotheses testing and discussion on direct effects	95
4.4.2	Hypotheses testing and discussion on mediation effects	101
4.4.3	Hypothesis testing and discussion on moderation effects	105
4.4.4	Coefficient of determination ( $R^2$ )	106
4.4.5	Effect size ( $f^2$ )	106
4.4.6	Predictive relevance ( $Q^2$ )	107
4.4.7	Post-hoc analysis: control variables effects on structural model	109
4.4.8	Summary of structural model analysis	110
4.5	Chapter summary	111
<b>5</b>	<b>RESEARCH CONCLUSIONS</b>	112
5.1	Introduction	112
5.2	Summary of the findings	112
5.3	Research contributions	118
5.3.1	Theoretical contributions	118
5.3.2	Practical contributions	120
5.4	Research limitations	121
5.5	Suggestions for future research	123
5.6	Conclusion	125
5.7	Chapter summary	125
	<b>REFERENCES</b>	126
	<b>APPENDICES</b>	156
	<b>BIODATA OF STUDENT</b>	172
	<b>LIST OF PUBLICATIONS</b>	173

## LIST OF TABLES

<b>Table</b>		<b>Page</b>
1.1	Malaysia's Environmental Performance Index (EPI) ranking and scores	9
1.2	Definitions of constructs	10
1.3	Problem statement, research questions, and research objectives	14
2.1	Definition of carbon accounting	17
2.2	The transformation of carbon accounting	20
2.3	Terms and definitions of corporate strategies as response to climate change	24
3.1	Summary of research design	65
3.2	Constructs, measurement items and sources of measurements	68
3.3	Questionnaire's details description	72
3.4	Response rate indicator	74
4.1	Variance inflation factor (VIF)	81
4.2	Frequency distribution of companies' profiles	82
4.3	Frequency distribution of respondents' profiles	84
4.4	Descriptive statistics of measurement items	85
4.5	The structure of measurement model	89
4.6	Factor loadings, convergent validity, and reliability for first-order constructs	90
4.7	Fornell-Larcker Criterion for first-order constructs	92
4.8	Latent variable correlations	93
4.9	Construct validity and reliability for second-order construct	94
4.10	Fornell-Larcker Criterion for second-order construct	94
4.11	Direct paths coefficients results	96
4.12	Direct effects path coefficients assessment	100

4.13	Mediation analysis results	101
4.14	Mediation path coefficients assessments	104
4.15	Moderation analysis results	105
4.16	Moderation path coefficients assessment	106
4.17	The level of $R^2$	106
4.18	The level of $f^2$	107
4.19	The level of $Q^2$	108
4.20	Assessments of the structural model with control variables effects	110
5.1	Summary of research problem, research questions, research objectives, hypotheses and results	115



## LIST OF FIGURES

<b>Figure</b>		<b>Page</b>
1.1	Diagram of global greenhouse gas emissions by gas	4
2.1	Carbon Emission Index (CEI) before and after reduction strategy implementation	27
2.2	Summary of research gaps	45
2.3	Theoretical framework	51
3.1	Conceptual framework	53
4.1	Measurement model	89
4.2	Structural model	95
4.3	Structural model augmented with control variables	109

## LIST OF APPENDICES

<b>Appendix</b>		<b>Page</b>
1.1	Malaysia carbon dioxide emissions historical data (1968 – 2017)	156
2.1	Empirical research of carbon accounting and carbon-related research in Malaysia	157
3.1	Questionnaire	160
4.1	Items loadings and cross loadings	169
4.2	Construct heterotrait-monotrait ratio (HTMT) for latent variables	171

## LIST OF ABBREVIATIONS

ACCA	Association of Chartered Certified Accountants
AVE	Average variance extracted
BIM	Building Information Modeling
CA	Carbon accounting
CAS	Carbon accounting system
CBs	Certification bodies
CDI	Carbon Disclosure Index
CDLI	Carbon Disclosure Leaders Index
CDM	Carbon Development Mechanism
CDP	Carbon Disclosure Project
CDSB	Carbon Disclosure Standard Board
CEI	Carbon Emission Index
CEO	Chief executive officer
CFA	Confirmatory factor analysis
CFO	Chief financial officer
CFV	Carbon footprint verification
CIMA	Chartered Institute of Management Accountants
CMB	Common method bias
CMS	Carbon management system
COP	Conference of Parties
COSO	Committee of Sponsoring Organizations
CP	Carbon performance
CR	Cronbach's alpha
CSR	Corporate Social Responsibility

EDDICE	Empirical Downscaling Dynamic Integrated Model of Climate and Economy
EM	Environmental management
EMA	Environmental management accounting
EMAN	Environmental Management Accounting Network
EMCS	Environmental Management Control System
EMS	Environmental management system
EPA	Environmental Protection Agency
EPI	Environmental Performance Index
ETS	Emission Trading Scheme
EU	European Union
GBI	Green Building Index
GDP	Gross Domestic Product
GHG/s	Greenhouse gases
GRI	Global Reporting Initiative
HTMT	Heterotrait-monotrait
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
INCAM	Integrated Carbon Accounting and Mitigation
INCR	Investor Network on Climate Risk
INDC	Intended Nationally Determine Contributions
ISO	International Organization for Standardization
KPMG	Klynveld Peat Marwick Goerdeler
MAS	Management accounting system
MASB	Malaysian Accounting Standard Board
MCS	Management control system

