

**International Society for Industrial Ecology**

**The Science  
& Culture  
of  
Industrial Ecology**

12-14 November 2001— The Netherlands

# The International Society for Industrial Ecology

is a new organization dedicated to supporting research and applications related to the emerging field of industrial ecology. Leaders from diverse disciplines who share an interest in this new field have come together to form this Society and to convene this meeting.

An eclectic group of individuals, representing a broad array of organizations and agencies have contributed to making this meeting a success. While our backgrounds are diverse, we all come with a shared goal to continue learning and to share our experiences with others who are working within the industrial ecology paradigm. The ISIE Steering Committee and the meeting coordinators thank you for joining us in this inaugural effort.

## ISIE Steering Committee

David Allen, *University of Texas*

Brad Allenby, *AT&T*

Helge Brattebo, *Norwegian University of Science & Technology*

Stefan Bringezu, *Wuppertal Institute*

Faye Duchin, *Rensselaer Polytechnic Institute*

John Ehrenfeld, *Executive Director, International Society for Industrial Ecology*

Marina Fischer-Kowalski, *Institute for Interdisciplinary Studies of Austrian Universities*

Tom Graedel, *Yale University*

Barbara Karn, *US Environmental Protection Agency*

René Kleijn, *Leiden University*

Reid Lifset, *Yale University*

Yuichi Moriguchi, *Japan National Institute for Environmental Studies*

Bob Pfahl, *Motorola*

Greg Pitts, *Ecolibrium*

Tadatomo Suga, *University of Tokyo*

## 2001 Meeting Coordinators

Kristan Cockerill, *Columbia University*

René Kleijn, *Leiden University*

The Coordinators extend special thanks to John Ehrenfeld, Reid Lifset, Sonja Plesset and Esther Philips for all of their help and support in planning this meeting.

# Monday, 12 November 2001

## 0900-1200 Workshops

### Material Flow Accounting: Concept and Methods

Heinz Schandl and Helga Weisz  
IFF Social Ecology, Vienna

Room: B37

Material Flow Accounting (MFA) has become a widely used tool in the field of Industrial Ecology. After a decade of discussion upon methodology, the scientific community has reached a reasonable level of methodological standardization. Due to a recent effort undertaken by the European Statistical Office, an internationally approved methodological guide is also available (EUROSTAT 2001).

However, courses on material flow accounting methods have rarely entered university curricula. This interactive workshop covers the essentials of the concept of material flow accounting, and addresses the most important methodological peculiarities of MFA in accordance with the EUROSTAT guide. The workshop concentrates on the national scale, as being the most highly developed. However, there is flexibility to address special problems of local, sectoral, or regional scales as well.

### Short Course on Life Cycle Assessment

Reinout Heijungs  
CML, Leiden University

Room: Foyer

The process of standardisation of LCA by ISO has yielded the first edition of the 14040-series. This provides a useful starting point for carrying out LCA. By design, the standards offer a conceptual framework more than an operational method.

At CML, work has been directed towards creating an operational guide to the ISO-standards for LCA. The handbook is more than 700 pages long and, is available at CML's website and is in print with Kluwer Academic Publishers. CML, in close co-operation with many leading LCA-experts, has interpreted the ISO-texts, made choices, and defined baseline guidelines for choosing the functional unit, defining system boundaries, selecting allocation rules, modelling impact category indicators and much more, thereby designing a practical implementation of the ISO-standards.

The short course will provide a tour of the interpretations and choices in the new handbook.

*ISIE Steering Committee will meet over lunch - 1200*

## 1300-1430 Opening Plenary Session

Room: Rotonde

### Introducing ISIE

John Ehrenfeld  
Executive Director, ISIE

### Government Perspective

Fritz Balkau (*invited*)  
Division of Technology, Industry, and Economics, UNEP

### Industrial Perspective

*To be announced*

**1430-1500 Break**

# Monday, 12 November 2001

## 1500–1630

## Technical Program I

### Social Framework in Industrial Ecology I

Chair: G. Unruh                      Room: B37

Radical Reformism: Embedding Industrial Ecology into Modernity (*Orssatto*)

Integrating Intelligent Trial and Error into Industrial Ecology (*Woodhouse, Swearengen, Howard*)

