

GREEN TECHNOLOGIES

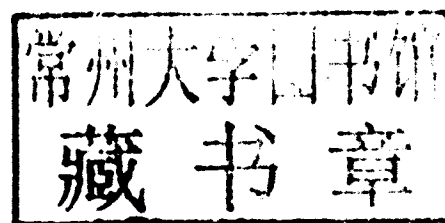
Concepts, Methodologies, Tools
and Applications



Green Technologies: Concepts, Methodologies, Tools and Applications

*Information Resources Management Association
USA*

Volume I



Information Science
REFERENCE

INFORMATION SCIENCE REFERENCE

Hershey • New York

Senior Editorial Director: Kristin Klinger
Director of Book Publications: Julia Mosemann
Editorial Director: Lindsay Johnston
Acquisitions Editor: Erika Caarter
Development Editor: Devvin Earnest
Publishing Assistant: Deanna Jo Zombro
Typesetters: Michael Brehm, Casey Conapitski, Keith Glazewski, Natalie Pronio,
Milan Vracarich, Jr., Deanna Zombro
Production Editor: Jamie Snavelly
Cover Design: Nick Newcomer

Published in the United States of America by
Information Science Reference (an imprint of IGI Global)
701 E. Chocolate Avenue
Hershey PA 17033
Tel: 717-533-8845
Fax: 717-533-8661
E-mail: cust@igi-global.com
Web site: <http://www.igi-global.com/reference>

and in the United Kingdom by
Information Science Reference (an imprint of IGI Global)
3 Henrietta Street
Covent Garden
London WC2E 8LU
Tel: 44 20 7240 0856
Fax: 44 20 7379 0609
Web site: <http://www.eurospanbookstore.com>

Copyright © 2011 by IGI Global. All rights reserved. No part of this publication may be reproduced, stored or distributed in any form or by any means, electronic or mechanical, including photocopying, without written permission from the publisher.

Product or company names used in this set are for identification purposes only. Inclusion of the names of the products or companies does not indicate a claim of ownership by IGI Global of the trademark or registered trademark.

Library of Congress Cataloging-in-Publication Data

Green technologies : concepts, methodologies, tools and applications / Information Resources Management Association, editor.

v. cm.

Includes bibliographical references and index.

Summary: "This reference assembles the most up-to-date collection of research results and recent discoveries in environmental and green technology, including climate change, sustainable development, green diplomacy, and more"--Provided by publisher.

ISBN 978-1-60960-472-1 (hardcover) -- ISBN 978-1-60960-473-8 (ebook) 1. Green technology. 2. Information technology--Environmental aspects. 3.

Technological innovations--Environmental aspects. 4. Business enterprises--Environmental aspects. 1. Information Resources Management Association.

HC79.E5G6917 2011

639.9--dc22

2010053491

British Cataloguing in Publication Data

A Cataloguing in Publication record for this book is available from the British Library.

All work contributed to this book set is original material. The views expressed in this book are those of the authors, but not necessarily of the publisher.

Editor-in-Chief

Mehdi Khosrow-Pour, DBA

Editor-in-Chief

Contemporary Research in Information Science and Technology, Book Series

Associate Editors

Steve Clarke

University of Hull, UK

Murray E. Jennex

San Diego State University, USA

Annie Becker

Florida Institute of Technology USA

Ari-Veikko Anttiroiko

University of Tampere, Finland

Editorial Advisory Board

Sherif Kamel

American University in Cairo, Egypt

In Lee

Western Illinois University, USA

Jerzy Kisielnicki

Warsaw University, Poland

Keng Siau

University of Nebraska-Lincoln, USA

Amar Gupta

Arizona University, USA

Craig van Slyke

University of Central Florida, USA

John Wang

Montclair State University, USA

Vishanth Weerakkody

Brunel University, UK

Additional Research Collections found in the “Contemporary Research in Information Science and Technology” Book Series

Data Mining and Warehousing: Concepts, Methodologies, Tools, and Applications

John Wang, Montclair University, USA • 6-volume set • ISBN 978-1-60566-056-1

Electronic Business: Concepts, Methodologies, Tools, and Applications

In Lee, Western Illinois University • 4-volume set • ISBN 978-1-59904-943-4

Electronic Commerce: Concepts, Methodologies, Tools, and Applications

S. Ann Becker, Florida Institute of Technology, USA • 4-volume set • ISBN 978-1-59904-943-4

Electronic Government: Concepts, Methodologies, Tools, and Applications

Ari-Veikko Anttiroiko, University of Tampere, Finland • 6-volume set • ISBN 978-1-59904-947-2

Knowledge Management: Concepts, Methodologies, Tools, and Applications

Murray E. Jennex, San Diego State University, USA • 6-volume set • ISBN 978-1-59904-933-5

Information Communication Technologies: Concepts, Methodologies, Tools, and Applications

Craig Van Slyke, University of Central Florida, USA • 6-volume set • ISBN 978-1-59904-949-6

Intelligent Information Technologies: Concepts, Methodologies, Tools, and Applications

Vijayan Sugumaran, Oakland University, USA • 4-volume set • ISBN 978-1-59904-941-0

Information Security and Ethics: Concepts, Methodologies, Tools, and Applications

