

PREMIER REFERENCE SOURCE

Green Finance and Sustainability

Environmentally-Aware
Business Models and Technologies



Zongwei Luo

Green Finance and Sustainability:

Environmentally-Aware Business Models and Technologies

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BUSINESS SCIENCE
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Preface

INTRODUCTION

Green, or environmentally friendly, often refers to goods and services considered to inflict minimal or no harm on the environment. The world now is at the point to pursue a low carbon development roadmap that would eventually decouple economic growth from greenhouse gas and other polluting emissions, through technological and business innovations. Worldwide, the supply chain sector is among the top 3 largest carbon emission contributors. Supply chain management undoubtedly shall undertake the burden of facilitating this carbon emission reduction by pursuing a low carbon supply chain management practice. The unanimous global pursuit of a sustainable environment has called for advocating the grand challenge of low carbon supply chain management research for business and technology innovation to pave the foundation for a low carbon economy.

Measurement of carbon emissions is broadly adopted as a proxy for quantifying damage to the environment. Low carbon SCM would play a major role in carbon reduction, thus promoting a long term sustainable economy development and well being. The branding value of low carbon development as well as the sustainable development methods would strengthen comparative advantages of environmentally-aware industries, supporting economic transformation by developing a technology rich, high value added, and service oriented, low carbon economy.

Carbon competitiveness is already considered as the critical benchmark of national economic competition. Therefore, supply chain carbon competitiveness will absolutely redefine an economy's competitive strength.

SUPPLY CHAIN CARBON MANAGEMENT

With growing concern on environmental considerations in supply chain industries, numerous corporations are facing new challenge on carbon management in supply chains. A few of the global companies which provide management services are developing various tools of carbon management. Since carbon management would exert considerable impacts with changes on supply chain activities, effective tools become critical to illustrate and measure the carbon inter-dependencies and inter-impact among activities.

For example, in the supply chain carbon management, it is inevitable to make changes on supply chain activities. Due to these activities having different connections or relationships with each other, some of them would lead to changes to the rest accordingly. In order to measure these changes, it would require tools to model and represent the inter-connection of activities, as well to calculate the impact to the rest

if any activities would change. It is necessary to develop models to represent the inter-connections of supply chain activities and calculate the change impact of carbon intensity caused by carbon management.

CARBON IMPACT MANAGEMENT

In supply chain carbon management, all activities could be considered competitive peers to each other, which mean each of them is wishing to fulfill their own objectives by proposing and insisting their demand for their benefit. Is it possible for each of them to reach the maximal total return at the same time? What is the carbon impact to the whole supply chain?

These questions are frequently asked when those supply chain activities are owned or executed by different interested parties respectively. All of them are pursuing the maximal interest in this carbon constrained economy.

If those activities are run by the same party, then not all activities are necessary to reach their biggest gain. It is natural to have a different priority to enforce the carbon impact to the activities in the supply chains when optimizing the carbon impact or de-carbonizing the whole chains.

With the rapid development of carbon accounting technique, a computable tool for carbon impact analysis to supply chain management is becoming viable, although still with considerable barriers ahead.

ABOUT THIS BOOK

This book is devoted to examining a range of major issues concerning green finance and sustainability to provide perspectives, clustered into five book sections on emerging environmentally aware business models, regulation and standard development, green ICT for sustainability, green finance and carbon market, green manufacturing, logistics and SCM, and regional low carbon development.