Industrial Ecology: The Discipline and Its Relation to the Real World (*Røine, Keitsch*)

Do Local Decision-Makers Ask for Substance Flow Analysis? (*Lindqvist, Eklund*)

### Thermodynamics and Industrial Ecology

Chair: B. Bakshi                      Room: B31

Exergy, Emergy, and Life Cycle Assessment (*Bakshi, Hau, Ukidwe*)

Entropy Production as a Measure for Resource Use Applied to Metallurgical Processes (*Goessling*)

Thermodynamics Applied. Where? Why? (*Hirs*)

Entropy as a Quality Measure for Industrial Metals Management (*Rechberger*)

### Theory in Substance Flow Analysis

Chair: B. Karn                      Room: B29

Integrating an Actor-oriented Perspective into Regional Resource Management (*Kytzia, Faist, Baccini*)

Study on Development of Environmental Indicators for Evaluation of Organic Resource Cycle System (*Matsumoto, Imura*)

Indicators for Chemical Product Input in Different Sectors: Possibilities to Include Chemical Products in Environmental Accounts (*Palm, Jonsson*)

GREAT-ER—A New Decision Support Tool for Management and Risk Assessment of Chemicals in River Basins (*Schowaneck, Fejitel*)

### Spatial Economics and Industrial Ecology

Chairs: J. van den Bergh and M. Janssen  
Room: Foyer

The Evolution of Industrial Symbiotic Networks - The Case of Kalundborg (*Jacobsen, Anderberg*)

Self-organization, Cooperation and Industrial Symbiosis (*Janssen, Boons*)

Waste Management Policies : An Applied General Equilibrium Analysis (*Bartelings, van Ierland, Dellink*)

Recycling, International Trade and the Environment: An Empirical Analysis (*van Beukering*)

### Theory in Life Cycle Assessment

Chair: J. Ertel                      Room: Rotonde

Towards a More Credible Handling of Environmental Values in LCA Studies (*Bengtsson*)

Life Cycle Activity Analysis: A Optimizing Approach to Industrial Ecology (*Freire, Thore*)

Risk Trade-off Analysis of Demand-side Management: Combining Life-Cycle Assessment and Risk Assessment (*Nishioka, Levy, Norris, Wilson, Hofstetter, Spengler*)

### Theory in Corporate Integration

Chair: B. Pfahl                      Room: B33

Environmental Communication of Japanese Industry (*Aoyagi-Usui*)

Organisational Challenges to Industrial Ecology: A Comparative Analysis of Three Companies' Efforts to Develop Environmentally Responsible Corporate Cultures (*Dahl, Hagen, Larssæther*)

Innovation Strategies—Impacts on Economic, Ecological and Social Co-Management (*Schwendner*)

# Monday, 12 November 2001

## 1645–1900 Poster Session

Room: B2-B4

More than 50 posters will be presented. Like the paper-based sessions, these posters cover a diverse array of topics relevant to industrial ecology.

## 1930 Dinner

*JIE Editorial Board will meet at dinner*

# Tuesday, 13 November 2001

*There will be an ISIE general meeting over breakfast beginning at 0730*

## 0830–1030 Plenary Session II

Room: Rotonde

**The History of Industrial Ecology in Leiden** Helias Udo de Haes

### Industrial Ecology Roots

Moderator: Robert Pfahl  
 Panelists: Brad Allenby      John Ehrenfeld  
                  Robert Ayres      Suren Erkman  
                  Stefan Bringezu

### What is Industrial Ecology Becoming and Where Will it Take Us?

Moderator: John Ehrenfeld  
 Panelists: Roland Clift      Marina Fischer-Kowalski  
                  Thomas Graedel      Reid Lifset  
                  Jason Makansi      Yuichi Moriguchi

**1030–1045 Break**

# Tuesday, 13 November 2001

## 1045-1215

## Technical Program II

### Social Framework for Industrial Ecology II

Chair: C. Andrews      Room: B31

The Social and Political Context of Industrial Ecology:  
Extrapolations on the Theory of Ecological Modernization  
(*Cohen*)

Ecological Modernisation (*Hotta*)

Material Culture: A Critical Missing Dimension in Industrial Ecology (*Ryan*)