Hamid Nemati, The University of North Carolina at Greensboro, USA • 6-volume set • ISBN 978-1-59904-937-3

Medical Informatics: Concepts, Methodologies, Tools, and Applications

Joseph Tan, Wayne State University, USA • 4-volume set • ISBN 978-1-60566-050-9

Mobile Computing: Concepts, Methodologies, Tools, and Applications

David Taniar, Monash University, Australia • 6-volume set • ISBN 978-1-60566-054-7

Multimedia Technologies: Concepts, Methodologies, Tools, and Applications

Syed Mahbubur Rahman, Minnesota State University, Mankato, USA • 3-volume set • ISBN 978-1-60566-054-7

Virtual Technologies: Concepts, Methodologies, Tools, and Applications

Jerzy Kisielnicki, Warsaw University, Poland • 3-volume set • ISBN 978-1-59904-955-7

Free institution-wide online access with the purchase of a print collection!

**Information Science
REFERENCE**

INFORMATION SCIENCE REFERENCE

Hershey • New York

Order online at www.igi-global.com or call 717-533-8845 ext.100
Mon–Fri 8:30am–5:00 pm (est) or fax 24 hours a day 717-533-7115

Preface

Green technology is the IT community's contribution to growing environmental responsibility. Green technology is the science and theory behind implementing technological systems while minimizing negative impact on the world. As our population expands and our resource consumption increases, it is important to take steps toward sustainable advancement.

The constantly changing landscape of green technology makes it challenging for experts and practitioners to stay informed of the field's most up-to-date research. That is why Information Science Reference is pleased to offer this three-volume reference collection that will empower students, researchers, and academicians with a strong understanding of critical issues within green technology by providing both broad and detailed perspectives on cutting-edge theories and developments. This reference is designed to act as a single reference source on conceptual, methodological, technical, and managerial issues, as well as provide insight into emerging trends and future opportunities within the discipline.

Green Technology: Concepts, Methodologies, Tools and Applications is organized into eight distinct sections that provide comprehensive coverage of important topics. The sections are: (1) Fundamental Concepts and Theories, (2) Development and Design Methodologies, (3) Tools and Technologies, (4) Utilization and Application, (5) Organizational and Social Implications, (6) Managerial Impact, (7) Critical Issues, and (8) Emerging Trends. The following paragraphs provide a summary of what to expect from this invaluable reference tool.

Section 1, ***Fundamental Concepts and Theories***, serves as a foundation for this extensive reference tool by addressing crucial theories essential to the understanding of green technology. Chapters such as *Green Health* by Nina Godbole, and *Planning Sustainable Communities* by Paul Donehue give an introduction and overview of green technology in a contemporary business environment. *Information and Communication Technologies for a more Sustainable World* by Lorenz M. Hilty discusses the potential contribution of Information and Communication Technology (ICT) to the dematerialization of the industrial societies and introduces a conceptual framework which accounts for positive and negative impacts of ICT on physical flows. Additional selections focus on providing backgrounds and introductions to specific concepts within green technology. These and several other foundational chapters provide a wealth of expert research on the elemental concepts and ideas surrounding green technology.

Section 2, ***Development and Design Methodologies***, presents in-depth coverage of the conceptual design and architecture of green technology. Designing and implementing effective processes and strategies are the focus of such chapters as *A Comprehensive and Practical Green ICT Framework* by Graeme Philipson, and *A Framework for the Implementation of Eco-Efficient Business Systems* by Maha Shakir. *Modeling of Green Supply Chain Logistics* by Hsin-Wei Hsu fills a gap in case-based green supply chain management models by proposing a more generalized model. With contributions from leading international researchers, this section offers copious developmental approaches and design methodologies for green technology.

Section 3, ***Tools and Technologies***, presents extensive coverage of the various tools and technologies used in the development and implementation of green technology. This comprehensive section includes such chapters as *A BIM Based Application to Support Cost Feasible 'Green Building' Concept Decisions*, by Goh Bee Hua, and *Sustainable Product Service Systems* by David Ness, which describe various techniques and models for sustainable development. *Using Knowledge Management Tools in Fostering Green ICT Related Behavior Change* by Magda Hercheui discusses the role of Green ICT in improving the management of information and knowledge about sustainability in order to promote behavior change. Finally, chapters such as *Energy Management System Using Wireless Sensor Network* by Ekata Mehul and Rahul Shah present tools to adapt to the challenges of sustainable energy systems. In all, this section provides coverage of a variety of tools and technologies that inform and enhance modern green technology.

Section 4, ***Utilization and Application***, describes how green technology has been utilized and offers insight on important lessons for their continued use and evolution. Including chapters such as *An Australian Rules Football Club Approach To Green ICT* by Jeffrey Phuah, and *Green Product Retrieval and Recommendations System* by Yi-Chun Liao, this section investigates numerous methodologies that have been proposed and enacted in green technology, as well as their results. As this section continues, a number of case studies in the use of green technology are presented from multiple industries across the world, in selections such as *Assessing Environment-Climate Impacts in the Nile Basin for Decision-making* by Farid El-Daoushy, *Breaking Out from Lock-In* by Gert-Jan Hospers, and *Green Urban Planning and Design for Smarter Communities* by Ozge Yalciner Ercoskun. Contributions found in this section provide comprehensive coverage of the practicality and current use of green technology.

