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Environmentally Responsible Supply Chains

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Foreword

This book is very timely considering that sustainability concerns increasingly take centre stage in business and society and perhaps even government. It certainly fills a gap in literature from a scientific as well as an educational perspective, especially since it takes a broad view and offers many new angles on this broad subject. Clearly, the recent COP21 in Paris has renewed interest in climate change actions and their impact on business. Similarly, the European Union is big on pushing its circular economy agenda and ready to direct a lot of money that way. Business has no option but to carefully consider how this new paradigm poses challenges and offers opportunities. For this, it may need support from research as well as education, for there will be difficult problems to solve and this will require well-trained people.

At a global level, one could state that this is the time to shape the society we want to live in the future. This society will be situated in a complex world where resource scarcity, costly externalities, climate change, and many other aspects like poverty, exclusion, and resulting conflicts will create a dynamic context. Within this context, the society needs to reunite policy making (legislation, governance, enforcement) with the public (consumer behaviour, priorities, and aspirations) and business. These three entities mutually influence one another and need to be kept in balance. This is not a simple task given the gaps between business, government, and the public have grown in recent times. Technological progress (e.g. robots, social media, and the Internet of things) greatly impacts this delicate balance, to be re-established for a sustainable future where nine billion people will not consume several times the resources available to mother earth and where there will be a better equity between the haves and have-nots.

Obviously one book cannot solve these complex issues at once, but this one does tackle some of its important components and allows for a nice introduction and basis for further study or analysis. There are several things I particularly like about this book:

First, it is based on brand new research in several disciplines, a lot of which is still to appear in print in academic journals. Many contributions are

written by young people who are the ones to shape our future world. So this book is “fresh” and refreshing in many ways.

Second, the book carefully considers different perspectives and business stances. It discusses pure for profit, seeing the business opportunities, perspective, as well as the compliance to legislation angle. Few publications acknowledge both sides of the coin. Business can be in the driver’s seat but so can policy makers. Mostly they strongly influence one another in what we would call a complex dynamic system with feedbacks and feed forwards, influenced by the public and its changing behaviours, as well as by technological breakthroughs.

Third, the book takes a very comprehensive supply chain view of environmental impact and responsibility. Given that supply chain management is my favourite topic, I certainly welcome this. The book contains recent and refreshing work on closed-loop supply chains (another pet subject of mine), remanufacturing (finally becoming mainstream in the circular economy movement), network design, inventory control, and product design and capacity management, among others. In short, it takes a broad system perspective instead of focusing unilaterally on a single issue. This is exemplified by the book’s treatment of problems in the context of broad impacts on tomorrow’s supply chains, or better supply networks, by including issues like climate change, consumer behaviour, environmental regulations, more careful recycling, and responsible sourcing, to mention just a few. Seeing the many sides of this complex coin is a great asset.

Fourth, this book is targeted at a broad audience. Sure, some chapters are rather technical in nature, but then again some adepts of the new trends like the circular economy would be well-advised to make themselves familiar with some technical knowledge to better support their righteous claims with scientific evidence from different disciplines. This book makes this possible since many chapters are organized such that they can be read by both academics and practitioners, and appeal to both. As such, this book can be a good introduction for novices to the field as well as a source for deepening knowledge for an expert in a subfield. We need all interested people, academics and practitioners, experts and laymen, technical and social/legal, to create a common understanding of the complex issues in sustainability.

While four is not a magic number in most cultures (better to have 3 or 7), I nevertheless hope that these four reasons why I like the book have convinced you to take a serious look at it. Above all things, the book is timely and fills an important gap.

Luk N. Van Wassenhove
Henry Ford Professor of Manufacturing
INSEAD
Fellow of POM, M&SOM, EurOMA, and EURO Gold Medallist
Past President of POMS

Preface

Environmental responsibility is increasingly perceived as a necessary component of a firm's business strategy. Be it driven by market pressure (e.g. via consumer or NGO demands) or from a resource economics perspective (e.g. in reference to a circular economy), identifying an environmentally responsible business strategy is crucial for any firm today.

This book aims to highlight what it takes to be successful in identifying and executing environmental responsibility from an operational perspective. Written by academic experts, using language that speaks to practice, this reference book provides cutting-edge research from globally recognized field experts. It is a useful resource for practitioners to explore why and how firms engage in environmentally responsible operations. It is also a valuable resource for academics as an introductory reference that provides direct exposure to key environmental operational problems faced by many firms today. In addition, it can be used as an introductory reading for students with varying educational backgrounds—from business school students interested in environmental issues to environmental scientists interested in obtaining a business perspective—as it provides a broad scope of key issues at the interface of operations management and environmental and social responsibility.

