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《产业生态学报》

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题目：水泥产业在产业生态系统中的分解者角色与危险物质的管理

作者：Lucas Reijnders

关键字：生物学类比，强行提取，危险物料，产业生态学，回收，选择性提取

摘要：水泥工业利用了多种二次再生原料，在产业生态系统中的扮演着分解者的角色。废物的再利用有助于降低生产成本，减少危险有害物的直接排放，但也带来了一些副作用：如水泥制品的加工使用等生命周期过程中会有重金属元素逐渐释放出来。通过选择性的过滤汞金属，减少水泥生产二次原料中的危险物含量，可大大缓解上述问题。自然生态与产业生态系统都有对危险物的进行选择性提取与隔离的功能，文章对二者作了比较。

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The Cement Industry as a Scavenger in Industrial Ecology and the Management of Hazardous Substances

Lucas Reijnders

KEYWORDS:
biological analogy, forced extraction, hazardous materials, industrial ecology, recycling, selective capture

SUMMARY:
The cement industry uses a variety of secondary materials and fuels, thus fulfilling the role of "scavenger" in industrial ecology (IE). The use of wastes in cement production has been advocated to reduce cement production costs and the degradation and immobilization of hazardous compounds. In dealing with hazardous elements contained in the wastes, this development has side effects such as relatively significant stack emissions of heavy metals and leaching of hazardous compounds during the life cycle of cement-derived products. Emissions and leaching potential may be substantially lowered by reducing levels of hazardous elements in wastes before they are included in cement production and by selectively capturing mercury from stack gases. An analogy to metabolic functions of selective update, sequestration, and selective excretion is presented.

《产业生态学报》

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题目：挪威建筑废物预测

作者：Håvard Bergsdal, Rolf André Bohne, Helge Brattebø

关键字：房屋，营造，拆除，翻修，废物组成，废物预测

摘要：挪威目前建筑行业(包括营造与拆除，即 C&D)的垃圾年产量约为 125 万吨。本文在研究各项建筑活动、分析废物产生指标的基础上，对挪威未来建筑垃圾的产量与处理量作了预测。研究主要基于建筑物与建材的存量与流量模型，并对模型输入参数作了蒙特卡略模拟，以增强结果的可信度。分析表明未来几年的建筑垃圾，尤其是混凝土、砖块及废木材的生成量可能大增。以上预测有助于确定主要建筑废物的类型，建立相应的处理能力，并应付可能的挑战。本文的研究方法同样用于另一篇讨论建筑废物系统的生态效率的论文。

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Projection of Construction and Demolition Waste in Norway

Håvard Bergsdal, Rolf André Bohne, and Helge Brattebø

KEYWORDS:
buildings, construction, demolition, renovation, waste composition, waste projection

SUMMARY:
Current waste generation from the construction and demolition industry (C&D industry) in Norway is about 1.25 million tonnes per year. This article presents a procedure for projection of future waste amounts by estimating the activity level in the C&D industry, determining specific waste generation factors related to this activity, and finally calculating projections on flows of waste materials leaving the stocks in use and moving into the waste management system. This is done through a simple model of stocks and flows of buildings and materials. Monte Carlo simulation is used in the calculations to account for uncertainties related to the input parameters in order to make the results more robust. The results show a significant increase in C&D waste for the years to come, especially for the large fractions of concrete/bricks and wood. These projections can be a valuable source of information to predict the future need for waste treatment capacity, the dominant waste fractions, and the challenges in future waste handling systems. The proposed method is used in an accompanying article for eco-efficiency modeling within an evaluation of a C&D waste system.

《产业生态学报》

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题目：传统与可持续投资基金的环境影响的投入产出生命周期评价

作者：Thomas Koellner, Sangwon Suh, Olaf Weber, Corinne Moser, Roland W. Scholz

关键字：生态表现，环境投资，股权基金，影响评价，产业生态学，社会责任投资(SRI)

摘要：本文比较了可持续股权投资基金与传统投资基金之间的环境影响差异。因为可持续基金与传统基金采取了相同的风险规避标准，二者的投资证券组合与投资产业分布具有很大的相似性，这导致二者的环境影响差别不大。文章根据摩根士丹利全球投资指数(MSCI World)，对企业环境的表现进行了模拟与投入产出生命周期评价(IO-LCA)，计算了 13 种可持续投资基金与 13 种传统投资基金的基于风险调整收益的单位业绩的环境影响。不同基金的经济与环境指标大体类似。结果显示 2000 至 2004 年之间可持续投资基金的环境表现较好，经济业绩则稍差；但在 2004 年，可持续基金的经济业绩同样优于传统基金。总体而言，可持续投资基金的环境影响要略小于传统基金。

