

The Greening of Industrial Ecosystems: Overview and Perspective

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and ROBERT A. FROSCH

"Paper or plastic?" is rapidly becoming the commonest query of our day. In selecting a desirable bag at the grocery store check-out stand, the environmentally concerned base their decision not just on which is better at carrying groceries, but which is "greener." Making a rational choice on environmental preferability of even simple options, however, is not simple. A comparison of beverage cups—plastic vs. paper vs. ceramic—illustrates the difficulty. The intuitive choice, based on disposability, is that ceramic is preferable, followed at a considerable distance by paper and then perhaps plastic, which is less biodegradable than paper. The most comprehensive study to date indicates, however, that ceramic cups are the preferable option only if each cup is reused at least hundreds of times; a conclusion dependent heavily on assumptions about washing patterns (van Eijk et al., 1992). As multiple reuse is unlikely in many cases (think of the logo-stamped coffee mugs that populate trade fairs), the counterintuitive conclusion is that both paper and plastic cups can be preferable to ceramic cups, depending on consumption practices. This raises interesting systems questions: Are long-lasting multi-use products always environmentally preferable? Should complex products such as automobiles or computers always be manufactured for multiple reuse? What are the effects—on the economy, on technological choices, on company operations, on consumer options—of what seem to be environmentally beneficial changes in existing products or the introduction of "green" products and processes?

As with all systems work or analysis, definition of the systems boundaries is critical. This is the case both in biological ecology and in the analysis of engineering systems such as computer networks, transportation systems, or chemical processing facilities. The same challenge exists in trying to understand industrial

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The Greening of Industrial Ecosystems National Academy of Engineering, Advisory Committee on Industrial Ecology and Environmentally Preferable Technology, 1994-02-01 In the 1970s the first wave of environmental regulation targeted specific sources of pollutants In the 1990s concern is focused not on the ends of pipes or the tops of smokestacks but on sweeping regional and global issues This landmark volume explores the new industrial ecology an emerging framework for making environmental factors an integral part of economic and business decision making Experts on this new frontier explore concepts and applications including Bringing international law up to par with many national laws to encourage industrial ecology principles Integrating environmental costs into accounting systems Understanding design for environment industrial metabolism and sustainable development and how these concepts will affect the behavior of industrial and service firms The volume looks at negative and positive aspects of technology and addresses treatment of waste as a raw material This volume will be important to domestic and international policymakers leaders in business and industry environmental specialists and engineers

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Greening of Industrial Ecosystems , **Annual Report** United States. Federal Emergency Management Agency, 1983 **The Industrial Green Game** National Academy of Engineering, 1997-07-10 Industrial ecology is a concept that has emerged in response to growing public concern about the impact of industry on the environment In this framework the natural flow or circulation of materials and energy that takes place in biological ecosystems becomes a model for more efficient industrial metabolism What industrial ecology is and how it may be applied to corporate environmentalism are the subject of The Industrial Green Game This volume examines industrial circulation of materials energy efficiency strategies green accounting life cycle analysis and other approaches for preventing pollution and improving performance Corporate leaders report firsthand on green efforts at Ciba Geigy Volvo Kennecott and Norsk Hydro And an update is provided on the award winning industrial symbiosis project in