Section 5, ***Organizational and Social Implications***, includes chapters discussing the organizational and social impact of green technology. *Adopting Green ICT in Business* by Subramanian Chitra explores the benefits and pitfalls associated with adopting green ICT in a business setting. *Communication, Information and Sustainability* by Marco Tortora analyzes the connections between geography, communication, organization, and sustainability. *From Traditional Non-Sustainable Production to Closed Loop Manufacturing* by Paulina Golinska Addresses the issues related to materials management for closed loop manufacturing. This section continues with *The Negative Impact of ICT Waste on Environment and Health* by Walied Askarzai, which discusses the negative impacts of ICT waste on the environment and health. Overall, these chapters present a detailed investigation of the complex relationship between individuals, organizations and green technology.

Section 6, ***Managerial Impact***, presents focused coverage of green technology as it relates to improvements and considerations in the workplace. *Balancing Green ICT Business Development with Corporate Social Responsibility (CSR)* by Marco Garito outlines topics relating to the design, development, and implementation of green ICT. Other chapters such as *Business Processes Management for a Green Telecommunications Company* by Ramesh Balachandran discuss management considerations, the evaluation and adoption of B2B applications, and the technical infrastructure supporting these systems. In all, the chapters in this section offer specific perspectives on how managerial perspectives and developments in green technology inform each other to create more meaningful user experiences.

Section 7, ***Critical Issues***, addresses vital issues related to green technology, which include customer relationship management, critical success factors and the business strategies. Chapters such as *The Role of the Business Analyst in Green ICT* by Adriana Beal, and *Decision Criteria for Green Management Information Systems* by Tagelsir Mohamed Gasmelseid discuss the success of green technology based on people and processes. Additional selections, such as *Information and Communication Technologies for the Good Society* by Wolfgang Hofkirchner, *Information and Communication Technology As Key Infrastructure for Sustainable Cities* by Motoo Kusakabe, and *Natural Resources Accounting for Sus-*

tainable Development by Ramakrishna Nallathiga address critical success factors in the deployment of green technology.

Section 8, ***Emerging Trends***, highlights areas for future research within the field of green technology, while exploring new avenues for the advancement of the discipline. Beginning this section is *Paving the Way towards Virtual Biorefineries* by Jörg Bremer and Barbara Rapp. This selection explores the drawbacks and opportunities of existing approaches to biomass logistics. Innovative new technologies are presented in *Technological Change and the Transformation of Global Agriculture* by Alejandro Nin-Pratt, and *The Optimizing WEB* by Aditya K. Ghose and Graham Billiau explores the merits of simulation systems before discussing their effectiveness. These and several other emerging trends and suggestions for future research can be found within the final section of this exhaustive multi-volume set.

Although the primary organization of the contents in this multi-volume work is based on its eight sections, offering a progression of coverage of the important concepts, methodologies, technologies, applications, social issues, and emerging trends, the reader can also identify specific contents by utilizing the extensive indexing system listed at the end of each volume.

As a comprehensive collection of research on the latest findings related to using technology to providing various services, *Green Technology: Concepts, Methodologies, Tools and Applications*, provides researchers, administrators and all audiences with a complete understanding of the development of applications and concepts in green technology. Given the vast number of issues concerning usage, failure, success, policies, strategies, and applications of green technology in organizations, *Green Technology: Concepts, Methodologies, Tools and Applications* addresses the demand for a resource that encompasses the most pertinent research in green technology development, deployment, and impact.

Section I

Fundamental Concepts and Theories

This section serves as the foundation for this exhaustive reference tool by addressing crucial theories essential to the understanding of green technology. Chapters found within these pages provide an excellent framework in which to position green technology within the field of information science and technology. Individual contributions provide overviews of the history of green technology, the impact of information systems on organizations, and overviews on various green technology processes such as green health and sustainable urban development. Within this introductory section, the reader can learn and choose from a compendium of expert research on the elemental theories underscoring green technology.