Section 1: Business Models, Regulation and Standard for Sustainability

- Chapter 1: *Towards the Transition to a Post-Carbon Society: The Crisis of Existing Business Models?* Sophie Galharret, Laurent Beduneau Wang
- Chapter 2: *Environmental Standardization for Sustainability*, John W. Bagby
- Chapter 3: *Promoting Technological Environmental Innovations: What is the Role of Environmental Regulation?* Jacqueline C.K. Lam and Peter Hills
- Chapter 4: *Quantifying Sustainability: Methodology for and Determinants of an Environmental Sustainability Index*, Kobi Abayomi, Victor de la Pena, Upmanu Lall, Marc Levy

Section 2: Green ICT for Sustainability

- Chapter 5: *Greener Data Centres in the Netherlands*, Theo Thiadens, Marko Dorenbos, Andries Kasper, Anda Counoutte-Potman
- Chapter 6: *Information Technology Resources Virtualization for Sustainable Development*, Malgorzata Pankowska

- Chapter 7: *An Introduction to the Green IT Balanced Scorecard as a Strategic IT Management System*, Yulia Wati, Chulmo Koo
- Chapter 8: *A New Recommendation for Green IT Strategies: A Resource-Based Perspective*, Yulia Wati, Chulmo Koo
- Chapter 9: *Information and Communication Technologies (ICT) in Building Knowledge Processes in Vulnerable Ecosystems: A Case for Sustainability*, Prakash Rao
- Chapter 10: *MSP430 Microcontroller: A Green Technology*, Mala Mitra
- Chapter 11: *Toward a Conceptual Model for Sustainability and Greening through Information Technology Management*, A.T. Jarmoszko, Marianne D'Onofrio, Joo Eng Lee-Partridge, Olga Petkova

Section 3: Green Finance and Carbon Market

- Chapter 12: *Price Relationships in the EU Emissions Trading System*, Julien Chevallier
- Chapter 13: *Carbon as an Emerging Tool for Risk Management*, Tenke A. Zoltani
- Chapter 14: *Voluntary Emissions Reduction: Are We Making Progress?* Robert Bailis and Neda Arabshahi
- Chapter 15: *GHG Emissions from the International Goods Movement by Ships and the Adaptation Funding Distribution*, Haifeng Wang
- Chapter 16: *Emissions Trading at Work: The EU Emissions Trading Scheme and the Challenges for Large Scale Auctioning*, Sabina Salkic, Bernd Mack
- Chapter 17: *A Pragmatic Profile Approach to Evaluating Environmental Sustainability Investment Decisions*, Frank Lefley, Joseph Sarkis

Section 4: Green Manufacturing, Logistics and SCM

- Chapter 18: *Green Logistics: Global Practices and their Implementation in Emerging Markets*, Marcus Thiell, Juan Pablo Soto Zuluaga, Juan Pablo Madieto Montanez, Bart van Hoof
- Chapter 19: *The Impact of Sustainability-Focused Strategies on Sourcing Decisions*, Ozan Ozcan, Kingsley Anthony Reeves, Jr.
- Chapter 20: *Green Logistics and Supply Chain Management*, Darren Prokop
- Chapter 21: *Greener Transportation Infrastructure: Theoretical Concepts for the Environmental Evaluation of Airports*, Jean-Christophe Fann, Jasenka Rakas
- Chapter 22: *A Conceptual Model for Greening a Supply Chain through Greening of Suppliers and Green Innovation*, H. K. Chan, T.-Y. Chiou and F. Lettice
- Chapter 23: *An Environmentally Integrated Manufacturing Analysis Combined with Waste Management in a Car Battery Manufacturing Plant*, Suat Kasap, Sibel Uludag Demirer, and Sedef Ergun

Section 5: Regional Development

- Chapter 24: *The Impact of Electricity Market and Environmental Regulation on Carbon Capture & Storage (CCS) Development in China*, Zhao Ang

- Chapter 25: *A Critical Assessment of Environmental Degeneration and Climate Change: A Multidimensional (Political, Economic, Security) Challenge for China's Future Economic Development and its Global Reputation*, Christian Ploberger
- Chapter 26: *Study on Low-Carbon Economy Model and Method of Chinese Tourism Industry*, Zhang Mu, Luo Jing, Zhang Xiaohong, Tang Lei, Feng Xiao-na, Chen Shan
- Chapter 27: *Government Policies and Private Investments Make for a Bright Cleantech Future in India*, Gavin Duke and Nidhi Tandon
- Chapter 28: *Building a Sustainable Regional Eco System for Green Technologies: Case of Cellulosic Ethanol in Oregon*, Bob Greenlee, Tugrul U Daim

LOOKING FORWARD

At present, low carbon development has been penetrating into various disciplines, becoming pervasive. This low carbon trend has been arousing interests from all kinds of people, including politicians, business professionals, and academic researchers, originating from the environmental movement, towards national strategy and policy worldwide.

