

Web-Based Green Products Life Cycle Management Systems: Reverse Supply Chain Utilization

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<i>Joel Q. Tanchuco, De La Salle University, Manila, Philippines</i>	

Chapter I provides an overall concept of life cycle assessment of green products and the quantitative method of measurement and ways of improvement for the industries. In particular, this chapter discusses life cycle assessment principles and its application in the design and planning of industrial supply chains. A specific case study on the production of biofuels from agricultural crops is used to illustrate the key concepts.

Chapter II

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<i>A. J. D. Lambert, Technische Universiteit Eindhoven, The Netherlands</i>	

Chapter II provides a rigorous method of life cycle assessment based on the concept of quantitative physical flow analysis, known as industrial metabolism. A discussion of the reverse product-process chain, which includes reuse and recycling, is presented from the transformation of both the materials and also the energy. In particular, the chapter summarizes available types of software with examples which are very useful and valuable for applications in practice.

Chapter III

Sustainability Constraints as System Boundaries: Introductory Steps toward Strategic Life-Cycle Management	51
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<i>Karl-Henrik Robèrt, Blekinge Institute of Technology, Sweden</i>	

Chapter III discusses the life cycle management from the sustainability viewpoint, and proposes a useful strategy to reach the global sustainability based on the continuous evaluation of numerous complex social, ecological, and economic factors. Thus, the article not only brings about the issues of sustainability in the framework of life cycle management, but also provides an approach to arrive at it with detailed illustration.

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<i>Ahmed Bufardi, Federal Institute of Aquatic Science and Technology (EAWAG), Switzerland</i>	
<i>Dimitris Kiritsis, École Polytechnique Fédérale de Lausanne, Switzerland</i>	

Chapter IV discusses the environmental criteria which should be considered in green product management and presents a method of environment impact assessment from MCDM approach. Therefore, not only can the environmental criteria be accessed from both the forward and reverse supply chains, but also the weights of their importance can be measured. A comprehensive case study of *a vacuum cleaner* is presented for illustration.

Chapter V

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<i>Xiaoying Zhou, University of California, Davis, USA</i>	
<i>Julie M. Schoenung, University of California, Davis, USA</i>	

Chapter V is also a study which integrates the sustainability into life cycle management, while taking a system viewpoint toward environmental performance assessment. In particular, the chapter highlights the environmental issues in the framework of overall economic, geographical, and legislative factors so that the methodologies developed along this line have guidelines to reach system optimization.

Chapter VI

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<i>Nobutaka Odake, Nagoya Institute of Technology, Japan</i>	
<i>Satomi Furukawa, Fuluhashi Environmental Institute Co., Ltd., Japan</i>	

Chapter VI introduces the concept of eco-efficiency, and in particular, provides two cases of European small and medium-sized enterprises for detailed illustration and demonstration. The article emphasizes the diffusion-oriented policy so that reducing environmental burden can be achieved by guiding the companies to improve their resource productivity and add production values.

Section II

Demand and Service Chain Management

Chapter VII

Does Trust Foster Sustainability? Results from a Management Simulation Game..... 149

Harold Krikke, Economics and Business Administration, The Netherlands

Ruud Brekelmans, Economics and Business Administration, The Netherlands

Hein Fleuren, Economics and Business Administration, The Netherlands

Cindy Kuijpers, Economics and Business Administration, The Netherlands

Chapter VII brings about a different and interesting view toward sustainability. Realizing the importance of marketing demand and customer response for green product development, this chapter presents a developed management game and concludes some propositions on the trust and sustainability in supply chains. The detailed description of the design of this game as well as the roles involved in this game along the overall supply chain have been provided, which facilitates practical implement. Also, further research along this line has been identified with a list of questions to be answered.

Chapter VIII

Identifying and Clustering of Target Customers of Green Products..... 182

Miao-Ling Wang, Ming-Hsin University of Science & Technology, Taiwan, ROC

Chapter VIII presents a methodology of identifying target customers of green products for market expansion purposes. Based on a data mining technique, the customers can be classified according to their preference, purchasing behaviour, and demographical factors. Then, by a developed bi-objective mathematical model, pricing strategies can be developed from win-win perspectives, which is beneficial for both the producers and the customers. The rigors analysis provides a tractable approach for market analysis and pricing development.

Chapter IX

Application of Fuzzy Analytic Network Process and Fuzzy TOPSIS to the Undesirable Location

Selection Problem 208

Semih ÖNÜT, Yildiz Technical University, Turkey

Selin Soner Kara, Yildiz Technical University, Turkey

Derya Tekin, Yildiz Technical University, Turkey

Chapter IX tackles a different but important issue related to green supply chain management, the facility location problem. Regarding the environmental impact, the issue is tackled by considering the undesirable

locations. Using fuzzy TOPSIS approach, the design of a group decision process is presented to find the criteria with their weights of undesirability. Measurement of conflict and vagueness among criteria and decision makers is presented with detailed illustration and numerical examples.