List of Contributors

Adero, Nashon Juma \ <i>Kenya Institute for Public Policy Research and Analysis (KIPPRA), Kenya</i>	798
Akkaya, Cigdem \ <i>Technische Universität München, Germany</i>	1587
Alba, José Maria Filippini \ <i>Embrapa Temperate Climate Research Center, Brazil</i>	1129
Arenales, Marcos N. \ <i>Instituto de Ciências Matemáticas e de Computação, Universidade de São Paulo, Brazil</i>	236
Arreola, Maria Eugenia \ <i>United Nations Environment Programme, Kenya</i>	980
Arunatileka, Dinesh \ <i>University of Western Sydney, Australia & University of Colombo, Sri Lanka</i>	1858
Askarzai, Walied \ <i>Academies Australasia, Australia</i>	1330
AuYeung, Benson \ <i>Brisbane City Council, City Planning Branch, Brisbane, Australia</i>	283, 902
Ayoko, Godwin A. \ <i>Queensland University of Technology, Australia</i>	1804
Baggiani, Leonardo \ <i>Independent Researcher, Italy</i>	1782
Bainbridge, David \ <i>University of Waikato, New Zealand</i>	124
Balachandran, Ramesh \ <i>Sri Lanka Telecom PLC, Sri Lanka</i>	1391
Beal, Adriana \ <i>Beal Projects, USA</i>	1495
Bellali, Johara \ <i>United Nations Environment Programme, Kenya</i>	980
Bellam, Kiranmai \ <i>Auburn University, USA</i>	1836
Bertoni, Malcolm \ <i>University of Tasmania, Australia</i>	136
Betts, Martin \ <i>Queensland University of Technology, Australia</i>	1034
Bhalla, Ishan \ <i>University of Technology Sydney, Australia</i>	678
Bhargava, Siddhartha \ <i>University of St. Andrews, UK</i>	268
Billiau, Graham \ <i>University of Wollongong, Australia</i>	2012
Birkeland, Janis \ <i>Queensland University of Technology, Brisbane, Australia</i>	1
Bong, Ridwan Kuswoyo \ <i>The Logistics Institute-Asia Pacific, Singapore</i>	111
Bremer, Jörg \ <i>Carl von Ossietzky, University of Oldenburg, Germany</i>	1901
Broman, Göran \ <i>Blekinge Institute of Technology, Sweden</i>	73
Bromley, J. \ <i>Oxford University, UK</i>	524
Bruch, Carl \ <i>Environmental Law Institute, USA</i>	466
Buch, Kaushal \ <i>Giant Metrewave Radio Telescope (GMRT), National Centre for Radio Astrophysics (NCRA), Tata Institute of Fundamental Research, India</i>	1891
Buch, Saket \ <i>Indian Space Research Organization, India</i>	1891
Bunker, Jonathan \ <i>Queensland University of Technology, Australia</i>	153, 388, 1044
Bustelo, B. Cristina Pelayo G. \ <i>University of Oviedo, Spain</i>	556
Cerba, Otakar \ <i>University of West Bohemia, Czech Republic</i>	1182

Ch'ng, Eugene \ <i>University of Wolverhampton, UK</i>	418
Charvat, Karel \ <i>Czech Center for Science and Society, Czech Republic</i>	1182
Chaudhary, Kamlesh \ <i>University of Technology Sydney, Australia</i>	678
Chelliah, Pethuru Raj \ <i>Robert Bosch India, India</i>	1610
Chen, X. Mara \ <i>Salisbury University, USA</i>	840
Chen, Edward T. \ <i>University of Massachusetts Lowell, USA</i>	1421
Chitra, Subramanian \ <i>Independent Scholar</i>	1145
Choi, Young B. \ <i>Bloomsburg University of Pennsylvania, USA</i>	405
Cosmi, C. \ <i>National Research Council, Italy</i>	493
Costa, Alysson M. \ <i>Instituto de Ciências Matemáticas e de Computação, Universidade de São Paulo, Brazil</i>	236
Cuomo, V. \ <i>National Research Council, Italy</i>	493
Curtis, Dave \ <i>MethodScience, Australia</i>	314
Davidson, Kristiane \ <i>Queensland University of Technology, Australia</i>	869
Dawes, Les \ <i>Queensland University of Technology, Australia</i>	1922
de Pablos, Patricia Ordóñez \ <i>University of Oviedo, Spain</i>	556
de Queiroz, Sonia Cláudia do Nascimento \ <i>Embrapa Environment, Jaguariúna/SP, Brazil</i>	946
de Souza, Manoel Dornelas \ <i>Embrapa Environment, Jaguariúna/SP, Brazil</i>	946
Deshpande, Yogesh \ <i>University of Western Sydney, Australia</i>	1266
Desouza, Robert \ <i>The Logistics Institute - Asia Pacific, Singapore</i>	111
Dinar, Ariel \ <i>University of California, USA</i>	1572
Dizdaroglu, Didem \ <i>Queensland University of Technology, Australia</i>	1922
Donehue, Paul \ <i>Queensland University of Technology, Australia</i>	46
dos Santos, Lana Mara R. \ <i>Universidade Federal de Viçosa, Brazil</i>	236
Dubey, Rahul \ <i>Dhirubhai Ambani Institute of Information and Communication Technology, India</i>	1891
Dukovska-Popovska, Iskra \ <i>Aalborg University, Denmark</i>	136
Dur, Fatih \ <i>Queensland University of Technology, Australia</i>	153, 388
Egodawatta, Prasanna \ <i>Queensland University of Technology, Australia</i>	1768, 1087
El-Daoushy, Farid \ <i>Uppsala University, Sweden</i>	694
Embaby, Mohamed El-Sayed \ <i>National Water Research Center, Egypt</i>	564
Ercoskun, Ozge Yalciner \ <i>Gazi University, Turkey</i>	884
Erek, Koray \ <i>Berlin Institute of Technology, Germany</i>	1448
Farmani, R. \ <i>University of Exeter, UK</i>	524
Fernandes, Elizabeth Nogueira \ <i>Embrapa Dairy Cattle, Juiz de Fora/MG, Brazil</i>	946
Fernández-Solís, José L. \ <i>Texas A&M University, USA</i>	1979
Ferracini, Vera Lúcia \ <i>Embrapa Environment, Jaguariúna/SP, Brazil</i>	946
Flores, Carlos Alberto \ <i>Embrapa Temperate Climate Research Center, Brazil,</i>	1129
Furukawa, Satomi \ <i>Fuluhashi Environmental Institute Co., Ltd., Japan</i>	1664
Gadatsch, Andreas \ <i>Bonn-Rhein-Sieg University of Applied Sciences, Germany</i>	1408
García-Díaz, Vicente \ <i>University of Oviedo, Spain</i>	556
Garg, Miti \ <i>The Logistics Institute - Asia Pacific, Singapore</i>	111
Garito, Marco \ <i>Viale Fulvio Testi, Italy</i>	1376
Garrastazu, Marilice Cordeiro \ <i>Embrapa Forest Research Center, Brazil</i>	1129
Gasmelseid, Tagelsir Mohamed \ <i>King Faisal University, Saudi Arabia</i>	1558
Gheewala, Deepa \ <i>Misys Software Solutions, UK</i>	1824
Gheewala, Vivek \ <i>UST Global, USA</i>	1824