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Comparing the Environmental Impacts of Conventional and Sustainable Investment Funds Using Input–Output Life-Cycle Assessment

Thomas Koellner, Sangwon Suh, Olaf Weber, Corinne Moser, and Roland W. Scholz

KEYWORDS:
ecological performance, environmental investment, equity funds, impact assessment, industrial ecology, socially responsible investments (SRI)

SUMMARY:
This study compares equity funds that are managed according to sustainability goals with conventionally managed funds with respect to their environmental impacts. Overlap in the portfolios of sustainable equity funds and conventional equity funds can be very large. Further, the sector allocation of both types of funds is generally very similar, because portfolio managers follow a chosen benchmark to minimize risk. These two effects may result in no difference existing between the two types of funds in terms of their environmental impact and damage (null hypothesis of this research). This study comparatively assesses the environmental impact of portfolios of 26 investment funds: 13 sustainable investment funds and 13 conventional funds, which are managed according to the benchmark MSCI World. The study applies input–output lifecycle assessment (IO-LCA) in combination with a simulation of company-specific environmental performance. The environmental impact is evaluated per functional unit for each fund, which is the risk-adjusted financial performance. The statistical analysis showed that the analyzed sustainable investment funds performed better with respect to environmental impact assessment but worse in economic risk-adjusted performance (RAP) over the period 2000-2004. In 2004, however, the RAP of the selected sustainable investment funds showed better performance. Both samples considerably overlap for the environmental and economic parameter. The results suggest that the environmental impact of sustainable investment funds in the sample is slightly less than that of conventional funds.

《产业生态学报》
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题目：美国有意使用的汞物流分析

作者：Alexis Cain, Sarah Disch, Cliff Twaroski, John Reindl, C. Randy Case

关键字：牙科银汞合金，重金属，产业生态学，集成产品政策(IPP)，物料流分析(MFA)

摘要：含汞产品生命周期的各个时刻都可能有汞流失。这一流量往往难以测量并导致了很多的不确定问题：如何种产品在何种情况下的汞排量最大？相应的环境损害怎样？以上因素对规范产品中的汞含量、改进含汞废物的管理方式有何影响等等。本文通过物质流分析法对含汞产品的汞流失量做了更为精确的估算，有助于制定相应的环境政策。

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Substance Flow Analysis of Mercury Intentionally Used in Products in the United States

Alexis Cain, Sarah Disch, Cliff Twaroski, John Reindl, and C. Randy Case

KEYWORDS:
dental amalgam, heavy metals, industrial ecology, integrated product policy (IPP), materials flow analysis (MFA)

SUMMARY:
Mercury-containing products release mercury (Hg) throughout their lifecycles, frequently in ways that are difficult to measure directly. Therefore, there are considerable uncertainties about the magnitude of mercury releases associated with products, about which products and which release pathways contribute the most to mercury releases, and about the likely impact on mercury releases of various possible interventions in the mercury content of products or in the management of mercury-containing wastes. This article presents an effort to use substance flow analysis to develop improved estimates of the environmental releases caused by mercury-containing products and to provide policy-makers with a better understanding of opportunities for reducing releases of mercury caused by products.

《产业生态学报》
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题目：传统与电子商务模式下 DVD 租赁的能耗、环境与经济成本分析