Postindustrial Ecology (*Unruh*)

### Material Flow Analysis in National Economies I

Chair: M. Fischer-Kowalski      Room: Foyer

Key Questions to MFA for National Economies (*Fischer-Kowalski*)

The Role of MFA Indicators in the EU Sustainable Development Strategy (*Steurer*)

Material Flow Analysis for the European Union and Beyond—Implications for Statistics and Policy (*Bringezu*)

Lessons from Japanese MFA (*Moriguchi*)

### Closing the Loop

Chair: N. Lawson      Room: B29

System Modelling for Decision Support in Industrial Ecology (*Cliff, Mellor, Williams, Azapagic, Stevens*)

Evaluating Alternative Life-Cycle Strategies for Electrical Appliances by Waste Input-Output Model (*Nakamura, Kondo*)

The Economics of Downcycling (*Pelletiere*)

### Industrial Symbiosis I

Chair: M. Chertow      Room: Rotonde

Building Partnerships for Sustainable Development  
(*Barnes*)

Sustainability in an Eco-Industrial Park (*Powell*)

Building a New Ecopark in Santa Perpetua de Mogoda (Catalonia) (*Durany, Huguet*)

### Modeling

Chair: A. Grimvall      Room: B37

Substance Flow Normalisation (*Grimvall, Löfving*)

MFA Modelling (*Huele, van der Voet, Kleijn*)

Infrastructure Ecology (*Dijkema, Ehrenfeld, Verhoef, Reuter*)

### Corporate Integration in Practice

Chair: B. Pfahl      Room: B33

“Resource Management” Contracting (*Ligon, Votta*)

Environmental-Economic Supply Chain Management of Suppliers, Contract Manufacturers and Recyclers: The Big Challenge of an Original Equipment Manufacturer  
(*Nagel*)

STABIS: An Integrated Environmental Management Tool  
(*Posch*)

Case Study: “Green” Construction and Environmental Management System Implementation at a Small Parts Manufacturing Facility Using the Concepts of Industrial Ecology (*Russell, Peters*)

## 1215-1330 Lunch

*Students will meet over lunch - 1215*

# Tuesday, 13 November 2001

## 1330–1500 Technical Program III

### Indicators

Chair: *To be announced* Room: Rotonde

Sustainability Spaces: A New Concept to Evaluate Development Using Indicator Systems (*Binder, Wiek, Fenchel*)

Indicators for Eco-efficiency in Recycling Systems (*Eik, Brattebo, Saugen, Solem, Steinmo*)

Challenges in Making and Using Social Indicators for Sustainable Development (*Hagen*)

### General Policy Issues

Chair: R. Jain Room: Foyer

“Transition Management” in the Netherlands (*Hekkert, Smits, van Lente*)

Transition Management (*Loorbach, Rotmans*)

Long-term Energy Efficiency Agreements Between Dutch Industry and Government (*van Dril, van der Palen*)

### Life Cycle Assessment Cases

Chair: J. Ertel Room: B37

The Ecological Footprint of a Mobile Phone (*Frey, Harrison, Billett*)

Greening of the Ivory Tower (*Gloria, Norris*)

Hydrogen Production and Fuel Cell Cars: A Life-cycle Assessment (*Hertwich, Stromman*)

### Sustainable Cities/Tourism

Chair: G. Keoleian Room: B29

Integrated Urban Planning and Estimation System for Recycle Oriented Sustainable City (*Fujita, Morioka*)

Tourism and Environmental Impacts: A Look at Sustainability (*Ng, Bergman, Graham-Brown, Farber, Horvath*)

Urban Energy Metabolism: Framework and Case Study (*Melaina, Keoleian*)

### Education

Chair: S. Lemkowitz Room: B31

Practical Experience in Teaching Industrial Ecology to International Students at a European Technological University (*Lemkowitz, Lameris, Korevaar*)

Industrial Ecology Curriculum at NTNU: An Interdisciplinary Approach (*Keitsch*)

Environmental Issues in Manufacturing for Engineers: An Interdisciplinary Course at Northeastern University (*Isaacs*)

Education: Industrial Ecology Through the Lens of Product Design (*Thorpe*)