Ghose, Aditya K. \ <i>University of Wollongong, Australia</i>	1011, 1435, 2012
Giordano, R. \ <i>Istituto di Ricerca Sulle Acque (IRSA) – Water Research Institute, Italy</i>	524
Godbole, Nina \ <i>IBM India Pvt. Ltd., India</i>	17, 1637
Goel, Amit \ <i>RMIT University, Australia</i>	301, 1361
Goh, Mark \ <i>The Logistics Institute - Asia Pacific, Singapore</i>	111
Golinska, Paulina \ <i>Poznan University of Technology, Poland</i>	1213
Gomes, Marco Antonio Ferriera \ <i>Embrapa Environment, Jaguariúna/SP, Brazil</i>	946
Gómez-Limón, José A. \ <i>Institute of Agricultural Research and Training (IFAPA), Spain</i>	597
Goonetilleke, Ashantha \ <i>Queensland University of Technology, Australia</i>	1768, 1804
Gupta, Sumeet \ <i>Shri Shankaracharya College of Engineering and Technology, India</i>	111
Gupta, Surendra M. \ <i>Northeastern University, Boston, USA</i>	378
Hayashi, Kiyotada \ <i>National Agriculture and Food Research Organization, Japan</i>	727
Henriksen, H.J. \ <i>GEUS, Denmark</i>	524
Hercheui, Magda David \ <i>Westminster Business School, UK</i>	587
Hilty, Lorenz M. \ <i>University of Zurich, Switzerland & Empa, Swiss Federal Laboratories for Materials Science and Technology, Switzerland</i>	36
Hofkirchner, Wolfgang \ <i>Vienna University of Technology, Austria</i>	1709
Hokazono, Shingo \ <i>National Agriculture and Food Research Organization, Japan</i>	727
Holmström, Jonny \ <i>Umeå University, Sweden</i>	27
Hospers, Gert-Jan \ <i>University of Twente, The Netherlands & Radboud University, The Netherlands</i>	713
Hsu, Hsin-Wei \ <i>National Tsing Hua University, Taiwan, ROC</i>	327
Hua, Goh Bee \ <i>National University of Singapore, Singapore</i>	351
Huovila, Pekka \ <i>VTT Technical Research Centre of Finland</i>	1344
Hvolby, Hans-Henrik \ <i>Aalborg University, Denmark</i>	136
Igbokwe, Edwin M. \ <i>University of Nigeria, Nigeria</i>	1084
Jacobsson, Mattias \ <i>Umeå School of Business, Umeå University, Sweden</i>	1099
Jain, Heemanshu \ <i>London School of Economics (LSE), UK</i>	1228
Jezek, Jan \ <i>University of West Bohemia, Czech Republic</i>	1182
Jörg, Andrea \ <i>University of Kaiserslautern, Germany</i>	1873
Kafka, Stepan \ <i>Help Service – Remote Sensing spol. s.r.o., Czech Republic</i>	1182
Kamal, Mehruz \ <i>The College at Brockport, State University of New York, USA</i>	1251
Kamani, Krunal \ <i>Anand Agricultural University, India</i>	749
Kathiriya, Dhaval \ <i>Gujarat Technological University, India</i>	749
Kiema, John Bosco Kyalo \ <i>University of Nairobi, Kenya</i>	798
Kolbe, Lutz M. \ <i>University of Göttingen, Germany</i>	1448
Kongar, Elif \ <i>University of Bridgeport, USA</i>	378
Krcmar, Helmut \ <i>Technische Universität München, Germany</i>	1587
Krichevsky, Tamar \ <i>Wilton Consulting Group, USA</i>	1466
Kumar, Arun \ <i>Queensland University of Technology, Australia</i>	1034
Kusakabe, Motoo \ <i>Ritsumeikan Asia Pacific University, Japan</i>	1719
Lan, Yi-Chen \ <i>University of Western Sydney, Australia</i>	934
Larson, Donald F. \ <i>World Bank, USA</i>	1572
Lau, Chean-Piau \ <i>City Planning Branch, Brisbane City Council, Brisbane, Australia</i>	283
Lee, Shinyi \ <i>Queensland University of Technology, Australia</i>	1072, 1768
Lehtonen, Debbie \ <i>Queensland University of Technology, Australia</i>	869
Leo, S. Di \ <i>University of Basilicata, Italy</i>	493