Kalundborg Denmark The Industrial Green Game looks at issues of special concern to business such as measuring and shaping public perceptions and marketing green products to consumers It offers discussions of the appropriate roles of government and private business **Taking Stock of Industrial Ecology** Roland Clift,Angela Druckman,2015-12-11 How can we design more sustainable industrial and urban systems that reduce environmental impacts while supporting a high quality of life for everyone What progress has been made towards reducing resource use and waste and what are the prospects for more resilient material efficient economies What are the environmental and social impacts of global supply chains and how can they be measured and improved Such questions are at the heart of the emerging discipline of industrial ecology covered in Taking Stock of Industrial Ecology Leading authors researchers and practitioners review how far industrial ecology has developed and current issues and concerns with illustrations of what the industrial ecology paradigm has achieved in public policy corporate strategy and industrial practice It provides an introduction for students coming to industrial ecology and for professionals who wish to understand what industrial ecology can offer a reference for researchers and practitioners and a source of case studies for teachers Perspectives on Industrial Ecology Dominique Bourg,Suren Erkman,2017-09-29 Business as usual in terms of industrial and technological development even if based on a growing fear of pollution and shortages of natural resources will never deliver sustainable development However the growing interest in recent years in the new science of industrial ecology IE and the idea that industrial systems should mimic the quasi cyclical functions of natural ecosystems in an industrial food chain holds promise in addressing not only short term environmental problems but also the long term holistic evolution of industrial systems This possibility requires a number of key conditions to be met not least the restructuring of our manufacturing and consumer society to reduce the effects of material and energy flows at the very point in history when globalisation is rapidly increasing them This book sets out to address the theoretical considerations that should be made implicit in future research as well as practical implementation options for industry The systematic recovery of industrial wastes the minimisation of losses caused by dispersion the dematerialisation of the economy the requirement to decrease our reliance on fuels derived from hydrocarbons and the need for management systems that help foster inter industry collaboration and networks are among the topics covered The book is split into four sections First the various definitions of IE are outlined Here important distinctions are made between industrial metabolism and IE Second a number of different industrial sectors including glass petroleum and electric power are assessed with regard to the operationalisation of industrial ecology Eco industrial Parks and Networks are also analysed Third the options for overcoming obstacles that stand in the way of the closing of cycles such as the separation and screening of materials are considered and finally a number of implications for the future are assessed The contributions to Perspectives on Industrial Ecology come from the leading thinkers working in this field at the crossroads between a number of different disciplines engineering ecology bio economics geography the social sciences and law **Industrial Ecology** Adeel Shah,Che Rosmawati Che

Mat,Alisa Ibrahim,Yu Zhang,Samreen Muzammil,2024-06-24 This book provides readers with insight into current industrial ecology practices in developing and developed countries how it impacts sustainability and why it is becoming more relevant The book affects the audience to understand the scarcity of raw materials because of COVID 19 lockdowns and rising population and resulting demand The chapters in the book shed light on the best practices to increase sustainability practices leading to an increase in the triple bottom line Governments around the globe are striving to meet United Nations Sustainable Development Goals 2030 Based on current trends governments due to the COVID 19 pandemic will miss the target For achieving the goals current and future grad students managers should be educated to achieve the targets early The inculcated idea of industrial ecology will enable managers to think in the right direction and use out of the box ideas to increase sustainability in short term and long term solutions to their immediate problems and future threats and weaknesses in the Post COVID 19 era Sustainable Strategic Management W. Edward Stead,Jean Garner Stead,Mark Starik,2004 This work fills the need for a strategic management text that gives full attention to sustainability and environmental protection It includes chapter by chapter case studies of two organizations that exemplify many of the principles of environmentally sound management practices **Industrial Ecology and Spaces of Innovation** K. Green,2006-01-01 This is an especially timely book Carefully organized and well motivated its power lies in the explicit effort to ask how industrial ecology and innovation studies do can and should intersect Reid Lifset Yale School of Forestry and Environmental Studies and editor Journal of Industrial Ecology This book explores the disciplinary interfaces and practical implications of working across the two disciplines of industrial ecology IE and innovation studies IS Both disciplines have something to say about instigating environmental improvement and more sustainable futures IE is predicated on the idea that social and economic systems mirror or should be made to mirror natural ecological systems Proponents of IE devise models and techniques to trace material and energy resource flows as they move through social and economic systems They propose policy and management improvements to increase the resource efficiency of such systems By contrast IS researchers work with the idea that innovation is a dynamic activity vital to social and economic change and is shaped by a range of actors in industry in government and in households The authors illustrate the conceptual and practical problems and opportunities of working across this bi disciplinary interface with case studies presented from each and from hybrid perspectives that draw on both These include applied examples from IE such as an evaluation of industrial symbiosis in the UK and from working projects in industrialising countries Cases that originate with IS cover the areas of food construction and waste incineration New directions for conceptual development and further research are also offered Conceptual blindspots and research gaps are identified at the interface of the two disciplines Industrial Ecology and Spaces of Innovation will appeal to a wide and interdisciplinary audience including academics and researchers of environmental innovation management and economics industrial ecology and schools of environmental engineering Business environmental practitioners consultants and managers

working with techniques such as life cycle analysis environmental impact assessment and collaborative industrial symbiosis initiatives will also find much to engage them within this book

