

## ANNUAL REPORT 2008

### Indicator Framework for Eco-Efficiency (IFEE) – Consortium

#### RESEARCHERS OF THE CONSORTIUM

**Partner 1:** *Åbo Akademi University (ÅA)*, Coordinator of the consortium:

Jouni Korhonen, Academy Fellow

Olavi Holmijoki, Researcher, PhD student

Jukka Hoffrén, Head of Research (site of work, Statistics Finland, STATFIN)

Eeva-Lotta Apajalahti, Researcher

**Partner 2:** *Turku School of Economics and Business Administration, Finland Futures Research Centre (FFRC):*

Jarmo Vehmas, Senior Researcher

Jyrki Luukkanen, Professor

Jari Kaivo-oja, Research Director, Doctoral Researcher (Academy of Finland)

Marileena Koskela, PhD student

**Partner 3:** *Technical Research Centre of Finland (VTT)*

Ilkka Savolainen, Research Professor

Johanna Kirkinen, Ph.D student

**Partner 4:** *University of Helsinki (HU)*

Pekka Kauppi, Professor

Laura Saikku, Ph.D student

Aapo Rautiainen, Research Assistant

#### UPDATED SYNOPSIS OF THE PROJECT

Many metrics and indicators exist to evaluate eco-efficiency (EE) of products, processes, organisations, or of larger systems. EE is defined as *units of value generation per unit of environmental influence*. EE applications that are not strategic and lead to problem shifting have been recently observed. We use the strategic sustainable development model (SSD) constructed in consensus by ten pioneering sustainability scientists. The aim of SSD is to prevent problem shifting and problem displacement when different sustainability concepts and approaches are used. *The objective is to develop an indicator framework for eco-efficiency*. Six hypotheses on the limitations of EE are considered in an explorative conceptual analysis of EE against SSD. Different EE indicators are studied to learn how they can be used in the evaluation of the six hypotheses. We apply the results in ‘what if?’ scenarios with case study data from VTT Finland, Statistics Finland, Finland Futures Research Centre, mainly from the forest industry of Finland. In case of each hypothesis, the results are transformed into criteria producing the indicator framework. The framework enables parallel and complementary use of different indicators to study where and how EE can be applied and where it cannot be applied.

#### PUBLICATIONS AND PRESENTATIONS

**Articles published and accepted in peer-reviewed international scientific journals**

Korhonen, J. 2008. Reconsidering the economics logic of ecological modernization. *Environment and Planning A*, Vol. 40: 1331-1346.

Korhonen, J. and Seager T. 2008. Beyond eco-efficiency: A resilience perspective. *Business Strategy and the Environment*. Volume 17 Issue 7. pp. 411- 419.

Hoffrén, J. and E. Apajalahti (2008), Emergent eco-efficiency paradigm in corporate environmental management. *Sustainable Development*. Published online 19 Nov 2008.

Kirkinen, J., Palosuo, T., Holmgren, K., Savolainen, I. Greenhouse Impact Due to the Use of Combustible Fuels: Life Cycle Viewpoint and Relative Radiative Forcing Commitment. *Environmental Management* (2008) 42:458–469

- Saikku, L., Rautiainen, A. & Kauppi, P. 2008. The sustainability challenge of meeting carbon dioxide targets in Europe by 2020. *Energy Policy* 36 (2), 730-742.
- Saikku, L. & Soimakallio, S. 2008. Top-down approaches for sharing GHG emission reductions - Uncertainties and sensitivities in the 27 European Union Member States. *Environmental Science & Policy* 11 (8), 723-734.

### **Manuscripts submitted to peer-reviewed international scientific journals**

- Hoffrén, J. and E. Apajalahti (2008), Development of Eco-efficiency in Finnish Metals Production. Submitted to *Progress in Industrial Ecology* in August 2008.
- Kirkinen, J., Sahay, A. & Savolainen, I. Greenhouse Impact of Fossil, Forest Residues and Jatropa diesel: A Static and Dynamic Assessment. Submitted to *Progress in Industrial Ecology*.
- Kirkinen, J., Soimakallio, S., Mäkinen, T. & Savolainen, I. Greenhouse impact assessment of peat-based Fischer-Tropsch diesel life cycle. Submitted to *Energy Policy*.
- Saikku, L. & Asmala, E. Eutrophication in the Baltic Sea: The role of fish consumption and international trade. Submitted to *Environmental Science & Policy* in November 2008.
- Peters, G., Marland, G., Hertwich, E., Saikku, L., Rautiainen, A. & Kauppi, P.E. 2008. Trade, Transport, and Sinks Extend the Carbon Dioxide Responsibility of Countries. Submitted to *Climatic Change* in August 2008.
- Pekka E. Kauppi, Aapo Rautiainen, Kari T. Korhonen, Alekski Lehtonen, Jari Liski, Pekka Nöjd, Sakari Tuominen, Markus Haakana, Tarmo Virtanen. 2008. Changing stock of biomass carbon in a boreal forest during 93 years. Submitted to *Forest Ecology and Management* in December 2008.