Liao, Yi-Chun \ <i>Hsuan Chuang University, Taiwan, R.O.C.</i>	848
Linde, Anneli \ <i>Umeå School of Business, Umeå University, Sweden</i>	1099
Linderoth, Henrik \ <i>University of Skövde, Sweden & Umeå School of Business, Umeå University, Sweden</i>	1099
Lingarchani, Amit \ <i>MethodScience, Australia</i>	314
Lombardi, Patrizia \ <i>Politecnico di Torino, Italy</i>	1344
Loperte, S. \ <i>National Research Council, Italy</i>	493
Lovelle, Juan Manuel Cueva \ <i>University of Oviedo, Spain</i>	556
Lukies, Ned \ <i>Queensland University of Technology, Australia</i>	869
Macchiato, M. \ <i>National Research Council, Italy</i>	493
MacDonald, Jamie P. \ <i>Office of the Minister of the Environment, Ontario, Canada</i>	73
Maharmeh, Mohammed \ <i>University of Western Sydney, Australia</i>	643
Mahbub, Parvez \ <i>Queensland University of Technology, Australia</i>	1804
Manzanares, Adam \ <i>Auburn University, USA</i>	1836
Mark-Herbert, Cecilia \ <i>The Swedish University of Agriculture Sciences, Uppsala, Sweden</i>	1504
Marmaridis, Ioakim (Makis) \ <i>IMTG, Australia</i>	1154
Martinez, Oscar Sanjuán \ <i>University of Oviedo, Spain</i>	556
Mathiassen, Lars \ <i>Georgia State University, USA</i>	27
Maumbe, Blessing Mukabeta \ <i>Eastern Kentucky University, USA</i>	757
Mayere, Severine \ <i>Queensland University of Technology, Australia</i>	171, 283, 902, 1059
Mehul, Ekata \ <i>eInfochips Pvt. Ltd., India</i>	515
Mehul, Ekata \ <i>eInfochips Pvt. Ltd., India</i>	342
Michelini, R.C. \ <i>DIMEC, University of Genova, Italy</i>	780
Miller, Wendy \ <i>Queensland University of Technology, Brisbane, Australia</i>	1
Molina, J.L. \ <i>Geological Survey of Spain, Spain</i>	524
Mukerji, Saugato \ <i>University of Wollongong, Australia</i>	1011
Murugesan, San \ <i>University of Western Sydney & BRITE Professional Services, Australia</i>	59
Mutis, Iván \ <i>Texas A&M University, USA</i>	1979
Nakayama, Mikiyasu \ <i>University of Tokyo, Japan</i>	466
Nallathiga, Ramakrishna \ <i>Centre for Good Governance, India</i>	1739
Nathadwarawala, Jay (Luv) M. \ <i>Cardiff University Business School, UK</i>	1751
Nathadwarawala, Khush M. \ <i>Imperial College Business School, UK</i>	1751
Ness, David \ <i>University of South Australia, Australia</i>	540
Nin-Pratt, Alejandro \ <i>International Food Policy Research Institute, USA</i>	1953
Ny, Henrik \ <i>Blekinge Institute of Technology, Sweden</i>	73
Obara, Shinya \ <i>Kitami Institute of Technology, Japan</i>	815
Odake, Nobutaka \ <i>Nagoya Institute of Technology, Japan</i>	1664
Oh, Tae H. \ <i>Rochester Institute of Technology, USA</i>	405
Omar, Mohd Faizal Bin \ <i>Queensland University of Technology, Australia</i>	95
Ozor, Nicholas \ <i>University of Nigeria, Nigeria</i>	1084
Paas, Leslie \ <i>International Institute for Sustainable Development, Canada</i>	980
Parmar, Sargam \ <i>Ganpat University, India</i>	1520
Parsania, Pankaj \ <i>Anand Agricultural University, India</i>	749
Perry, Jim \ <i>International Institute for Sustainable Development, Canada</i>	980
Pessoa, Maria Conceição Peres Young \ <i>Embrapa Environment, Jaguariúna/SP, Brazil</i>	946
Philipson, Graeme \ <i>Connection Research, Australia</i>	186
Phuah, Jeffrey \ <i>Carlton Football Club, Australia</i>	637