### Material Flow Analysis in National Economies II

Chair: C. Amann Room: B33

Methodological Experiences from Advising the Generation of National Material Flow Analysis' in Developing Countries (*Amann*)

Testing the Kuznets Environmental Curve in the Input of Materials in Economy (*Ferrão, Conceição, Canas*)

Analyzing Material Flows: A Necessary Condition Towards Sustainable Development in Taiwan (*Hsiao, Hwa Yu, Wernick*)

Measuring Sustainability Through Materials Flow Analysis of Industrial Systems in Antarctica (*Klee*)

**1500–1530 Break**

# Tuesday, 13 November 2001

## 1530–1700

## Technical Program IV

### Industrial Ecology: The Metaphor

Chair: J. Korhonen Room: Foyer

Industrial Ecology's Hidden Philosophy of Nature: Fundamental Underpinning to Use Nature as Model (*Isenmann*)

Industrial Ecology: A Paradigmatic and Practical Source for Sustainability (*Korhonen*)

Production Systems in Industry and Ecology: Some Comparisons Relevant to Industrial Ecology (*Levine*)

Industrial Ecology: The Biosphere-Technosphere Analogy (*van der Voet, Huele, Stevers*)

### Structural Change and Economics

Chair: J. van den Bergh and M. Janssen  
Room: B33

Exergy and Work: Accounting for the Solow Residual (*Ayres*)

An Approach to Dynamic Environmental Life-cycle Assessment by Evaluating Structural Economic Sequences (*Gloria*)

Assessing the Dynamics of Industrial Ecosystems (*Ruth*)

Structural Decomposition of the Iron, Steel and Plastic Flows in the Dutch Economy, 1990-1997 (*Hoekstra, van den Bergh*)

### Closing the Loop: Soft Barriers

Chair: D. Pelletiere Room: B31

Industrial Symbiosis: No Time to Waste (*Aragao*)

Overcoming Opposition to Using Recycled Materials: Industrial Ecology in Manchester (*Douglas, Lawson*)

Policy Design for Material Recovery Systems: A Case Study of Policy and Technology Based Obstacles for Eco-efficiency in the Recycling System of Plastic Packaging from Households in Trondheim, Norway (*Opoku, Eik*)

Unique Non-Profit Assists Auto Recycler with Environmental Compliance (*Scannell*)

### Material Flow Analysis in National Economies III

Chair: V. Palm Room: B37

Multi-Stakeholder Decision Support in Long-Term Construction Material Chain Management (*Mueller*)

Biological Metabolism and the Material Flow Balances of the Food Flux (*Mäenpää, Risku-Norja, Koikkalainen, Rikkonen, Vanhala*)

Creating National Physical Material Flow Accounts (*Rogich*)

Material Inputs in the Portuguese Economy: The DMI Approach (*Ferrão, Conceição, Canas*)

### Policy Cases in Industrial Ecology

Chair: C. Ryan Room: B29

Free Riding in Voluntary Programs: The Case of the USEPA WasteWise Program (*Delmas, Keller*)

Renewables as Chemical Feedstocks: An Assessment Prepared Under the European Climate Change Programme (*Patel, Bastioli, Doutlik, Ehrenberg, Johansson, Kåb, Klumpers*)

Techno-economic Life Cycle Modeling (*Gielen, Moriguchi*)

Ecodesign in the EU: Can We Hope for Factor X? (*Tukker*)

### Eco-Design I

Chair: W. Knight Room: Rotonde

Models and Tools for End-of-Life Product Management (*Sodhi, Knight*)

Methodology for the Design of Sustainable Chemical Processes (*Korevaar, Harmsen, Lemkowitz*)

Industrial Ecology and Green Chemistry (*Lankey, Anastas*)

Life-Cycle Assessment of Toner Particles (*Ahmadi, Williamson, Theis, Powers*)



# Tuesday, 13 November 2001

## **1800 Conference Dinner**

*Please meet the shuttle buses no later than 1800*

We will host the conference dinner in the miniature city Madurodam. Attractions there include the canal houses of Amsterdam, the Alkmaar cheesemarket, and parts of the Delta Works, all replicated in minute detail on a 1:25 scale. According to the Madurodam website, "windmills turn, ships sail and modern trains are traversing the city on the world's largest miniature railway."