作者：Deepak Sivaraman, Sergio Pacca, Kimberly Mueller, Jessica Lin

关键字：消费，娱乐，温室气体(GHG)，产业生态学，生命周期分析(LCA)，可持续消费

摘要：本文运用生命周期方法(LCA) 评价了两种 DVD 的租赁模式的环境影响：其一为电子商务模式，顾客通过互联网在线选择所需的影像；其二为传统模式，顾客亲自前往租赁商店租借 DVD 影片。研究以居住在美国密歇根州安娜堡市的顾客为例，制定了多种 LCA 评价指标(如能耗及包括空气污染及温室气体在内的环境影响等)。已有研究多认为 DVD 租赁的环境影响与交通方式密切相关，本研究则有不同的发现——运输 DVD 碟片时所采取的包装方式决定着最终的环境影响。与传统模式相比，电子商务模式的能耗低 33%，二氧化碳排放低 40%。二者之间能耗差异的 67%来自传统租赁业的包装。文章还对交通距离、交通模式、DVD 欣赏频率及 DVD 包装的再利用程度等因素做了灵敏度分析。传统模式下顾客往返租赁点的交通方式对能耗及全球污染也有很大的影响。如顾客徒步前往租赁点，一次能耗可最多降低 12%。但不论采取何种交通方式，传统模式的环境表现都不及电子商务模式。本文通过 ESAL 这一指标对不同交通方式对道路带来的压力作了经济上的估算，并最后比较了包括经济(ESAL)、能耗及货币化环境成本在内的两种租赁模式的总成本。电子商务租赁方式在节能与环保方面具有很大的优势，以每次租赁 3 片 DVD 为例，其总成本要比传统模式少 1.17 美元。

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Comparative Energy, Environmental, and Economic Analysis of Traditional and E-Commerce DVD Rental Networks

Deepak Sivaraman, Sergio Pacca, Kimberly Mueller, and Jessica Lin

KEYWORDS:
consumption, entertainment, greenhouse gas (GHG), industrial ecology, life-cycle assessment (LCA), sustainable consumption

SUMMARY:
This study is a comparative life-cycle assessment (LCA) of two competing digital video disc (DVD) rental networks: the e-commerce option, where the customer orders the movies online, and the traditional business option, where the customer personally goes to the rental store to rent a movie. The analytical framework proposed is applied to an example considering a customer living in the city of Ann Arbor, Michigan in the United States. The primary energy and environmental performance (criteria air pollutants and greenhouse gas emissions) for both the rental networks are presented in the form of a multicriterion LCA. In contrast to other studies presented, which found that impacts are highly sensitive to the transportation phase, differences in the performance of the two alternatives considered are due to the selection of the package used to deliver the DVDs. The package selected by the traditional business is responsible for 67% of the difference in total energy consumption of the two alternatives. Results from the case study show that the e-commerce alternative consumed 33% less energy and emitted 40% less CO_2 than the traditional option. A set of sensitivity analyses applied to the case study test the influence of distance traveled, transportation mode, and DVD and DVD packaging reuse on the final results. The mode of transportation used by the customer in the traditional business model also affects global emissions and energy consumption. A maximum of 12% reduction in primary energy is possible in the traditional network when the customer decides to walk to the store; however, the e-commerce option performed comparatively better despite all transportation modes tested. A novel economic indicator (ESAL) is used to compare different transportation modes based on the level of stress exerted on the pavement. The two networks are compared on the basis of cost accounting, calculated as the sum of ESAL, energy, monetized environmental impacts of CO_2 emissions and transportation. Consistent with its energy and environmental advantages, the e-commerce network exerts $1.17 less economic impact than the traditional network for the functional unit tested.

《产业生态学报》
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题目：政治之中见科学：“复合利用”与产业生态相结合的自然资源使用模式

作者：Olli Salmi, Aino Toppinen

关键字：生物学类比，边界对象，场域性，构架，比喻，俄罗斯

摘要：在产业生态学不长的历史上，人们注重于落实学科理念，对产业生态技术模式与社会进程的相互关联则关注不深；但实践中往往面对的是相对确定的产业生态模型与复杂多变的社会环境如何相结合的挑战——产业生态系统只有与具体的社会需求和社会环境有机联系起来才能产生真正的政治意义。为此，本文讨论了产业生态学与社会政治相结合的问题。俄罗斯科拉半岛的“复合利用”政策可视为产业生态学的一个政策工具。文章在此基础上建立了一个复合利用分析框架，分析了 1935 至 2005 年之间的五种复合利用模式，并与丹麦卡伦堡的六种产业共生模式作了比较。研究发现只有兼顾一般原理与实践环境，把一般模式下所考虑的效率、经济与环境问题落实到具体的实践中去，才有望实现产业生态模式与社会政治的成功结合。此外，在结合的过程中必须慎重处理具体产业生态模式的社会环境适应性问题。社会政治构架同样影响着产业技术模式的发展。

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Embedding Science in Politics: “Complex Utilization” and Industrial Ecology as Models of Natural Resource Use