MIA	Malaysian Institute of Accountants
MICPA	Malaysian Institute of Certified Public Accountants
MITI	Ministry of International Trade and Industry
MoU	Memorandum of Understanding
MT	Metric tonnes
MyCREST	Malaysian Carbon Reduction and Environmental Sustainability Tool
NCDP	National Carbon Disclosure Program
NGO	Non-governmental organizations
NGTP	National Green Technology Policy
OLS	Ordinary Least Square Regressions
O/SHE	Occupational Safety, Health and Environment
PLS	Partial Least Square Regression
PLS-SEM	Partial Least Squares Structural Equation Modeling
PMS	Performance measurement system
PwC	PricewaterhouseCoopers
RE	Renewable energy
RBT	Resource-Based Theory
RBV	Resource-Based View
ROA	Return on assets
ROE	Return on equity
ROI	Return on investment
ROS	Return on sales
SC	Securities Commission
SD	Standard deviation
SDG	Sustainable Development Goals
SEM	Structural Equation Modeling

SIRIM	Standard and Industrial Research Institute of Malaysia
UN	United Nation
UNDP	United Nations Development Programme
UNSD	United Nations Division of Sustainable Development
UNFCCC	United Nations Framework Convention on Climate Change
VCR	Voluntary Carbon Reporting
VIF	Variance inflation factor
WBCSD	World Business Council on Sustainable Development
WEF	World Economic Forum

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

This chapter comprises the background of the study, research problem, research questions, research objectives, and significance of the study. The study background explains and elaborates on the interrelation between carbon strategies, carbon accounting, and carbon performance; the adverse effects of greenhouse gas (GHG) emissions that instigate climate change<sup>1</sup>; how GHG emissions and climate change affect accounting at the organizational, national and global levels. The subsequent parts are the statement of problems, research questions, research objectives, the definitions of all the research constructs, and, last but not least, the study's significance.

### 1.2 Background of the study

Sustainability has become a very important dimension for corporation currently. The world's scientists have clearly warned the humanity of a climate emergency (Ripple et al, 2020). A massive increase of actions and endeavors to preserve environment from every single person or entity is needed to avoid untold suffering due to the climate crisis. The climate crisis is closely linked to corporate world. As consequences, corporation specifically corporate accounting should not only focus on financial but must take action to counter the effects of their greenhouse gases emissions especially carbon dioxide, the major cause of climate change. Hence, this study is focusing on the role of accounting in mitigating carbon dioxide emissions. Presently, industrial corporations' carbon dioxide (CO<sub>2</sub>) emissions, corporate social responsibility (CSR), and corporate environmental responsibility have become a focal discussion among global society. The attention is due to the concern for environmental threats, climate change as such. The hazardous impacts of climate change are not only affecting the environment but also the economy. Hence, corporate performance nowadays is being evaluated financially and environmentally (Schaltegger & Burritt, 2006).

Carbon emissions could substantially affect business activities and behavior (Saka & Oshika, 2014). Therefore, business organizations must limit and control their CO<sub>2</sub> emissions, and also must seriously consider climate traits in their corporation's strategies (Gallego-Álvarez, Rodríguez-Domínguez, & García-Sánchez, 2011). This study focuses on corporate carbon strategies, which utilize carbon accounting to improve corporate carbon performance. Corporate carbon strategy is vital for effective corporations' carbon improvement process (Schaltegger & Csutora, 2012). However, there is a close interplay between carbon strategy and carbon accounting (system) that makes them interdependent. According to Luo and Tang (2016), a carbon accounting

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<sup>1</sup> Climate change is a change in global or regional climate patterns. Notably, the change has been apparent from the mid to late 20th century onwards. It is contributed mainly by the increased atmospheric carbon dioxide level produced by the use of fossil fuels.

system is a method to materialize a company's carbon strategy to increase efficiency in mitigating carbon emissions and gain a competitive advantage. Further, according to Wijethilake, Munir, and Appuhami (2016), organizational performance would not directly result from the implementation of the strategy; however, performance is better when carbon accounting is practiced through corporate carbon strategies to achieve superior organizational performances.