# Wednesday, 14 November 2001

Members of the newsletter board will meet over breakfast - 0800

## 0900-1030 Technical Program U

### Social Framework for Industrial Ecology III

Chair: F. Berkhout

Room: B33

Solving New Environmental Problems by Going Beyond Regulation and Response (*Andrews*)

Stakeholder Involvement in Life-Cycle Assessment (*Anex*)

Individuals, Social Groups, and Institutions: An Examination of the Locus of Decision Making with Major Impact on the Environment (*Duchin*)

Implementing Industrial Ecology—A Policy Science Exercise? (*Tukker*)

### Regional Material Flow Analysis

Chair: J. Isaacs

Room: Rotonde

On MFA and Policy Making, or What if Data Uncertainties Were Considered? (*Burström, Danius*)

Linking Energy, Material and Economic Flows on the Local and Regional Level: First Steps Towards a Material Flow Economy (*Fritsche*)

A System to Optimize Regional Material and Energy Flow for Designing Recycling Society (*Goto, Fujie, Usui*)

Improved Environmental Performance by Means of System Innovation and Networking: Case of a Regional Energy Supply System (*Hämäläinen, Siikavirta*)

### Industrial Symbiosis II

Chair: M. Chertow

Room: Foyer

Fulfilling Taiwan's Aspiration of Becoming the "Green Silicon Island" through Industrial Ecology (*Hu, Chong*)

Construction of Cycle-Oriented Industrial Complex Systems: Strategies for Planning and Estimation (*Morioka, Yoshida, Fujimura*)

Industrial Symbiosis as Economic Development (*Chertow*)

Evaluation and Monitoring of Ecoefficiency in Ecoparks: A Case Study from the Ora Ecopark in Norway (*Thoresen*)

### Eco-Design II

Chair: W. Knight

Room: B37

The GQFD as a Methodology of Environmentally-conscious Manufacturing (*Raggi, Petti, Mercuri*)

Advances in Design for Environment at Motorola: 5 years of Lessons Learned (*Mueller, Riess, Stutz, Schnecke, Pongratz, Hoffman, Nicolaescu, Scheifers, Pfahl*)

Talk to be announced

### Corporate Integration - ICT

Chair: H.S. Matthews

Room: B31

Economic and Environmental Implications of On-line Retailing in the United States (*Matthews, Hendrickson*)

The Environmental Benefits and Costs of Telework (*Kitou, Horvath, Masanet*)

Will Industrial Ecology Give Way to Service Ecology?: A Critical Review of Ideas and Research on "sustainable (product) Service Systems" (*Mont, Ryan*)

Software Renting: A Platform for Sustainable IT Sector (*Plepys*)

### Substance Flow Analysis Cases

Chair: B. Karn

Room: B29

Toxic Accumulation in Efficient Recycling: Societal Cadmium Dynamics and Recycling of Phosphorus (*Fredrikson, Karlsson, Holmberg*)

Grand Technological Nutrient Cycles: A Survey and Status Report (*Graedel, Klee*)

The Contemporary European Copper Cycle: One Year Stocks and Flows (*Spatari, Graedel, Bertram, Rechberger*)

Sustainable Metals Flow Management: First Steps in the Region of Hamburg (*von Gleich*)

## 1030-1100 Break

# Wednesday, 14 November 2001

## 1100-1300 Closing Plenary Session

Room: Rotonde

### Issues in Academics

Moderators: Helge Brattebo and John Holmberg

Presentations: Formal Education in Industrial Ecology (*Brattebo*)

Utrecht University's New Educational Program on Natural Sciences and Innovation Management (*Hekkert*)

Professional Identity and Interdisciplinarity at the Industrial Ecology Programme at NTNU (*Hermundsgard, Larssaether, Mathiassen*)

Sustain This?: Environmental Management Program at the Stuart School of Business (*Nassos, Kusz*)

Following the short presentations will be a panel featuring students, teachers and professionals from industry and government. This panel will focus on the following issues:

What competence does industry/government look for, and what are the employment opportunities?

Designing a curricular strategy - disciplinary depth or interdisciplinary broadness?

How do we support a good learning process - literature, industrial cases, practical exercises, teamwork?

**Conference Closing** John Ehrenfeld