Structured in a modular fashion, each chapter in this book introduces and analyses a specific timely topic, allowing readers to identify the chapters that relate to their interests. More specifically, the book distinguishes between two key drivers of environmental responsibility: profit and regulatory compliance.

The first three sections of the book explore profit-driven environmental responsibility—and provide examples as to where the motives for environmentally responsible business practices come from, where business opportunities are, and what operational perspectives are key to profitability.

In the first chapter of the book, James Abbey and Dan Guide focus on motives for environmentally responsible business in the context of remanufacturing, a product-life extension strategy. They explore consumer markets for remanufactured products and provide a number of new insights as to how and

when consumers value remanufactured products. The insights from this chapter can help a consumer goods manufacturer that considers remanufacturing as to when and how it can position remanufacturing as an environmentally responsible business practice and, most importantly, where the profit opportunities are. In the second chapter, Necati Terreyagolu builds on Abbey and Guide's research and focuses particularly on drivers of consumer valuation for remanufactured products in traditional and online markets. He investigates the effects of seller reputation, warranties, and money-back guarantees on consumer perceptions of remanufactured products and whether these perceptions affect consumers' valuations of new products. This chapter nicely illustrates that the bottom line profit potential of the assumed environmental benefits of remanufacturing may not be straightforward. Finally, Karen Zheng, Leon Valdes, and Tim Kraft extend the scope of how markets or consumers perceive environmental responsibility practices from the context of remanufacturing to a general social responsibility environment and show once again that the market reaction to responsible business practices is not straightforward. Overall, these three chapters nicely illustrate the need for exploring and identifying the profit-driven motives for social or environmental responsibility.

The second section focuses on examples of for-profit opportunities from environmentally responsible business. Deishin Lee starts the section with a chapter that introduces the concept of by-products synergies, an opportunity to gain improved economic and environmental benefits through a joint production model that leverages economies of scope. She presents this concept as an opportunity to effectively use natural resources while simultaneously reducing waste and explores its economic and environmental implications. In the next chapter, Vishal Agrawal teams up with Deishin Lee to explore opportunities from (environmentally or socially) responsible-sourcing and provide an overview of possible responsible-sourcing challenges faced by firms and the mechanisms firms can use to overcome these challenges. In the third chapter, Paolo Letizia takes a deeper dive into the implications of supply chain structure on the feasibility of and opportunities from responsible sourcing and illustrates by examples if and how collaboration between different supply chain partners can be sustained. Finally, Vishal Agrawal and Ioannis Bellos highlight the potential of servicizing (e.g. selling services as opposed to products) as an environmentally responsible business strategy and identify conditions where it can create a win-win solution both from economic and environmental perspectives.

The third section of the book continues to consider environmental responsibility in a non-regulated system with particular focus on operational variables such as inventory, capacity, and network design choices. Ashish Kabra, Elena Belavina, and Karan Girotra analyse network design and inventory location choice problems in a bicycle-sharing system; the social and environmental benefits of which as a public transportation mechanism are clear. They identify the unique characteristics of a bicycle-sharing system as it

differs from traditional public transportation models and illustrate the operational/infrastructural variables that can help maximize the environmental benefits of bicycle-sharing. Michael Lim and Yanfeng Ouyang, on the other hand, focus on how one can design a biofuel network/supply chain that can help improve the environmental benefits associated with replacing traditional fuels with biofuels. They explore and illustrate core trade-offs in this context and discuss key issues around logistics network optimization, transportation, inventory management, and land use. Finally, Mark Ferguson, Shanshan Hu, Gil Souza, and Wenbin Wang discuss a firm's capacity investment decision in renewable energy technologies. They focus on factors that complicate this decision, such as variability in energy demand and prices, and show that the trade-offs in this decisions can be resolved by solutions that are simple to compute and intuitive, which allows them to provide managers with a framework for evaluating the trade-offs of investing in renewable and conventional technologies. Overall, this chapter provides three excellent examples of why an operational outlook should be a key component in environmentally responsible business.

The last two sections of the book focus on regulation as a driver of environmental responsibility and identify motives, opportunities, or operational perspectives as to effective regulatory compliance.