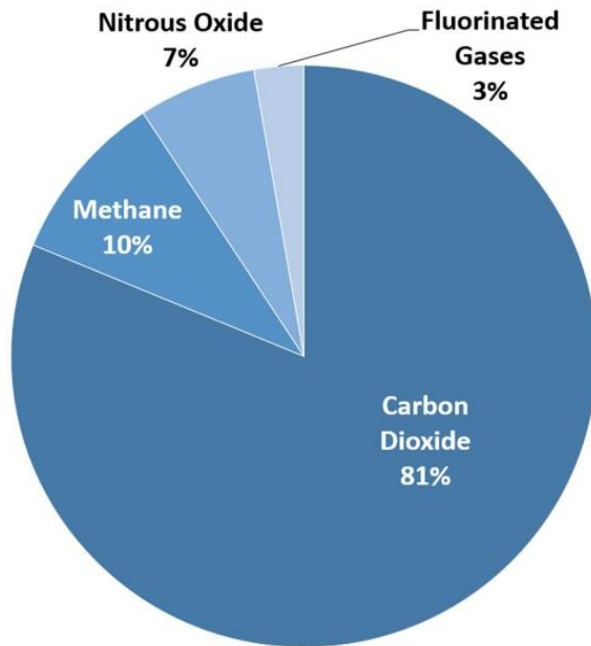
The industry and the industrial use have been acknowledged as the primary causes and contributors to carbon dioxide (CO<sub>2</sub>) emissions (UNDP, 2013; Van der Hoeven, 2011), backed by a reluctance to adopt green technology and to maintain the usual business activities have driven CO<sub>2</sub> level to rise. Hence, accountants can help concerned organizations deal with organizational CO<sub>2</sub> emissions by employing carbon accounting. As measuring, recording, and communicating are the accounting principle, carbon accounting refers to a process that facilitates carbon emissions measuring and monitoring that will eventually motivate better performance. Thus, accountants play an important role in carbon accounting establishment and operation. The Association of Chartered Certified Accountants (ACCA) has issued accountants' guidelines regardless of big corporations or small and medium-sized entities. A simple form of carbon accounting is potentially accessible to all entities. That way, businesses are not discouraged by the time consumed to generate carbon accounts or by the complexity of the process. The simplest form of carbon accounting guidelines (developed by ACCA and Green Accountancy in the United Kingdom) involve decisions that primarily start from narrowing down the reporting scope by focusing on business activities that significantly involve emissions. The guidelines provide reporting form, methodology, and even conversion factors (e.g., energy used converted into emissions in metric tons) to encourage more organizations to protect the environment, gain business growth, and save cost. Carbon accounting deals with professional responsibilities. Organizations must take action to help reduce greenhouse gas emissions because CO<sub>2</sub> emissions mitigation is a huge task that requires widely synchronized resolutions. The environmental degradation caused by carbon emissions affects business operations in every country and region across the globe. Hence, carbon accounting is needed in various aspects. Systematically, carbon accounting provides tools to quantify carbon emissions and help organizations make informed-decisions regarding mitigation strategies. The information generated from carbon accounting could enhance carbon performance superiority. Economically, provided with the right guidance, carbon accounting can simply help identify which business activities consume much energy, which is the starting point to help reduce the energy and resources used. This aspect signifies how carbon accounting assists organizations to attain a superior carbon performance and also proves that carbon accounting does improve carbon performance (Alrazi & Husin, 2016). Once a cost is lowered, better pricing can be set without affecting the margin to attract customers. If the number of customers grows, financial performance will indicate better results. In terms of social and business development, the use of carbon accounting can help attract the right employees, customers, and investors who strongly support green business and believe in growing together, environmentally, and financially. When a company has achieved an improved carbon performance, the carbon transparency demonstrated will develop trust and loyalty among the stakeholders. Environmentally, carbon accounting implementation helps organizations become more environmentally conscious by taking carbon emissions and mitigation efforts into their accounts. This move fundamentally to create a real change that contributes to the achievement of Sustainable Development Goals (SDG).



Transforming conventional customs and behaviors that are detrimental to the environment into more environmentally friendly approaches needs a substantial understanding of its surroundings and influences (Daud, Mohamed, & Abas, 2015). Thus, in implementing carbon accounting practices in organizations, companies must understand the needs to mitigate a company's CO<sub>2</sub> emissions; the factors that influence a certain amount of emissions, suitable carbon strategies that suit the organization's needs are required. In the carbon accounting practices perspective, a company needs necessary internal mechanisms such as carbon strategies to create a holistic carbon mitigation system. Bui and Fowler (2017) posit that strategies or strategic responses need supports from the implementation of carbon accounting practices in organizations. According to Motzer (2020), there are few ways to achieve successful corporate carbon performance and reporting; firstly, to define carbon accounting boundaries to concentrate on and which part of business activities that significantly emit CO<sub>2</sub>. Secondly, to determine the consumption values, especially when robust energy consumption values are fundamental for reliable measurement and calculation of CO<sub>2</sub> emissions. Carbon accounting, therefore, plays a vital role in measuring reliable values of CO<sub>2</sub> emissions. Thirdly, to develop appropriate carbon strategies according to the organization's needs. Besides the importance of CO<sub>2</sub> emissions' hard facts and figures, companies' CO<sub>2</sub> emissions mitigation or environmental efforts shall also be reflected in the corporate strategy that they have embedded. Companies must embed carbon strategies into their operation in order to stay competitive. These strategies include incorporating carbon governance, identifying and managing carbon risks, and setting carbon reduction targets; these measures help companies to keep track of their efforts to improve carbon performance, to always be guided with standard compliances, and to encourage the stakeholders' involvement in their mitigation efforts. Consequently, the development of carbon strategy and carbon accounting has become critical in the current business sphere, especially when strategies and systems are interdependent.

Unfortunately, most of the economic production forms will continue to contribute to pollution. Various forms of pollutions are typically released into the environment affecting the air, water, and soil quality, except if the waste or emissions management systems are put in place efficiently (Bakar, Abdullah, Ibrahim, & Jali, 2017). The greenhouse gas (GHG) emissions, especially carbon emissions, are the catalyst to climate change and the emissions continue to escalate. Other types of business activities' GHG emissions include carbon dioxide (CO<sub>2</sub>), carbon dioxide equivalents (CO<sub>2</sub>e), methane (CH<sub>4</sub>), carbon monoxides (CO), sulfur oxides (SO), and volatile organic compounds (VOC) (Chee, Mahmood, & Raman, 2010); nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), and chlorofluorocarbons (CFCs) (Lenzen et al., 2018), and perfluorocarbons or sulfur hexafluoride (SF<sub>6</sub>) (Schmidt, 2009). Figure 1.1 presents an overview of global greenhouse gas (GHG) emissions. Based on Figure 1.1, from various kinds of greenhouse gases, carbon dioxide covered up to 81% emissions in the world.