Pietrapertosa, F. \ <i>National Research Council, Italy</i>	493
Pinheiro, António Cipriano \ <i>University of Évora, Portuga,</i>	624
Pradhan, Alok \ <i>Macquire University, Australia</i>	1314
Qin, Xiao \ <i>Auburn University, USA</i>	1836
Qureshi, Sajda \ <i>University of Nebraska at Omaha, USA</i>	1251
Rahman, Shaikh M. \ <i>Texas Tech University, USA</i>	1572
Rajain, Somesh \ <i>eInfochips Pvt. Ltd., India,</i>	342
Ramaiya, Kinjal \ <i>Symbiosis Centre for Information Technology, India</i>	268
Ranatunga, Dilupa \ <i>University of Colombo, Sri Lanka</i>	1858
Rapp, Barbara \ <i>Carl von Ossietzky, University of Oldenburg, Germany</i>	1901
Rashid, Kushairi \ <i>Queensland University of Technology, Australia</i>	1044
Razzoli, R.P. \ <i>DIMEC, University of Genova, Italy</i>	780
Ribeiro, Nunode Almeida \ <i>University of Évora, Portugal</i>	624
Riesgo, Laura \ <i>Pablo de Olavide University, Spain</i>	597
Robèrt, Karl-Henrik \ <i>Blekinge Institute of Technology, Sweden</i>	73
Rorarius, Jonas \ <i>The Swedish University of Agriculture Sciences, Uppsala, Sweden</i>	1504
Rosen, Michael \ <i>Wilton Consulting Group & Cutter Consortium, USA</i>	1466
Ruan, Xiaojun \ <i>Auburn University, USA</i>	1836
Ryoo, Jungwoo \ <i>The Pennsylvania State University-Altoona, USA</i>	405
Saeed, Zahra \ <i>University of Technology Sydney, Australia</i>	643
Sahay, Arun \ <i>Strategic Management, Management Development Institute, Gurgaon, India</i>	1281
Salewicz, Kazimierz A. \ <i>Systems Analyst, Austria</i>	466
Sallam, Gehan A.H. \ <i>National Water Research Center, Egypt</i>	564
Salvia, M. \ <i>National Research Council, Italy</i>	493
Sandberg, Johan \ <i>Umeå University, Sweden</i>	27
Sanders, Paul \ <i>Queensland University of Technology, Australia</i>	1539
Santer, Elena \ <i>United Nations Environment Programme, Kenya</i>	980
Santos, Ricardo H.S. \ <i>Universidade Federal de Viçosa, Brazil</i>	236
Sato, Masaei \ <i>National Agriculture and Food Research Organization, Japan</i>	727
Savic, D.A. \ <i>University of Exeter, UK</i>	524
Schmidt, Nils-Holger \ <i>University of Göttingen, Germany</i>	1448
Schmidt, Heinz \ <i>RMIT University, Australia</i>	301, 1361
Shah, Rahul \ <i>eInfochips Pvt. Ltd., India</i>	515
Shakir, Maha \ <i>Zayed University, UAE</i>	220
Shaltot, Fatma \ <i>Hellwan University, Egypt</i>	564
Sharma, Harsh \ <i>OMG Sustainability SIG, USA</i>	1466
Sharma, Nalini \ <i>United Nations Environment Programme, Kenya</i>	980
Sherringham, Keith \ <i>IMS Corp, Australia</i>	1933
Shibata, Kuniko \ <i>Osaka City University, Japan</i>	1539
Shingala, Chetan \ <i>Sibridge Technologies Ltd, India</i>	342
Shrinivasan, Vivek \ <i>University of St. Andrews, UK</i>	268
Steger-Jensen, Kenn \ <i>Aalborg University, Denmark</i>	136
Sundarkarni, Balan \ <i>The Logistics Institute-Asia Pacific, Singapore</i>	111
Sunikka-Blank, Minna \ <i>University of Cambridge, UK</i>	1344
Surový, Peter \ <i>University of Évora, Portugal</i>	624
Tembo, Rachael \ <i>Cape Peninsula University of Technology, South Africa</i>	757
Teriman, Suharto \ <i>Queensland University of Technology, Australia</i>	171, 1059

Tiwarly, Amit \ <i>Utility Industry, Australia</i>	301, 1198, 1361
Too, Eric \ <i>Queensland University of Technology, Australia</i>	1034
Tortora, Marco \ <i>Political Science School, University of Florence, Italy</i>	1164
Tran, Vu Long \ <i>Springboard Research, Australia</i>	1118
Trigunarsyah, Bambang \ <i>Queensland University of Technology, Australia</i>	95
Trivedi, Bharti \ <i>DDU Nadiad, India</i>	201, 1305
Turner, Paul \ <i>University of Tasmania, Australia</i>	136
Twesigye, Charles K. \ <i>Kyambogo University, Uganda</i>	653
Uchida, Susumu \ <i>National Agriculture and Food Research Organization, Japan</i>	727
Unhelkar, Bhuvan \ <i>University of Western Sydney & MethodScience,</i> <i>Australia</i>	201, 934, 1198, 1154, 1266, 1305, 1520, 1933
Virparia, Paresh \ <i>Sardar Patel University, India</i>	749
von Hauff, Michael \ <i>University of Kaiserslautern, Germany</i>	1873
Wang, Hui-Ling \ <i>University of Wollongong, Australia</i>	1435
Wang, Miao-Ling \ <i>Ming-Hsin University of Science & Technology, Taiwan, ROC</i>	1683
Wang, Hsiao-Fan \ <i>National Tsing Hua University, Taiwan, ROC</i>	327
Wimelius, Henrik \ <i>Umeå University, Sweden</i>	27
Withanage, Rasika \ <i>University of Wales, UK</i>	1858
Witten, Ian H. \ <i>University of Waikato, New Zealand</i>	124
Wolcott, Peter \ <i>University of Nebraska at Omaha, USA</i>	1251
Wolf, Petra \ <i>Technische Universität München, Germany</i>	1587
Wong, Johnny \ <i>Queensland University of Technology, Australia</i>	95
Worku, Goshu \ <i>Water Works Design & Supervision Enterprise, Ethiopia</i>	920
Wrege, Marcos Silvera \ <i>Embrapa Forest Research Center, Brazil</i>	1129
Yigitcanlar, Tan \ <i>Queensland University of Technology,</i> <i>Australia</i>	153, 171, 283, 388, 902, 1044, 1059, 1072, 1768, 1922, 1804
Youssef, Tahani \ <i>Helwan University, Egypt</i>	564
Zarnekow, Rüdiger \ <i>Berlin Institute of Technology, Germany</i>	1448
Zong, Ziliang \ <i>South Dakota School of Mines and Technology, USA</i>	1836