However, practice and adoption of low carbon technology in business or industry are not smooth. Low carbon is often associated with terms like more capital expenditure and less operation efficiency. Thus, while low carbon development is an important matter, sustainability now has to move beyond environmental concerns to a holistic view, over emerging business models, low carbon and clean technologies, technology access and finance, and policy and regulations.

I believe this book appears at the right time. I genuinely hope it will bring insights and enlarge your view into this urgent field.

Zongwei Luo

Table of Contents

Preface	xviii
----------------------	-------

Section 1 **Business Models, Regulation and Standard for Sustainability**

Chapter 1

Towards the Transition to a Post-Carbon Society: The Crisis of Existing Business Models?.....	1
<i>Sophie Galharret, Expert on Energy and Climate Issues, France</i>	
<i>Laurent Beduneau Wang, Expert on Strategy & Transformation of Business Model and Financial System Issues, France</i>	

Chapter 2

Environmental Standardization for Sustainability	31
<i>John W. Bagby, Pennsylvania State University, USA</i>	

Chapter 3

Promoting Technological Environmental Innovations: What is the Role of Environmental Regulation?	56
<i>Jacqueline C. K. Lam, The University of Hong Kong, Hong Kong</i>	
<i>Peter Hills, The University of Hong Kong, Hong Kong</i>	

Chapter 4

Quantifying Sustainability: Methodology for and Determinants of an Environmental Sustainability Index	74
<i>Kobi Abayomi, Georgia Institute of Technology, USA</i>	
<i>Victor de la Pena, Columbia University, USA</i>	
<i>Upmanu Lall, Columbia University, USA</i>	
<i>Marc Levy, CIESIN at Columbia University, USA</i>	

Section 2

Green ICT for Sustainability

Chapter 5

Greener Data Centres in the Netherlands.....	91
<i>Theo Thiadens, Fontys University of Applied Sciences, The Netherlands</i>	
<i>Marko Dorenbos, Fontys University of Applied Sciences, The Netherlands</i>	
<i>Andries Kasper, Fontys University of Applied Sciences, The Netherlands</i>	
<i>Anda Counoutte-Potman, Open University, The Netherlands</i>	

Chapter 6

Information Technology Resources Virtualization for Sustainable Development.....	110
<i>Malgorzata Pankowska, University of Economics in Katowice, Poland</i>	

Chapter 7

An Introduction to the Green IT Balanced Scorecard as a Strategic IT Management System	126
<i>Yulia Wati, Chosun University, South Korea</i>	
<i>Chulmo Koo, Chosun University, South Korea</i>	

Chapter 8

A New Recommendation for Green IT Strategies: A Resource-Based Perspective	153
<i>Yulia Wati, Chosun University, South Korea</i>	
<i>Chulmo Koo, Chosun University, South Korea</i>	

Chapter 9

Information and Communication Technologies (ICT) in Building Knowledge Processes in Vulnerable Ecosystems: A Case for Sustainability	176
<i>Prakash Rao, Symbiosis International University, India</i>	

Chapter 10

MSP430 Microcontroller: A Green Technology	191
<i>Mala Mitra, PES School of Engineering, India</i>	

Chapter 11

Toward a Conceptual Model for Sustainability and Greening through Information Technology Management.....	199
<i>A.T. Jarmoszko, Central Connecticut State University, USA</i>	
<i>Marianne D'Onofrio, Central Connecticut State University, USA</i>	
<i>Joo Eng Lee-Partridge, Central Connecticut State University, USA</i>	
<i>Olga Petkova, Central Connecticut State University, USA</i>	