## Overview of Greenhouse Gas Emissions in 2018



**Figure 1.1: Diagram of global greenhouse gas emissions by gas**  
[Source: Environmental Protection Agency (EPA) (2018)]

Malaysia, as one of the developing nations in Asia, is considerably responsible for the environment. As the Malaysian economy is rapidly booming as the nation aspires to be a high-income nation by 2020, Malaysia continues to be attentive and careful of its responsibility toward environmental stewardship and sustainability in creating a better life quality for the citizens. Hence, Malaysia is also one of the countries that are actively mitigating CO<sub>2</sub> emissions through various domestic alleviation efforts and intergovernmental instruments such as an international agreement intended at decreasing greenhouse gas (GHGs) atmospheric concentrations (Safaai, Noor, Hashim, Ujang, & Talib, 2011). Under the National Green Technology Master Plan 2017-2030, Malaysian government targets to minimize CO<sub>2</sub> emissions from the contemporaneous eight metric tons (MT) per capita to six metric tons per capita in 2030. Relatively, at the worldwide emissions reduction effort, Malaysia has signed and ratified the Kyoto Protocol on 4<sup>th</sup> September 2002, which is a global climate change agreement that lawfully binds industrial countries to lessen the accumulative GHG emissions. Subsequently, in 2009, in Copenhagen, Malaysia has pledged to adopt an indicator of up to 40% of emission intensity of gross domestic product (GDP) by 2020, and this indicator is to be compared to 2005 emissions levels (UNDP Malaysia, 2012). Meanwhile on 16 November 2016 in Paris, Malaysia signed and ratified the Paris Agreement that permits Malaysia to take part actively in the global carbon emissions reduction effort, which Malaysia intentionally aims to minimize greenhouse gas emissions intensity of GDP by 45% by 2030 and to be compared with the 2005

emissions intensity of GDP (UN, 2017). The plan to achieve the country's pledges for carbon footprint reduction at the climate change conferences in Paris and Kyoto is a tough balancing act as Malaysia's carbon dioxide emissions keep increasing each year, and the trend in the past few decades is alarming. Evidently, the surface temperatures mean in Malaysia have increased from 0.6°C to 1.2°C over 50 years from 1969 until 2009. These figures are expected to intensify from 1.5 to 2°C by 2050 (Begum, 2017). According to BP Statistical Review of World Energy (2017) in its Carbon Dioxide Emissions Historical Data of Malaysia, the carbon dioxide emissions have been in an upward trend in Malaysia since 1968 until the recent years. The data statistics can be referred in Appendix 1.1.

Corporations or business organizations are the catalysts of a modern economic environment. Business corporations contribute to the success of converting natural resources into wealth, which have directly created today's sophisticated social world but unfortunately, at the same time, deteriorated the environment. The powerful dynamism of modern corporate organizations has led to simultaneous societal and environmental transformation. Traditionally, it is customarily that corporate organizations prioritize revenue and profit opportunities. However, due to the increased societal awareness of environmental protection and preservation, corporate organizations must balance their profit-making interest and contribution to environmental and societal wellbeing. In doing so, the reporting on sustainability, specifically on carbon emissions or having carbon mitigation initiatives, should benefit corporations in some ways besides demonstrating their move toward more sustainable, ethical, and responsible business operations. Nevertheless, many companies are still not convinced by the benefits of environmental accounting (Ong, Teh, Ng, & Soh, 2016). Also, the overall discussions on this field and the results from prior studies remained inconclusive for developed and developing countries, particularly Malaysia. Sustainability efforts are considered costly, complicated, and subjective to measure (Kasbun, Teh, & Ong, 2016). This perception causes corporate organizations to be skeptical of such efforts. In Malaysia, the government holds a critical, authoritative role that can enforce carbon emissions mitigation and encourage industries' carbon reduction efforts. Government carbon initiatives are crucial; without the initiatives' promotion, there is a possibility of a high unawareness level among Malaysian companies on the adverse impacts of carbon emissions despite the existing attempts to further reduce carbon footprint in the global warming mitigation task.

Despite the complexity of committing to sustainability efforts and relatively low climate change awareness, the carbon mitigation efforts are gaining momentum in Malaysia. In a study by Bakar et al. (2017), based on their survey, 80% of the organizations studied are probably concerned more about the negative or positive impacts of carbon emissions on the environment. This finding indicates that if green-economy awareness has increased, it can lead to environmental sustainability (Bakar et al., 2017). Past studies also indicate that companies that have opted for the sustainability-related business model have a twofold probability of reporting profit that comes from sustainability compared to companies that maintain the conventional model; it is also reported that organizations report a profit once after they have changed to a sustainability-related business model (MIT Sloan Group, 2009). Organizations' CO<sub>2</sub> emissions will adversely affect the environment and businesses in many aspects. Hence, companies must consider the critical role of carbon strategies, carbon

accounting, and carbon performance to help reduce CO<sub>2</sub> emissions' risks and negative impact probabilities. The ripple of the sustainability wave is slowly affecting the corporate sector as Malaysian companies are encouraged to report via integrated annual reports (Securities Commission Malaysia, 2017). The extreme growth of carbon emissions level combined with businesses' daily routines could impede Malaysians' efforts toward sustainable development paths (Zaid, Myeda, Mahyuddin, & Sulaiman, 2015). As natural resources are essential for business activities, companies must also be aware that they also owe society the same way as any human. Sustainability awareness and knowledge may lead to climate change improvement. The purpose and emphasis of accounting as a social practice has changed over time (Jones & Oldroyd, 2009). Different information grows, and priorities have changed toward catering for demanding and challenging environmental and social issues. This transformation is evident over time as accountants are deeply involved in environmental disclosure matter, plus the emergence of social information from various sides such as government organizations, non-governmental organizations (NGOs), and public and private organizations (Adams & Frost, 2008). Thus, when a national level is involved like what is taking place in Malaysia, the government must promote more initiatives to encourage active carbon emissions mitigation efforts. Even the United Nations Framework Convention on Climate Change (UNFCCC) encourages industrialized countries, corporate organizations, and even individuals to adopt a measure to mitigate carbon emissions and to have initiatives to move toward low-carbon-footprint (Ministry of International Trade and Industry, 2017).