Contents

Volume I

Section I. Fundamental Concepts and Theories

This section serves as the foundation for this exhaustive reference tool by addressing crucial theories essential to the understanding of green technology. Chapters found within these pages provide an excellent framework in which to position green technology within the field of information science and technology. Individual contributions provide overviews of the history of green technology, the impact of information systems on organizations, and overviews on various green technology processes such as green health and sustainable urban development. Within this introductory section, the reader can learn and choose from a compendium of expert research on the elemental theories underscoring green technology.

Chapter 1.1. Green Energy: Sustainable Energy Sources and Alternative Technologies	1
<i>Wendy Miller, Queensland University of Technology, Brisbane, Australia</i>	
<i>Janis Birkeland, Queensland University of Technology, Brisbane, Australia</i>	
Chapter 1.2. Green Health: The Green IT Implications for Healthcare & Related Businesses	17
<i>Nina Godbole, IBM India Pvt. Ltd., India</i>	
Chapter 1.3. Green IS: Steps towards a Research Agenda	27
<i>Jonny Holmström, Umeå University, Sweden</i>	
<i>Lars Mathiassen, Georgia State University, USA</i>	
<i>Johan Sandberg, Umeå University, Sweden</i>	
<i>Henrik Wimelius, Umeå University, Sweden</i>	
Chapter 1.4. Information and Communication Technologies for a more Sustainable World	36
<i>Lorenz M. Hilty, University of Zurich, Switzerland & Empa, Swiss Federal Laboratories for Materials Science and Technology, Switzerland</i>	

Chapter 1.5. Planning Sustainable Communities: An Appropriate Basis for Sustainable Residential Communities?	46
<i>Paul Donehue, Queensland University of Technology, Australia</i>	
Chapter 1.6. Strategies for Greening Enterprise IT: Creating Business Value and Contributing to Environmental Sustainability	59
<i>San Murugesan, University of Western Sydney & BRITE Professional Services, Australia</i>	
Chapter 1.7. Sustainability Constraints as System Boundaries: Introductory Steps toward Strategic Life-Cycle Management	73
<i>Henrik Ny, Blekinge Institute of Technology, Sweden</i>	
<i>Jamie P. MacDonald, Office of the Minister of the Environment, Ontario, Canada</i>	
<i>Göran Broman, Blekinge Institute of Technology, Sweden</i>	
<i>Karl-Henrik Robèrt, Blekinge Institute of Technology, Sweden</i>	
Chapter 1.8. Sustainable Infrastructure Project Planning: Progress in Contemporary Decision Support Tools	95
<i>Mohd Faizal Bin Omar, Queensland University of Technology, Australia</i>	
<i>Bambang Trigunarsyah, Queensland University of Technology, Australia</i>	
<i>Johnny Wong, Queensland University of Technology, Australia</i>	
Chapter 1.9. Sustaining the Green Information Technology Movement	111
<i>Miti Garg, The Logistics Institute - Asia Pacific, Singapore</i>	
<i>Sumeet Gupta, Shri Shankaracharya College of Engineering and Technology, India</i>	
<i>Mark Goh, The Logistics Institute - Asia Pacific, Singapore</i>	
<i>Robert Desouza, The Logistics Institute - Asia Pacific, Singapore</i>	
<i>Balan Sundarkarni, The Logistics Institute-Asia Pacific, Singapore</i>	
<i>Ridwan Kuswoyo Bong, The Logistics Institute-Asia Pacific, Singapore</i>	
Chapter 1.10. The Greenstone Digital Library Software	124
<i>Ian H. Witten, University of Waikato, New Zealand</i>	
<i>David Bainbridge, University of Waikato, New Zealand</i>	
Chapter 1.11. Sustainable Supply Chain Management: Cases and Models of RFID and Information Systems use in Green Logistics	136
<i>Iskra Dukovska-Popovska, Aalborg University, Denmark</i>	
<i>Malcolm Bertoni, University of Tasmania, Australia</i>	
<i>Hans-Henrik Hvolby, Aalborg University, Denmark</i>	
<i>Paul Turner, University of Tasmania, Australia</i>	
<i>Kenn Steger-Jensen, Aalborg University, Denmark</i>	
Chapter 1.12. Sustainable Transport Infrastructure: Perspectives for Sustainable Urban and Transport Development.....	153
<i>Fatih Dur, Queensland University of Technology, Australia</i>	
<i>Tan Yigitcanlar, Queensland University of Technology, Australia</i>	
<i>Jonathan Bunker, Queensland University of Technology, Australia</i>	