Section 3

Green Finance and Carbon Market

Chapter 12

Price Relationships in the EU Emissions Trading System.....	212
<i>Julien Chevallier, Université Paris Dauphine, France</i>	

Chapter 13

Carbon as an Emerging Tool for Risk Management.....	221
<i>Tenke A. Zoltáni, Islan Asset Management, Switzerland</i>	

Chapter 14

Voluntary Emissions Reduction: Are We Making Progress?	241
<i>Robert Bailis, Yale University, USA</i>	
<i>Neda Arabshahi, Yale University, USA</i>	

Chapter 15

GHG Emissions from the International Goods Movement by Ships and the Adaptation Funding Distribution	274
<i>Haifeng Wang, University of Delaware, USA</i>	

Chapter 16

Emissions Trading at Work: The EU Emissions Trading Scheme and the Challenges for Large Scale Auctioning.....	291
<i>Bernd Mack, Deutsche Boerse, Germany</i>	
<i>Sabina Salkic, Deutsche Boerse, Germany</i>	

Chapter 17

A Pragmatic Profile Approach to Evaluating Environmental Sustainability Investment Decisions.....	321
<i>Frank Lefley, University of London, UK</i>	
<i>Joseph Sarkis, Clark University, USA</i>	

Section 4

Green Manufacturing, Logistics and SCM

Chapter 18

Green Logistics: Global Practices and their Implementation in Emerging Markets	334
<i>Marcus Thiell, Universidad de los Andes, Colombia</i>	
<i>Juan Pablo Soto Zuluaga, Universidad de los Andes, Colombia</i>	
<i>Juan Pablo Madieto Montañez, Universidad de los Andes, Colombia</i>	
<i>Bart van Hoof, Universidad de los Andes, Colombia</i>	

Chapter 19

The Impact of Sustainability-Focused Strategies on Sourcing Decisions 358

Ozan Özcan, University of South Florida, USA

Kingsley Anthony Reeves Jr., University of South Florida, USA

Chapter 20

Green Logistics and Supply Chain Management..... 387

Darren Prokop, University of Alaska Anchorage, USA

Chapter 21

Greener Transportation Infrastructure: Theoretical Concepts for the Environmental
Evaluation of Airports..... 394

*Jean-Christophe Fann, Université Libre de Bruxelles, Belgium & University of
California, Berkeley, USA*

Jasenska Rakas, University of California, Berkeley, USA

Chapter 22

A Conceptual Model for Greening a Supply Chain through Greening of Suppliers and
Green Innovation 422

H. K. Chan, University of East Anglia, UK

T.-Y. Chiou, University of East Anglia, UK

F. Lettice, University of East Anglia, UK

Chapter 23

An Environmentally Integrated Manufacturing Analysis Combined with Waste Management
in a Car Battery Manufacturing Plant 436

Suat Kasap, Hacettepe University, Turkey

Sibel Uludag Demirer, Villanova University, USA

Sedef Ergün, Drogosan Pharmaceuticals, Turkey

Section 5 Regional Development

Chapter 24

The Impact of Electricity Market and Environmental Regulation on Carbon Capture & Storage
(CCS) Development in China 463

Zhao Ang, Freelance Researcher, Belgium

Chapter 25

A Critical Assessment of Environmental Degeneration and Climate Change:
A Multidimensional (Political, Economic, Security) Challenge for China's Future
Economic Development and its Global Reputation..... 472

Christian Ploberger, University of Birmingham, UK

Chapter 26

Study on Low-Carbon Economy Model and Method of Chinese Tourism Industry 492

Zhang Mu, Jinan University, China

Luo Jing, Jinan University, China

Zhang Xiaohong, Jinan University, China

Tang Lei, Jinan University, China

Feng Xiao-na, Jinan University, China

Chen Shan, Jinan University, China

Chapter 27

Government Policies and Private Investments Make for a Bright Cleantech Future in India 526