Therefore, as the CO<sub>2</sub> emissions issue is gaining worldwide attention, Malaysia's involvement is not an exception. One way to aid environmental improvement in dealing with climate change issues and achieve sustainability in Malaysia is via carbon emissions mitigation to reduce carbon footprint. Thus, this study investigates the relationship between carbon strategies, carbon accounting, government carbon initiatives, and performance (carbon and financial) of companies in Malaysia. This study's underpinning theories are resource-based theory (RBT), legitimacy theory, and stakeholder theories. These theories address the primary concern of this study to prove that companies should have a carbon strategy empirically. A carbon strategy that enables carbon information to be captured by a carbon accounting system, may positively impact a company's carbon performance for better financial health and simultaneously helps restore the environmental vitality for the wellbeing of the nation and society. Nevertheless, carbon emissions issues and possibilities are very unpredictable; thus, it is worrying to think that the impacts of the accumulated carbon emissions could be more devastating to recover compared to other risks posed by economic or political crises, etc. Research efforts should be undertaken as a reference to improve the situation positively and to avoid unsustainable business activities. It is hoped that carbon footprint issues could be resolved or at least improved in Malaysia through the cooperation from the industrial companies.

### 1.3 Problem statement

During the United Nations Summit on Climate Change in Copenhagen, Malaysia has vowed to lessen carbon emissions of GDP by 40% by 2020 (Bahari, Alrazi, & Husin, 2016; Zaid et al., 2015). Nevertheless, if the annual carbon emissions continue to rise or remain stagnant beyond 2020, the target is obviously unattainable (Damert, Paul, & Baumgartner, 2017); this situation implies that carbon emissions mitigation is still poorly handled. It is impossible to forecast when the CO<sub>2</sub> emission trend will finally decrease even for the smallest value. However, the present deteriorating trend of CO<sub>2</sub> emissions obviously shows no immediate improvement can be made in the next few years. It is impossible for Malaysia to tremendously reduce its CO<sub>2</sub> emission by 40% in 2020 (Shahid et al., 2014). Apart from Copenhagen's pledge, Malaysia has also taken a pledge in the Paris Agreement to undertake efforts to curb the temperature rise by cutting its greenhouse emissions by 45% by 2030. Besides the target year of 2020, which has unfortunately produced unfavorable results, the target to achieve the reduction of carbon emissions by 2030 is also utterly ambitious and considerably ambiguous. On top of that, Malaysia's target to be a carbon-neutral nation by 2050 seems superficial.

Companies take strategic options to respond to environmental issues (Kolk & Pinkse, 2005). Companies' major challenge is to immediately convert their activities into an advanced sustainable action in dealing with the organizations' carbon footprint issues. Especially when companies are already comfortable with the traditional management approach; habitual power usage inefficiency and organization reluctant toward sustainability cause the increase of CO<sub>2</sub> that leads to the greenhouse effect, later causing environmental catastrophe. Some companies might prefer to implement individual small sustainable acts (eg: practicing energy saving) in various areas of their business activities; meanwhile, other companies might concentrate on implementing significant changes (eg: change company's green policy) to attain sustainability in specific business areas (Rhee & Lee, 2003). Companies' responses are diverse because of difference resources or strategic choices. Nevertheless, without proper integration of carbon strategies in a company, carbon issues might be worsened. According to Eco-Business (2018), since investors are increasingly focusing on sustainable business strategies, CSR is no longer sufficient. Due to that development, the situation insists businesses to instill sustainability efforts as their main business strategy (Eco-Business, 2018). Despite the magnitude of carbon strategies, companies remain reluctant to invest in a strategy due to no direct link to financial return, besides the strategies' implementation is considered troublesome or expensive.

Stereotypically, companies are skeptical whether the public and stakeholders are seriously interested in their environmental and social performance; companies and managers, due to lack of information system, believe that the environmental performance costs outweigh its benefits (Solomon & Lewis, 2002). According to a study by Downie and Stubbs (2012), although industrial participants are concerned with social and environmental matters, because of weak stakeholders' pressure on sustainability issues, organizations and their managers tend to see sustainability efforts as unnecessary and irrelevant; in a way, the lack of stakeholders' pressure also demotivated them to do any changes in facilitating the efforts. This circumstance is

similar PwC (2013), the analysis on the reasons for Malaysian companies to stop reporting performance on climate change (such as carbon performance) showed that 44% are not disclosing GHG emission, 26% are not measuring GHG emission because it is voluntary, while 18% feel their stakeholders are not interested in their GHG emissions (PwC, 2013). The consequences were that most companies have no immediate motivation to change either their company strategy or use a carbon accounting system.

The ISO 14001 EMS specification certification standards are to aid companies in developing and implementing the EMS. An adequate accounting system such as carbon accounting is vital to assist companies in fulfilling their environmental tasks (Burritt, Hahn & Schaltegger 2002). Nevertheless, besides the ISO 14001 certification, little is known about carbon accounting in Malaysia. Prior studies are prescriptive and focus mostly on one EMA tool or managerial aspect. Besides being so familiar with traditional technologies utilization, Malaysian organizations assume that there will be more downsides than benefits to implement an environmental management system and comply with its standard. The downsides assumed include additional bureaucracy, extensive requirements, strict regulations, and unnecessary documentation to meet the standards and system implementation. Even looking at the ISO 14001 certification rate poses doubts about whether the certification benefits and carbon accounting adoption could exceed the costs (Jalaludin, Sulaiman, & Ahmad, 2010).