### **Edited international journals applying the referee-practice**

- Korhonen, J. Editor in Chief, *Progress in Industrial Ecology - An International Journal*. 6 issues in 2008.
- Korhonen, J. and Seager, T. (Guest Editors). 2008. Special issue 'Strategic Sustainability Management'. *Business Strategy and the Environment*. Volume 17 Issue 7 (November 2008). Wiley InterScience.

### **Other publications**

- Apajalahti, E. (2008), Metallien jalostuksen ekotehokkuus Suomessa 2000-2006. [Eco-efficiency of Finnish metals production 2000-2006] Pro gradu tutkielma. Vaasan yliopisto. Kansantaloustieteen laitos. Vaasa. (Note that the thesis was awarded with grade laudatur).
- Asmala, E. 2008. Kiertoa sulkemassa: Typen ja fosforin virrat Suomen merialueiden kalankasvatuksessa. [Closing the loop: flows of nitrogen and phosphorus in the Finnish marine aquaculture]. Ympäristönsuojelutieteen Pro Gradu -työ. Bio- ja Ympäristötieteiden laitos, Helsingin Yliopisto.

### **Conference presentations**

- Hoffrén, J. (2008), Ekotehokkuus materiaalivirtojen hallinnan työkaluna. Suomen Teollisen Ekologian Seuran seminaari "Materiaalivirrat ja ilmastomuutos", Geologian Tutkimuskeskus, Espoo (Otaniemi), 28.-29.4.2008.
- Koskela, M. 2008. Corporate environmental management and corporate social responsibility in forest industry: A review of literature. Paper presented in *Seventh Annual Colloquium of the European Academy of Business in Society* "Corporate Responsibility and Sustainability: Leadership and Organisational Change", Cranfield, 10-12 September 2008. 18 pp.
- Koskela, M. 2008. Eco-efficiency measurement in forest industry: Description of the research project. Paper presented in *EABIS PhD Conference*, Ashridge, 13th September 2008. 11 pp.
- Vehmas, J. & Luukkanen, J. & Mustonen, S. & Kaivo-oja, J. & Snäkin, J.-P. & Jusi, S. 2008. Changing Energy Production Structures and CO2 Emissions in the ASEAN Countries: Decomposition Analysis of Drivers Behind the Changes. Proceedings of *International Conference on Energy Security and Climate Change: Issues, Strategies, and Options*, Bangkok 6-8 August 2008. CD-ROM. Also available at <http://www.serda.ait.ac.th/eric>.
- Kirkinen, J. "Greenhouse Impact of Fossil, Forest Residues and Jatropa Diesel: A Static and Dynamic Assessment". *The 14th Annual International Sustainable Development Research Conference*, New Delhi, India, 21-23 September 2008. Also co-chair in Track 10: Biofuels for climate change mitigation.

Kirkinen, J. "Greenhouse impact of the use of peatland for energy – scenarios considering peatland utilisation and after-treatment". *The 13<sup>th</sup> International Peat Congress*, Tullamore, Ireland, 8-13 June 2008.

## **OTHER ACTIVITIES**

### **Organised International Scientific Conferences**

The ÅA team was the responsible organizer of *The 14<sup>th</sup> Annual International Sustainable Development Research Conference*, India Habitat Center, New Delhi, India, September 21-23, 2008.<sup>1</sup> The Delhi Conference attracted altogether over 300 participants. Jouni Korhonen was the Chairman of the conference and Kaisa Pihlatie was the Manager of the Board of the conference.

The Consortium is also one of the main partners of the *International Sustainable Development Research Society (ISDRS)*<sup>2</sup>. The leader of the Consortium, Dr. Korhonen, is the President of the society. The consortium worked intensively for the Society's *14<sup>th</sup> Annual International Sustainable Development Research Conference*, New Delhi, India, September 21-23, 2008.

### **Organised Domestic Scientific Conferences**

The leader of the consortium, Dr. Korhonen, runs the *Finnish Society for Industrial Ecology* as its chair, Ms. Pihlatie at the Åbo Akademi group is the secretary. The ÅA team arranged the annual conference of the *Finnish Society for Industrial Ecology*<sup>3</sup> together with the Geological Survey of Finland. The conference was held on April 28-29, 2008 at Geological Survey of Finland in Otaniemi, Espoo. The theme of the conference was 'Material Flows and Climate Change' and the program included keynotes e.g. from Prof. Frank Figge and Prof. Stefan Bringezu and a professor panel discussion about current challenges in energy and climate change issues. The conference had some 160 participants.