Olli Salmi and Aino Toppinen

KEYWORDS:
biological analogy, boundary object, contextuality, framing, metaphor, Russia

SUMMARY:
Throughout the short history of industrial ecology, issues of implementation have been heavily emphasized. Less attention has been given to the ways in which the technical models of industrial ecology interact with social processes. Yet the practitioners of industrial ecology frequently encounter challenges pertaining to contextualization when embedding a general model in different local contexts. In addition, there are reasons to believe that the models of industrial ecological systems become politically meaningful only when they are carefully contextualized and linked to localized needs. In this article, we aim at a better understanding of the political embedding of industrial ecology. In order to demonstrate some general mechanisms of embedding, we first conduct a frame analysis of complex utilization—a scientific policy instrument analogous to industrial ecology, developed in the Kola Peninsula, Russia. We identify five frames in which complex utilization has been promoted between 1935 and 2005. These frames are then compared to six frames identified in the industrial symbiosis in Kalundborg, Denmark. We find that effective political embedding relies on frames that function both on a general level and in specific contexts. General frames, such as efficiency, economy, and environment, need to be aligned with localized perceptions of particular issues. What is more, sensitivity to purely context-specific frames is necessary for effective political embedding. Finally, the political processes of framing also shape the scientific-technical models that are being promoted.

《产业生态学报》
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题目：欧洲生产者长期责任制对企业战略、财政与产品设计的影响及相关案例研究

作者：C. Kieren Mayers

关键字：电池，电子废物，产业生态学，包装，回收，废电子电器(WEEE)

摘要：欧洲通过立法确立了生产者长期责任制(EPR)，要求生产企业承担废电池、废包装、报废汽车及其它电子废物的回收责任。目前 EPR 环境法规已在欧盟 29 国实行，生产商与废物管理企业联合建立了 250 多个生产者责任组织(PRO)，具体负责废弃产品的回收与处理。本文以索尼欧洲电子游戏公司(SCEE,主要销售 PlayStation 系列产品)为例，分析了 EPR 法规对企业经营发展的影响。

2005 年 SCEE 废弃产品回收的净成本为 40.1 万欧元，此外通过 PRO 服务节省了 40.8 万欧元。为遵守 EPR 相关法规，SCEE 等电子产品制造商需采取一系列新的行动，如汇报销售额，检查 PRO，统计回收成本，提供产品的环境标示等。案例研究发现，WEEE 指令对改进产品设计提供了一定的经济激励，但目前同样存在很多政策及实践上的障碍。在政策支持足够的前提下，生产商能够在遵守 WEEE 指令的同时做出面向生命周期终端的产品设计改进。

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Strategic, Financial, and Design Implications of Extended Producer Responsibility in Europe: A Producer Case Study

C. Kieren Mayers

KEYWORDS:
batteries, e-waste, industrial ecology, packaging, recycling, waste electrical and electronic equipment (WEEE)

SUMMARY:
Extended producer responsibility (EPR) legislation, making producers responsible for financing and organizing take-back and recycling of waste batteries and packaging, end-of-life vehicles (ELVs), and waste electrical and electronic equipment (WEEE), has or is currently in the process of being implemented across 29 different countries in Europe following introduction of a number of European Union directives. Producers and waste management companies have established more than 250 different Producer Responsibility Organizations (PROs) to organize the take-back, treatment, and recycling processes involved. This article reviews the potential impacts of EPR for waste batteries, packaging, and WEEE on producers distributing products in Europe through a case study of Sony Computer Entertainment Europe (SCEE)—responsible for marketing and distribution of PlayStation products—and by analyzing related developments.

SCEE's net take-back costs were €401,000 in 2005—with an additional estimated €408,000 avoided through competitive review of PRO services. Electronics producers such as SCEE must coordinate a range of new activities to ensure compliance with take-back legislation such as legal tracking, reporting of sales data, review of PROs, cost accounting, and provision of product information and labeling. Review of SCEE's case, and its industry situation, reveals a number of political and practical obstacles for any economic incentives for improved product design that the WEEE Directive is supposed to provide. It is concluded that producers, provided they are given adequate support by policy makers, still have opportunities to develop new processes under the WEEE Directive to allow them take advantage of products designed with end of life in mind.