More scientists and researchers are paying attention to the association of carbon performance and firm performance in the present development. However, the argument or the discussion on whether carbon disclosures align with an organization's carbon performance is still unresolved (Ennis et al., 2012). According to Rahman et al. (2014), their result implies that participants are irresponsible toward the organization's carbon performance. They are irresponsible because there is a possibility of insufficient and unreliable carbon information coming from carbon performance. Insufficient information proves to be inadequate for them to evaluate companies' performance (Rahman, Rasid, & Basiruddin, 2014). Due to the possibility of insufficient information, poor carbon performance is evident among Malaysian companies. The inadequate carbon information in carbon performance could be due to the absence of a carbon accounting system where a company cannot capture and generate adequate carbon information to present the carbon performance of a company. Hence, Malaysian companies might be reluctant to produce a carbon performance because there is no substantial evidence showing that Malaysian companies' carbon performance can positively impact financial performance. Again, this circumstance reflects companies' lack of awareness of carbon footprint issues.

Since the Kyoto Protocol ratification in 2002, Malaysia has instigated numerous initiatives to reduce carbon emissions. Despite various government initiatives, Malaysia's ranking in Environmental Performance Index (EPI) that is recorded once every two years, nonetheless, keeps dropping since 2014. Based on the Environmental Performance Index (EPI) presented in Table 1.1, Malaysia ranked 68<sup>th</sup> globally in 2020, slightly lower than in 2018. However, it is still considered significantly high in terms of pollutions (Wendling, Emerson, de Sherbinin, & Esty, 2020). In the previous years, Malaysia ranked 75<sup>th</sup> out of 180 countries in 2018 (Yale University, 2018), 63<sup>rd</sup> in

2016, and 51<sup>st</sup> in 2014 (Malaysia Productivity Corporation, 2016). The ranking drop indicates that the initiatives introduced to reduce carbon emissions have not yet proven successful for Malaysia. Even though Malaysia's rank has climbed to 68<sup>th</sup> in 2020, the score difference is not much compared to the previous year's rank in terms of pollution caused by carbon emissions. Malaysia should be more proactive in reducing carbon emissions as Malaysia's carbon emissions per capita is relatively high compared to other developing countries (Ibrahim, Shabudin, Koshy, & Asrar, 2016).

**Table 1.1: Malaysia's Environmental Performance Index (EPI) ranking and scores** [Source: Yale University (2020)]

Country	EPI 2020		EPI 2018		EPI 2016		EPI 2014	
	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Malaysia	68	47.9	75	59.22	63	74.23	51	59.31

One of the carbon reduction initiatives programs initiated by the government is MyCarbon. The government launched MyCarbon program in August 2013, and since then, it has faced many challenges. Among the challenges was in 2015, the program managed to enlist 51 pilot reporting organizations, which were among the public companies, but only 26 companies participated (Theseira, 2015). The participation number shows that the Malaysian companies' awareness toward carbon emissions is increasing but it is still low. Presently, there is no news updates provided by MyCarbon program or the program may have already been terminated. Moreover, besides the government's dynamic carbon initiatives, the carbon emissions mitigation effort trend among Malaysian companies also remain uncertain. Despite various policies introduced to protect the environment, Malaysia's CO<sub>2</sub> emissions are significantly increasing. This increase indicates that the Malaysian companies' knowledge and awareness on the existence of carbon initiatives are still lacking; there is uncertainty in the mitigation efforts although government carbon initiatives can be an essential mechanism to exert a sense of responsibility toward the society so that the corporations would work hard to reduce their carbon emissions (Al-Amin, Rasiah, & Chenayah, 2015; Hashim, Ramlan, & Wang, 2017). Besides, the lack of awareness and responsibility, political instability, and changes that are taking place in the Malaysian government could probably worsen the situation. Based on the above problem statements, this study aims to investigate the relationships between carbon strategies, carbon accounting, government carbon initiatives and firm performances in Malaysia.

#### 1.4 Research questions

The parameter of this study aligns with corporate carbon strategies that can potentially influence the implementation of corporate carbon accounting and impact corporate carbon performance. Thus, to address the research problems, research questions raised are as follows:

1. Do corporate carbon strategies positively influence the implementation of carbon accounting?

2. Does carbon accounting mediate the relationships between corporate carbon strategies and carbon performance?
3. Does the implementation of carbon accounting positively influence carbon performance?
4. Do the government carbon initiatives moderate the relationships between carbon accounting and carbon performance?
5. Does carbon performance positively influence a company's financial performance?

### 1.5 Research objectives

This study aims to investigate how a corporation's carbon strategies can influence carbon accounting applications to achieve carbon emissions mitigation in carbon performance, thus affecting financial performance. Based on the gaps identified, there is an urgent need to conduct this study specifically to achieve the following objectives:

1. To examine the influence of corporate carbon strategies on the implementation of carbon accounting.
2. To analyze the mediating effects of carbon accounting in the relationships between corporate carbon strategies and carbon performance.
3. To examine the influence of carbon accounting implementation on carbon performance.
4. To analyze the moderating effects of government carbon initiatives in the relationships between carbon accounting and carbon performance.
5. To examine the influence of carbon performance on a company's financial performance.