The first chapter in the penultimate section (by Douglas Webber, Luk Van Wassenhove, and I) argues that environmental legislation will be in most firms' radars in today's economy and suggests ways to cope with potential upcoming legislation. In particular, the chapter suggests and exemplifies firm strategies that involve raising awareness and political competence development (e.g. having a strong lobbying presence) in order to shape the environmental legislation before it is written, as opposed to being reactive to it. In the next chapter, David Drake and Robin Just provide a complementary perspective and discuss a number of reactive strategies that firms can use to respond to environmental regulation. Essentially, these two chapters provide a roadmap for firms to take a competitive edge when facing environmental regulation as a threat or a reality. In the next chapter, Basak Kalkanici, Erjie Ang, and Erica Plambeck analyse how firms could respond to environmental or social impact disclosure mandates, considering their impact on investor valuation of the firm and consumer valuation of the firm's products or services. They suggest that mandated disclosure may discourage a firm from investigating or identifying the social and environmental impacts of its supply chain. Demonstrated by consumer experiments, they show that a voluntary disclosure (instead of a mandated one) can be beneficial for the firm as it can help improve a firm's valuation by its consumers or investors. In the final chapter of this section, Gokce Esenduran and I analyse the implications of an economic value added from environmental compliance in a regulated market. In particular, we use the example of electronics take-back regulation and show how environmental regulation targeted at potentially valuable electronic waste can lead to a distorted competitive landscape and how firms

can leverage regulation in the presence of competition. Overall, this chapter exemplifies a number of ways environmental regulation affects supply chain efficiency or firm profitability and suggests ways to deal with such concerns from a supply chain, firm, or social planner perspective.

The final section in the book focuses on how firms should design their supply chains or products to cope with environmental regulation, particularly focusing on the impacts of climate change, substance control, and take-back policies. In the first chapter of the section, Nur Sunar provides a comprehensive perspective on how emissions regulation works around the globe and discusses a series of emissions control challenges for firms (be it driven by regulation or voluntary efforts). The chapter also leverages a number of existing research papers to demonstrate supply chain, firm, or social planner level strategies to maximize the efficiency of emissions regulation from economic or environmental perspectives. In the next chapter, Ozge Islegen, Erica Plambeck, and Terry Taylor take a deeper dive into the economics of emissions regulation. They analyse how a firm will design its supply chain under different forms of climate change policies and investigate their economic and environmental implications. In particular, they show that a cap-and-trade system may have unexpected welfare benefits (in comparison to a basic emissions tax) when there is variability in emissions cost: It can drive producers to design supply chains that primarily operate in a region with climate policy. Next, Tim Kraft, Kathryn Sharpe, and Ozgen Karaer explore the challenges that firms face in managing the chemicals and substances found in their products and supply chains. They examine and illustrate levers available to both for-profit firms and nonprofits for improving the environmental performance of a supply chain. Finally, Luyi Gui, Natalie Huang, Beril Toktay, and I take a stab at the product design implications of environmental regulation in the form of a take-back mandate and show that the assumed implications of environmental regulation on product design do not hold in general. In particular, we show that design incentives under environmental regulation may be weakened, muted, or even negated as a result of operational factors such as design trade-offs, market competition, and recycling resource sharing in the reverse supply chain. Overall, this chapter shows that an operational outlook should be a key component of how a firm or supply chain responds to environmental regulation or how a policy maker should craft the same.

It is my sincere hope and expectation that the reader (be it a practitioner, an academic professional, or a student) of this book will benefit from the broad exposure to different environmental and social responsibility-related topics in the supply chain context and realize the importance of an operational lens in successfully identifying and executing environmental responsibility.

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I dedicate this book to my family. The two witches (Irem and Peri), Ceren, Kubilay, and Perihan: This book could not have been here without your support. Thank you!

About the Editor

Atalay Atasu, PhD (INSEAD, 2007), is an associate professor of operations management at Georgia Tech Scheller College of Business. His research expertise is on sustainable operations management, with focus on product recovery economics and extended producer responsibility, on which he has published extensively. His research appeared in *Management Science*, *Manufacturing & Service Operations Management*, *Production and Operations Management*, *Journal of Industrial Ecology*, and *California Management Review*. He is recipient of a number of research awards, including the Wickham Skinner Best Paper Award (winner 2007, runner up 2014), Wickham Skinner Early Career Research Award (2012), and Paul Kleindorfer Award in Sustainability (2013). His research originating from extensive collaborations with a number of Electronics Manufacturers in Europe, particularly in the context of extended producer responsibility, has been particularly influential in the European WEEE Directive implementations.