《产业生态学报》
2007 年冬，第 11 卷第 3 期，133–146

题目：食品生产与消费的技术变化与环境影响：以英国酸奶产业为例

作者：Paul Dewick, Chris Foster, Ken Green

关键字：农业，乳制品，环境，产业生态学，创新，酸奶加工

摘要：本文研究了英国酸奶制品的生产与消费情况，对酸奶加工过程的技术变化与环境问题作了重点分析。20 世纪 50 年代以来，英国酸奶产业逐渐形成工业化大生产的格局，产品品种日益丰富。作者在访问产业相关人士的基础上，论述了这一历史过程，并分析了新技术、社会政治趋向及产业战略等因素对酸奶工业的影响。酸奶生产与消费过程的环境影响很大程度上取决于相关技术与技术变化。随着产品产量与品种的增加，未来如何从技术层面上改造酸奶生产与消费系统，从而减少其环境影响？文章就此展开了分析，指出在进行因应决策时不仅应着眼于生产过程，还应对酸奶生产与消费的各个环节有一个通盘的考虑，尤为重要的是提高酸奶加工过程的资源效率，减少废物排放。对酸奶生产与消费系统进行全面的更新将极大地改善过程的环境表现，但这需要酸奶产业乃至更为广泛的社会技术部门的不懈努力。

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Technological Change and the Environmental Impacts of Food Production and Consumption: The Case of the UK Yoghurt Industry

Paul Dewick, Chris Foster, and Ken Green

KEYWORDS:
agriculture, dairy, environment, industrial ecology, innovation, yoghurt processing

SUMMARY:
This article examines the changing food production and consumption system of yoghurt in the United Kingdom, focusing on the environmental impact of the yoghurt processing stage from a technological perspective. Based on interviews with key industry stakeholders, we describe the evolution of the yoghurt industry since the 1950s, characterized by a shift toward industrialized mass production and increased product diversity. We explain how new technologies, sociopolitical trends, and industrial strategies have shaped the evolution of the industry over this period. Moreover, we argue that the environmental impact of the current yoghurt production and consumption system has been determined to a large extent by technological change. The article explores the future of the yoghurt production and consumption system, considering the environmental implications of increased production of more differentiated yoghurt products and how technological change may mitigate some of those impacts. The analysis reveals that to appreciate the environmental impact of the yoghurt industry, policy makers should not focus simply on the primary stage of production but on all stages of the yoghurt production and consumption system. Minimizing waste and improving resource efficiency at the yoghurt processing stage are found to be particularly important. Transformation to an alternative yoghurt production and consumption system with substantially lower environmental impacts requires significant commitment to change across the industry and the wider sociotechnical landscape.

《产业生态学报》
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题目：武汉大学的产业生态学教育

作者：Wei Ning, Pengyu Chen, Feng Wu, Kristan Cockerill, Nansheng Deng

关键字：中国，循环经济，教学，环境工程，环境科学，产业生态学

摘要：中国需要借助产业生态学的理念协调日益尖锐的经济增长与环境污染和资源衰竭之间的矛盾；因此，必须注重产业生态学原理、方法与工具的教育推广。1997 年以来产业生态教学已在中国几所大学开花结果。其中，武汉大学于 1999 年正式推出了面向不同专业本科、硕士与博士生的产业生态课程，并于 1999 至 2004 年之间训练了五千以上的学生。尽管目前还存在师资不足、课本有限等困难，越来越多的学校已对产业生态学教育予以关注，不久的将来这一学科有望在中国迎来全面繁荣。

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Industrial Ecology Education at Wuhan University

Wei Ning, Pengyu Chen, Feng Wu, Kristan Cockerill, and Nansheng Deng

KEYWORDS:
China, circular economy, education, environmental engineering, environmental science, industrial ecology

SUMMARY:
China requires industrial ecology (IE) skills and knowledge to deal with the contradiction between rapid economic growth and subsequent environmental pollution and resource depletion. It is crucial for China to popularize IE theories, methods and tools. Industrial ecology education was introduced in China in 1997 and now a few Chinese universities offer IE courses. Wuhan University is one of them and since 1999 has committed itself to promoting IE education. The university offers different curricula for different majors at all levels: undergraduate, master's, and doctoral. Between 1999 and 2004 more than 5,000 students received IE education at Wuhan University. Although inadequate human resources and a lack of relevant textbooks present challenges to further developing IE education in China, as more universities pay attention to IE, more courses will be developed. It is believed that IE education in China will blossom in the near future.