### 1.6 Definitions of constructs

This study involves carbon-related terms. The definition of constructs in this study context will provide a clear understanding to the readers and to avoid misunderstanding that might lead to redundancy of the meanings. Table 1.2 presents the following terms that are defined in the context of this study:

**Table 1.2: Definitions of constructs**

Terms	Conceptual definition	Operational definition
<b>Carbon accounting</b>	A way to implement a company's carbon strategy or policy is to enhance input usage efficiency, mitigate emissions and risks, and avoid compliance costs or gain a competitive advantage (Luo & Tang, 2016).	A system that uses accounting methods and procedures to collect, record, and analyze climate-change-related information and to account and report carbon-related assets, liabilities, expenses, and income for



		internal managers and external stakeholders' decision-making process (Tang, 2014).
<b>Corporate carbon strategies</b>	A complex set of actions to reduce the impact of a company's business activities on climate change and to gain competitive advantages over time (Damert et al., 2017).	A company's efforts to strategize business practices toward reducing its CO <sub>2</sub> level in its response to climate change.
<b>Carbon governance</b>	An organization's managerial capabilities where a company gets involved in the company's carbon activities and how it deals with issues related to climate change mitigation and result in governance mechanisms (Luo & Tang, 2014).	A whole organizational involvement in a company's carbon matters aims to engage a company's workforce in carbon reduction and climate change mitigation efforts.
<b>Carbon risk management</b>	Risk management refers to the identification, measurement, assessment, and treatment of risks with negative consequences on organizational performance and opportunities to increase organizational value (Bui & de Villiers, 2017).	The assessment of risks and opportunities related to a company's carbon emission reduction.
<b>Carbon reduction target</b>	A company's commitment to reducing its GHG emissions and implementing measures to achieve the set targets (Lee, 2012).	A company sets and tracks emission reduction targets and aims not to emit carbon beyond the set target for carbon emissions.
<b>Carbon stakeholder collaboration</b>	Includes corporate activities in cooperation with private or public actors (Damert et al., 2017) and any group or individual who can affect or is affected by the companies' achievement (Freeman, 1984).	Company and stakeholders' collaboration efforts in mitigating carbon emissions due to concerns for the community's future generations and in response to climate change.
<b>Carbon standard</b>	'Standardization' in line with increased interest in carbon accounting (Csutora & Harangozo, 2017) or guidelines introduced and available to assist carbon reporting (Haque & Ntim, 2017).	The standards or guidelines that provide a standardized framework to ensure consistency, comparability, and transparency in carbon reporting, internationally.
<b>Carbon</b>	Carbon performance is the	A company's carbon

<b>performance</b>	result of the absolute GHG emissions reduction and improvement in intensities or efficiencies of carbon emissions (Schaltegger & Csutora, 2012).	performance results from either a successful carbon reduction (low CO <sub>2</sub> emissions) or poor carbon reduction (high CO <sub>2</sub> emissions)
<b>Government carbon initiatives</b>	Government-driven corporate responses to climate change through initiatives that aim to reduce carbon emissions (Qian, Hörisch, & Schaltegger, 2018).	Government efforts or initiatives launched to support and encourage business corporations to respond to carbon emissions mitigation.

### 1.7 Significance of the study

This study's significance includes the research theoretical and practical contributions in terms of how the findings will partly or wholly benefit or impact others. Theoretically, first and foremost, this study provides further insights into the role of carbon accounting as a system that captures carbon data, which is generated from carbon strategies that a company developed. This insight contributes to the richness of the management accounting literature in the context of carbon accounting and sustainable development. Secondly, carbon accounting serves as a mediator that mediates the relationships between corporate carbon strategies and corporate carbon performance, which offers a fresh perspective on both areas as previous studies concentrated mostly on carbon accounting as the mediator between strategies and firms' performance instead of giving particular attention on corporate carbon performance first. Thirdly, this study hopes to provide empirical evidence on the direct relationship between corporate carbon performance and a firm's financial performance, and how the formers affect the latter.

The next part of this study's significance is the practical contributions to academics, practitioners, and policy-makers. Since carbon accounting and reporting are relatively new, studies that analyze carbon accounting and reporting are still inadequate worldwide, including Malaysia. Most of the research conducted on carbon accounting is of the chemical engineering fields (Bong et al., 2017; Chee et al., 2010; Hashim et al., 2015) and business strategy (Alrazi, 2014; Rahman, Rasid & Basiruddin, 2017). In Malaysia, carbon accounting research is that the accounting field is still scarce. Although there are suggestions to increase the effort to impart carbon accounting into conventional reporting and decision processes (Hartmann, Perego, & Young, 2013), the research focuses on carbon accounting is somehow limited (Tang, 2014). Thus, this study adds value to the existing literature on environmental issues, focusing primarily on carbon accounting. It will supplement the recent literature in carbon accounting research in the accounting field, especially in Malaysia. Likewise, research enables the generation of accounting context knowledge, and it is a useful instrument for accounting researchers such as accounting practitioners, policy-makers, and society. Due to carbon emissions' enormous challenge and opportunity, there is an urgency to provide a holistic view of accounting and auditing assurance that focuses on emissions reduction and management (Milne & Grubnic, 2011). Besides that, according to Tang

and Luo (2014), as accounting-based climate knowledge is valuable in the industry nowadays, the accounting profession can at least make a substantial contribution through this subject matter.

This research will be a more proactive approach reference for carbon emissions reduction in Malaysia through the indication of a relevant and reliable carbon accounting system; and, thereby, will provide a credible basis for corporate carbon strategies and carbon decision making via corporate carbon performance (Burritt & Tingey-Holyoak, 2012). Corporate entities should understand how their carbon emissions mitigation can help lower global warming, and this matter must be communicated effectively. Thus, this study intends to encourage positive involvement among practitioners in carbon accounting because their involvement could directly strengthen the role of accounting in Malaysia. Also, it contributes knowledge and understanding of factors that help organizations determine whether they should or should not include carbon accounting in their annual report due to the lack of standards on carbon accounting, which is a new facet of carbon accounting that is rarely mentioned in previous literature. Presumably, the rationale behind the understanding of how carbon emissions can ruin the world climate is the need for greater awareness of the problem's scope that will probably initiate ecologically responsible thinking and decision-making.