The Social Embeddedness of Industrial Ecology Frank Boons, Jennifer A. Howard-Grenville, 2009-01-01 From its inception the field of industrial ecology has taken a distinctly technological approach to understanding and improving ecological consequences of industrial activities Increasingly however scholars and practitioners are developing perspectives on the social embeddedness of industrial ecology the ways in which material and energy flows in regions and product chains are shaped by the social context in which they occur This book presents empirical work addressing how cognitive cultural political and structural mechanisms condition the emergence and operation of industrial ecology Further exploring such mechanisms holds promise for understanding both the barriers to and opportunities for altering the ecological impacts of industrial practice Through contemplative chapters and intermezzos authors with different disciplinary backgrounds reflect on the contribution of work from various social sciences to industrial ecology Unique to the volume the authors of the commentaries bring in their personal and professional experiences reflecting on how they have engaged in or have seen the value in cross disciplinary work They also include discussion explicitly on the dialogue and its value to the evolution of the field In these ways the book develops the dialogue between social science contributors and researchers from other disciplines within the field of industrial ecology Scholars and students involved in the study of industrial ecology and related fields as well as practising managers and those involved in facilitating industrial ecology projects around the world will find this engaging and comprehensive volume indispensable

Eco-industrial Strategies Edward Cohen-Rosenthal, Judy Musnikow, 2017-09-29 Eco industrial development is born from the realisation that the places where we work waste too much and unnecessarily pollute the land air and water This book explores the key issues involved in developing eco parks and identifies the stakeholders and their roles in such projects

A Handbook of Industrial Ecology Robert U. Ayres, Leslie Ayres, 2002-01-01 The editors of this handbook have brought together 58 of the world's greatest environmental systems experts These professionals have in 46 specific topic headings divided into six major sections provided very insightful information and guidance as to what industrial ecology entails how it can be implemented and its benefits a very valuable tool This book provides essential information to mid and top level management that can enable industry to make more prudent business decisions regarding the manufacturing of its products Robert John Klancko Environmental Practice Industrial ecology is coming of age and this superb book brings together leading scholars to present a state of the art overviews of the subject

Designing the Green Economy Brian Milani, 2000-09-20 Designing the Green Economy explores realistically and in detail the world's enormous potential for human and ecological regeneration It also explains why this potential has been suppressed or distorted by industrial institutions thus creating economic crisis growing inequality and environmental destruction The first half of the book looks at the challenge ecological change has represented to capitalism as well as capitalism's repressive response the waste economy as expressed in postwar

Fordist capitalism and current trends toward a globalized economy But today the great divide between waste and green economies can be narrowed by emerging legal institutional and market approaches to production and environmentalism In Part II Milani explores the practical and theoretical implications of fully unleashing these new productive forces to create community based ecological economies Milani argues that neither sustainability social justice nor economic stability can be secured without comprehensive redesign of the economy along ecological principles It looks at key sectors of the economy including manufacturing energy and money and finance to illustrate how this redesign can and is taking place through both incremental grassroots initiatives and transformative politics

Green Industrial Restructuring Manfred Binder, Martin Jänicke, Ulrich Petschow, 2013-03-09 Starting from this dematerialization hypothesis for the first time comparative case studies analyse in detail the driving forces of industrial restructuring of different industries and countries in Europe where such a decline has been observed at least temporarily

Green Business B. S. Sahay, Roger R. Stough, Amrik Sohal, Sonu Goyal, 2006 Proceedings of the Conference on Green Competitiveness for Sustainable Development held at New Delhi during 27 28 October 2006