Chapter X
Sustainable Product Service Systems: Potential to Deliver Business and Social Benefits with Less Resource Use 232

David Ness, University of South Australia and Department for Transport Energy and Infrastructure, SA, Australia

Chapter X presents an overall system for green service chain management, namely sustainable product service systems (S-PSS). By taking the factors of sustainability, resource productivity, and eco-efficiency into account, the article shows how the developing countries, in particular, can apply the system to trade off among these factors. Many practical cases are presented which provide significant references for both concept clarification and practical applications.

Chapter XI
Strategic Decisions for Green Electricity Marketing: Learning from Past Experiences 250

Marta Pérez-Plaza, Universidad Pontificia Comillas, Spain
Pedro Linares, Universidad Pontificia Comillas, Spain

Chapter XI discusses the energy issues, in particular, green electricity and its renewability from historical development. Based on the literature review and the customer response, the article concludes a comprehensive approach toward green electricity utilization by identifying its development boundaries and past mistakes.

Section III
Supply Chain and Logistics Management

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Modeling of Green Supply Chain Logistics 268

Hsin-Wei Hsu, National Tsing Hua University, Taiwan, ROC
Hsiao-Fan Wang, National Tsing Hua University, Taiwan, ROC

Chapter XII opens another door toward green supply chain and logistics management. A mathematical model in the form of a 0-1 integer linear program is developed for close-loop logistics of which optimal solution for determining the facilities of manufactures, distribution centers, and dismantlers can be found with minimum cost. Sensitivity analyses on the recovery rate and land-filling rate on the reverse logistics have been carried out for managerial purposes.

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Reverse Supply Chain Design: A Neural Network Approach 283

Kishore K. Pochampally, Southern New Hampshire University, Manchester, USA

Surendra M. Gupta, Northeastern University, Boston, USA

Chapter XIII provides an alternative method for reverse supply chain design. Realizing the efficiency issues of the collection facilities and recovery facilities chosen while designing a reverse supply chain, this chapter is based on the neural network approach to develop a four-stage procedure for evaluating the facilities. Group decision techniques are in-cooperated with successful applications.

Chapter XIV

System Dynamics Modeling for Strategic Management of Green Supply Chain 301

Ying Su, Tsinghua University, China

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Chapter XIV takes a different approach of system dynamics methodology to develop a simulation model for evaluating different green supply chain management strategies. By measuring the total profit, the effectiveness of different strategies can be evaluated efficiently and successfully.

Chapter XV

A Vehicle Routing and Scheduling Model for a Distribution Center 334

Hsiao-Fan Wang, National Tsing Hua University, Taiwan, ROC

Yu-Chun Chiu, National Tsing Hua University, Taiwan, ROC

Chapter XV illustrates how to design a routing system for a distribution center to assign a number of limited-capacity vehicles to serve a given number of customers within the required time window with minimum service cost. An optimization model is formulated in the form of an integer linear program and a genetic algorithm is developed for efficient solution. Therefore, NP complexity problem embedded in such kinds of optimization problems have shown to be resolved with reasonable accuracy.

Chapter XVI

A Data Envelopment Analysis Approach for Household Appliances and Automobile Recycling 368

Elif Kongar, University of Bridgeport, Bridgeport, CT, USA

Surendra M. Gupta, Northeastern University, Boston, USA

Chapter XVI discusses a recovery issue in reverse supply chain. Criteria and the proposed data envelopment method are presented to evaluate the used house appliance and automobiles. It aims that the cost added to the process of the recycled products will be justified by their economic and environmental benefit.

Chapter XVII

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<i>Yi-Chun Liao, Hsuan Chuang University, Taiwan, ROC</i>	

Chapter XVII introduces a preference-based recommendation procedure in a green product information retrieval system. The online procedure is based on an off-line database which includes the description of the green products with their green properties and prices and the relevant green regulations. The information retrieval procedure then is based on the preference of the users, and by a data mining technique, the products can be recommended and the database can be updated simultaneously. The system is useful for both the consumers and the producers. A prototype has been developed and illustrated in the chapter.

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<i>Giannis T. Tsoulfas, University of Piraeus, Greece</i>	
<i>Costas P. Pappis, University of Piraeus, Greece</i>	
<i>Nikos I. Karacapilidis, University of Patras, Greece</i>	

Chapter XVIII discusses a different issue of Web-based green supply chain management. This online decision support system is developed for the stakeholders in reverse supply chain when they have different views, perspectives, and priorities. The end-of-life mobile phones are taken as an illustrative example to show how this system supports a collaborative decision-making process on the Web site.

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