Furthermore, this study aims to reveal more information on the carbon accounting context from the Malaysian perspective. It is hoped that by doing so, the accounting profession can support organizations to manage human-caused climate change problems effectively. Besides that, understanding the new environmental practices should also be comprehended, as conceptually, it is evolving. As carbon accounting is conceptually evolving, an extensive implication of this research is that it can assist accounting regulatory in Malaysia such as Malaysian Accounting Standard Board (MASB) in enhancing the Malaysian carbon accounting standards or aid UNDP Malaysia in refining MyCarbon program, and other carbon reduction and mitigation initiatives that are currently being used or adopted by many to reduce carbon emissions for a better decision-making process made by corporations that will benefit the environment and the society as well.

## **1.8 The alignment of the problem statement, research questions, and research objectives**

Table 1.3 presents problem statements highlighted that are aligned with the research questions and research objectives of this study.

**Table 1.3: Problem statement, research questions, and research objectives**

Problem statements	Research questions	Research objectives
<p>It is difficult for companies to transform and adapt to a new sustainability norm in their business activities by integrating proper strategies focusing on carbon emissions. Companies are still reluctant to invest in a sustainability strategy and are unclear about the significance of carbon accounting implementation in their organizations.</p> <p>Most companies have no immediate motivation to change any of their company strategies because of low stakeholders' pressure, low firm governance supports, and the discovery that managers view sustainability reports as unnecessary and irrelevant.</p> <p>The target year 2020 to achieve carbon emissions reduction is despairing. The target year of 2030 and 2050 to achieve carbon emissions reduction and become carbon-neutral nation are utterly vague and might be unattainable for Malaysia.</p>	<p>1. Do corporate carbon strategies positively influence the implementation of carbon accounting?</p>	<p>1. To examine the influence of corporate carbon strategies on carbon accounting implementation.</p>
<p>Despite ISO 14001 certification, little is known about carbon accounting in Malaysia since prior studies are dominantly prescriptive, often focusing on one specific EMA tool or managerial aspect of an organization.</p> <p>Companies consider that the added establishment and requirements for carbon accounting and performance are extensive with unnecessary documentation preparation, and the cost to adopt carbon</p>	<p>2. Does carbon accounting mediate the relationships between corporate carbon strategies and carbon performance?</p> <p>3. Does the implementation of carbon accounting positively influence carbon performance?</p>	<p>2. To analyze the mediating effects of carbon accounting in the relationships between corporate carbon strategies and carbon performance.</p> <p>3. To examine the influence of carbon accounting implementation on carbon performance.</p>

accounting is high.		
<p>Besides serious carbon initiatives and recognitions from the government, the trend of carbon emissions mitigation efforts shown by Malaysian companies is still uncertain. This situation indicates that Malaysian companies' knowledge about the existence of carbon initiatives is still lacking.</p> <p>EPI ranking has been dropping since 2014 until the recent years despite various government initiatives.</p>	4. Do the government carbon initiatives moderate the relationships between carbon accounting and carbon performance?	4. To analyze the moderating effects of the government carbon initiatives in the relationships between carbon accounting and carbon performance.
<p>Related business participants are not responsive to companies' carbon performance. The available carbon performance data is not inadequate, and no substantial evidence is available to provide clear indications whether carbon performance can positively impact financial performance, this situation causes companies to be reluctant and unwilling to produce carbon performance.</p>	5. Does carbon performance positively influence a company's financial performance?	5. To examine the influence of carbon performance on a company's financial performance.

## 1.9 Chapter summary

This chapter discusses the context of this research, which includes the background of the study that explains the research foundation, the general issues instigated by the industrial CO<sub>2</sub> emissions, the types of greenhouse gases, the interrelation between carbon strategies, carbon accounting, and carbon performance, and the importance for companies to embed carbon mitigation efforts. Research problems have been highlighted, and the research questions have also been raised; there are objectives to be answered and achieved that will fulfill the main aim of the research. Last but not least, the description of the significance of the study has also been presented.

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## BIODATA OF STUDENT

Nur Fatin binti Kasbun is a doctoral researcher majoring in Accounting at the School of Business and Economics, Universiti Putra Malaysia. She was born on January 21<sup>st</sup>, 1989. Fatin earned a Master of Science (MSc) in Accounting from Putra Business School, Universiti Putra Malaysia in 2015. She also holds Bachelor of Accountancy First-Class (Hons) and Diploma in Accounting.

Her PhD research focuses on carbon accounting, corporate carbon strategies, carbon and financial performances of firms certified with ISO14001 by SIRIM in Malaysia. During her Master's degree study, she has done a research that examined the relationship between sustainability reporting and financial performance of Malaysian Public Listed Companies. Prior to fully focusing on PhD study, Fatin worked as a lecturer and taught subjects such as financial accounting and auditing. Through those experiences, her research and teaching interests include carbon accounting, sustainability accounting, environmental accounting, financial accounting, auditing and etc. that specifically concern on the roles of accounting in emphasizing contributions to both environmental and economics well-beings.

Outside of academia, she has been actively volunteering for various non-governmental organizations, humanitarian initiatives, missions and projects. Since the past few years, she volunteered and involved with several NGOs in Malaysia such as Hospitals Beyond Boundaries (Malaysia and Phnom Penh, Cambodia), IMARET Imam Response and Relief Team, Al-Hasan Volunteer Network aid for refugees, and Briged Bakti Malaysia (volunteer teacher) due to her concerns on issues pertaining to the needy society and children's rights to education and healthcare.

## LIST OF PUBLICATIONS

### Journal Publications

- Kasbun, N. F., Ong, T. S. (2021). Carbon Stakeholder Collaboration's Influence on Carbon Accounting Implementation Of Organizations In Malaysia. *International Journal of Academic Research in Business and Social Sciences*. Volume 11, Issue 1. Pg 20 – 36.
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