### **Research visits**

PhD Student Johanna Kirkinen (VTI partner) was eight months (from 1.10.2007 to 31.5.2008) on a research visit at Management Development Institute (MDI) in India, New Delhi doing research for her doctoral thesis as well as performing PhD courses for her doctoral degree.

### **Editorial activities (peer-reviewed international scientific journals)**

Dr. Korhonen is the Editor-in-Chief of *Progress in Industrial Ecology* (Inderscience Publishers), the Associate Editor of *Journal of Cleaner Production* (Elsevier Science) and a member of the editorial board of *Business Strategy and the Environment*, *Sustainable Development*, *Corporate Social Responsibility and Environmental Management* and the *International Journal of Innovation and Sustainable Development*.

Dr. Hoffrén is a member of the editorial board of *Progress in Industrial Ecology* (Inderscience Publishers).

Professor Savolainen is the Assistant Editor of *Progress in Industrial Ecology*. Dr. Hoffrén, Dr. Vehmas and Dr. Luukkanen are members of the editorial board of *Progress in Industrial Ecology*. Professor Kauppi is a member of the editorial board of *Environmental Science and Policy* (Elsevier Science).

Johanna Kirkinen has been a guest editor for the forthcoming special issue on "Biofuels for climate change mitigation" in *Progress in Industrial Ecology*.

### **Referee activities (peer-reviewed international scientific journals)**

Dr. Korhonen has reviewed about 50 scientific articles to *Progress in Industrial Ecology* (Editor-in-Chief), *Journal of Cleaner Production* (Associate Editor), *Business Strategy and the Environment*, *Sustainable Development*, *Corporate Social Responsibility and Environmental Management* and the *International Journal of Innovation and Sustainable Development* (Member of the editorial board).

---

<sup>1</sup> Delhi Conference website and conference program: <http://www.14aisdrc2008.com/>

<sup>2</sup> ISDRS website: <http://www.isdrs.org>

<sup>3</sup> Finnish Society for Industrial Ecology website: <http://www.teollinenekologia.fi>. The conference program can be found from [http://www.teollinenekologia.fi/documents/TE-GTK\\_seminaari\\_ohjelma\\_final\\_000.pdf](http://www.teollinenekologia.fi/documents/TE-GTK_seminaari_ohjelma_final_000.pdf)

Dr. Vehmas has reviewed two articles to Energy Policy and one article to Journal of Cleaner Production in relation to eco-efficiency.

Prof. Kauppi has reviewed 3-4 articles in 2008.

### **PROGRESS MADE IN RELATION TO THE PROJECT PLAN**

The IFEE consortium has continued its critical scientific research addressing the concept and approaches of eco-efficiency. EE has evolved as a strong public policy philosophy and business management model. The consortium partners, having their individual budgets, have mainly worked on their own. The partners have also collaborated in a) publications, b) joint conferences and c) new research funding applications. In 2008, the IFEE consortium has enjoyed the 8 month research visit of the VTT research scientist Ms. Johanna Kirkinen (ÅA Ph.D student) to Management Development Institute, Gurgaon, India. This collaboration with the India partner has yielded visible and documented results (see the list of publications).

At the Geological Survey Centre (GTK), the Industrial Ecology Society of Finland ([www.teollinenekologia.fi](http://www.teollinenekologia.fi)) organized a conference in the spring of 2008. We had a special professor panel to give the letter from the President Tarja Halonen to Dr. Antero Honkasalo of the Ministry of Environment for a title of a 'professor'. All IFEE consortium partners participated into this event. Central professors in Finland in sustainable development research attended the event. We had over 160 participants in the event.

After two years, IFEE has achieved publications in international scientific peer-reviewed journals. We list these publications in the mid-report of IFEE to the Academy of Finland. In sum, we believe, we have achieved what we have wanted to achieve with the first two years. Now, I do believe, we must try our very best to contribute, e.g., a joint publication presenting a) the theoretical challenges of eco-efficiency, b) an overview of the practical case studies that show some of the many controversies in analysis, planning and management and c) some new applications of eco-efficiency that can help to solve these issues.

The IFEE team is leading international scientific platforms, peer-reviewed journals and conferences etc. We should try and utilize this potential visibility and accessibility to peer-review (which almost always improves one's work!). One possibility is to shoot for a special issue of a journal with a special conference track supporting that.

At Turku School of Economics, Finland Futures Research Centre, PhD student, M.Sc. (Eng.) Marileena Koskela has proceeded in the preparation of her PhD thesis following her research plan under supervision of Dr. Jarmo Vehmas and Tampere University of Technology. Her PhD thesis focuses on eco-efficiency and corporate social responsibility in forest industry. She has written manuscripts for articles to be included in the PhD thesis and given related presentations in two international conferences in 2008.

Turku, January 15, 2008

Jouni Korhonen