Gavin Duke, Aloe Private Equity, UK

Nidhi Tandon, Networked Intelligence for Development, Canada

Chapter 28

Building a Sustainable Regional Eco System for Green Technologies: Case of Cellulosic

Ethanol in Oregon 535

Bob Greenlee, Cascade Microtech, USA

Tugrul Daim, Portland State University, USA

Compilation of References 569

About the Contributors 613

Index 625

Detailed Table of Contents

Preface xviii

Section 1
Business Models, Regulation and Standard for Sustainability

Chapter 1
Towards the Transition to a Post-Carbon Society: The Crisis of Existing Business Models?..... 1
Sophie Galharret, Expert on Energy and Climate Issues, France
Laurent Beduneau Wang, Expert on Strategy & Transformation of Business Model and Financial System Issues, France

This chapter provides a diagnosis of internal and external factors that will trigger incentives to reshape business models incorporating green considerations, on a basis of three sectors analysis (oil, car and outdoor sportswear industries). The authors are aiming at enlightening the way they conceive the transition and the challenges that remain for business transformations.

Chapter 2
Environmental Standardization for Sustainability 31
John W. Bagby, Pennsylvania State University, USA

This chapter reviews the role of standardization activities in setting environmental constraints, in the development of green technologies, and in establishing metrics for environmental certification and monitoring. The implications of managing environmental standardization to attract financing for sustainable business models are so significant that disregarding the risks of environmental standardization imperils competitiveness.

Chapter 3
Promoting Technological Environmental Innovations: What is the Role of Environmental Regulation? 56
Jacqueline C. K. Lam, The University of Hong Kong, Hong Kong
Peter Hills, The University of Hong Kong, Hong Kong

This chapter reviews and discusses the debate over the effectiveness of environmental regulation in promoting industrial Technological Environmental Innovation (TEI). Using the innovation-friendly regulatory principles adapted from Porter and van der Linde (1995a and 1995b), this chapter demonstrates how properly designed and implemented environmental regulation (TEI promoting regulation) has played a critical role in promoting TEI in the transport industry in California and Hong Kong.

Chapter 4

Quantifying Sustainability: Methodology for and Determinants of an Environmental

Sustainability Index 74

Kobi Abayomi, Georgia Institute of Technology, USA

Victor de la Pena, Columbia University, USA

Upmanu Lall, Columbia University, USA

Marc Levy, CIESIN at Columbia University, USA

This chapter consider new methods of component extraction and identification for the Environmental Sustainability Index (ESI) – an aggregation of environmental variables created as a measure of overall progress towards environmental sustainability. Principally, the authors propose and illustrate a parametric version of Independent Component Analysis via Copulas (CICA). The CICA procedure yields a more coherent picture of the determinants of environmental sustainability.

Section 2

Green ICT for Sustainability

Chapter 5

Greener Data Centres in the Netherlands..... 91

Theo Thiadens, Fontys University of Applied Sciences, The Netherlands

Marko Dorenbos, Fontys University of Applied Sciences, The Netherlands

Andries Kasper, Fontys University of Applied Sciences, The Netherlands

Anda Counoutte-Potman, Open University, The Netherlands

In this chapter, the current situation regarding green data centres in the Netherlands is mapped. The chapter successively goes through the entire chain of processes that are needed for arriving at greener data centres. The chapter starts with the legislators. It continues with the procurement of IT. It discusses the design of facilities required for a data centre and the ICT provisions as used by this data centre. It looks at the analysis of the degree of sustainability in data centres and the measures that need to be taken as a result of this. And it concludes by describing how ICT equipment could be recycled.

Chapter 6

Information Technology Resources Virtualization for Sustainable Development..... 110

Malgorzata Pankowska, University of Economics in Katowice, Poland

The first part of the chapter includes presentation of benefits resulting from IT (Information Technology) resources virtualization, Grid computing and cloud computing development. The second part

contains a model of IT governance for sustainability. The main important factors included in the model concern IT strategy, business strategy, IT management, business agreements.