International Perspectives on Industrial Ecology Pauline Deutz, Donald I. Lyons, Jun Bi, 2015-10-30 With its high level focus on industrial ecology related policies such as circular economy and industrial symbiosis this book provides a timely analysis of the industrial ecology experience worldwide Editors Pauline Deutz Donald I Lyons and Jun Bi combine their diverse experiences in both research and teaching to examine the topic as a business community and academic endeavor in different settings worldwide *International Perspectives on Industrial Ecology* provides a cutting edge in depth exploration of the commonalities and differences of industrial ecology experiences comparing geographical contexts from each of the world s continents Expert contributors utilize case studies and contextualized reviews of current projects to formulate invaluable insights in the field Much attention is given to industrial symbiosis waste management circular economy sustainable development and environmental management as each pertains to the field This book s international perspective makes it ideal background reading for academics working in industrial ecology as well as a valuable reference for postgraduates doing research or taking courses in the field Public or private sector bodies trying to facilitate industrial symbiosis economic development agencies considering industrial symbiosis projects and environmental managers and regulators trying to improve environmental performance in their particular country will also find it engaging and relevant

Introduction to Environmental Management Mary K. Theodore, Louis Theodore, 2021-05-29 Written at a level that is accessible to students in all disciplines *Introduction to Environmental Management* Second Edition translates complex environmental issues into practical and understandable terms The book provides students and practitioners an understanding of the regulations pollutants and waste management issues that can be applied in various related environmental fields and industries This new edition is updated throughout and adds eleven new chapters including coverage of water conservation water toxins measurement methods desalination industrial ecology legal issues and more Features

Updated throughout and includes eleven all new chapters Reviews the specialized literature on pollution prevention sustainability and the role of optimization in water treatment and related areas as well as references for further reading Provides illustrative examples and case studies that complement the text throughout Includes ancillary exams and a solutions manual for adopting instructors This book serves as a complete teaching tool offering a combination of insightful coverage concise language and convenient pedagogical features and supplies practical guidance that will aid students and practitioners alike

Measures of Environmental Performance and Ecosystem Condition National Academy of Engineering, 1999-05-19 When Cleveland's Cuyahoga River caught fire in 1969 no environmental measurements were necessary to know the seriousness of the problem Incidents like the Cuyahoga fire raise an important question Can catastrophes in the making be detected early enough to be prevented For those in industry such disasters point to the need for measures that can improve the environmental performance of processes products business practices and linked industrial systems In *Measures of Environmental Performance and Ecosystem Condition* experts share their insights on environmental metrics The volume explores the most productive relationship between measures of environmental performance and measures of ecosystem conditions It reviews current approaches evaluates structures for business decisionmaking and includes a matrix for determining the environmental performance of industrial facilities Case studies include Development and application of a water quality rating scheme for streams and reservoirs in the Tennessee Valley Three years of successful experience with waste metrics at 3M The book covers the range of environmental performance and condition metrics from the use of material flow data to monitor environmental performance at the national level to the use of bioassays to measure the toxicity of industrial effluents This book offers something for everyone policymakers executives engineers managers and advocates with a stake in the measurement of environmental performance and ecological conditions

Industrial Ecology and Industry Symbiosis for Environmental Sustainability Xiaohong Li, 2017-12-01 This book opens up a critical dimension to the interdisciplinary field of Industrial Ecology IE and one of its four areas Industrial Symbiosis IS Presenting the concept of closed loop thinking this timely book explains how industries and societies can achieve environmental sustainability a necessity for today's businesses Providing a critical review of the definitions and developments of both IE and IS this study establishes their fundamental role in improving environmental sustainability The author identifies valuable lessons to be learned and presents conceptual frameworks to guide future IE and IS applications Transforming industrial systems into closed loop industrial ecosystems dramatically reduces the negative impact of industrial activities on the environment Therefore this book is an important read not only for operations management scholars but also those who are interested in ensuring an environmentally sustainable future

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