Chapter 7

An Introduction to the Green IT Balanced Scorecard as a Strategic IT Management System..... 126

Yulia Wati, Chosun University, South Korea

Chulmo Koo, Chosun University, South Korea

This chapter introduces the Green IT Balanced Scorecard by incorporating an environmental aspect of technology into the scorecard measurement method. The authors conceptualized the Green IT balanced scorecard as “a nomological management tool to systematically align IT strategy with business strategy from an environmental sustainability perspective in order to achieve competitive advantage.”

Chapter 8

A New Recommendation for Green IT Strategies: A Resource-Based Perspective 153

Yulia Wati, Chosun University, South Korea

Chulmo Koo, Chosun University, South Korea

This chapter conceptualizes three different strategies: tactical green IT strategy, strategic proactive green IT strategy, and sustained green IT strategy, along with theory-based propositions for each of the strategies. The chapter also demonstrates that the Green IT strategy is path-dependent; that is to say, a firm’s prior experience and history helps determine its current strategies. This study also involves a discussion of the development of the theory, the proposed model, and some possible future research directions.

Chapter 9

Information and Communication Technologies (ICT) in Building Knowledge Processes in Vulnerable Ecosystems: A Case for Sustainability 176

Prakash Rao, Symbiosis International University, India

The present chapter explores the use of some of the current state of the art technologies like ICTs including tools like Remote Sensing and GIS as a means for providing sound and efficient decision making across various sectors.

Chapter 10

MSP430 Microcontroller: A Green Technology 191

Mala Mitra, PES School of Engineering, India

In this chapter, the architecture and function of a microcontroller, a device for system operation control at micro-level, is briefed. The need for a low power microcontroller towards sustainability and greening is stressed with various examples. The MSP430 Microcontroller, a product from Texas Instruments, is a very low power microcontroller.

Chapter 11

Toward a Conceptual Model for Sustainability and Greening through Information

Technology Management..... 199

A.T. Jarmoszko, Central Connecticut State University, USA

Marianne D'Onofrio, Central Connecticut State University, USA

Joo Eng Lee-Partridge, Central Connecticut State University, USA

Olga Petkova, Central Connecticut State University, USA

This study describes a conceptual approach to greening and sustainability through Information Technology management. The authors reviewed existing research and publications on the topic of greening, and concluded that while much has been written about ways to go green, much less are available on guidelines to help gauge the degree of greening efforts.

Section 3

Green Finance and Carbon Market

Chapter 12

Price Relationships in the EU Emissions Trading System..... 212

Julien Chevallier, Université Paris Dauphine, France

This chapter details the idiosyncratic risks affecting each emissions market, be it in terms of regulatory uncertainty, economic activity, industrial structure, or the impact of other energy markets. Besides, based on a careful analysis of the EUA and CER price paths, this chapter assesses common risk factors by focusing more particularly on the role played by the CER import limit within the ETS.

Chapter 13

Carbon as an Emerging Tool for Risk Management..... 221

Tenke A. Zoltáni, Islan Asset Management, Switzerland

Since 2005, when the European Union Emissions Trading Scheme (EU ETS) launched, green adoption in business and industry has been marred by fraudulent carbon credits, VAT swindlers and carbon cowboys, inefficiencies of a nascent market, and not least of all by legislative uncertainty. The disrepute afforded by these examples hindered low carbon growth and deterred emerging business models from adopting more carbon friendly practices.

Chapter 14

Voluntary Emissions Reduction: Are We Making Progress?..... 241

Robert Bailis, Yale University, USA

Neda Arabshahi, Yale University, USA

To assess how voluntary emissions reduction programs have performed, this study examines the progress that C4C signatories have made. The results show widely dispersed GHG quantities and a range of reduction plans. Due to the lack of uniform, comparable data, the authors call for standardized, clearly defined carbon accounting guidelines as the first step towards effective corporate GHG management