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《产业生态学报》

1998年冬, 第2卷第2期, 13-22页

题目: 从产业生态学的角度考察人与环境的关系

作者: Matthius Ruth

关键字: 复杂性, 动态建模, 技术史, 社会经济学, 系统工程, 技术变革

摘要: 本文讨论了对新兴的产业生态学极其重要, 但是尚未引起重视的技术、产业和社会经济机构之间的关系。目前, 人们开始关注技术和社会经济机构之间复杂关系的演变过程, 从概念和决策过程中处理这种复杂性的方法, 以及在不同的组织系统层面上处理技术和政策选择的相互关系的方法。基于上述讨论, 本文提出了系统思想和建模、系统工程以及技术和产业政策在促进产业生态系统发展, 同时减小环境影响的新作用。

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Mensch and Mesh: Perspectives on Industrial Ecology

Matthius Ruth

Keywords:

complexity, dynamic modeling, history of technology, socioeconomics, systems engineering, technological change

Summary:

This article discusses several relationships between technologies, industries, and socioeconomic institutions that are central to the emerging field of industrial ecology but as of yet have found little recognition. Special attention is given to the history of changes in the complexity of technologies and socioeconomic institutions, methods for dealing with this complexity conceptually and in the context of decision making, and interrelationships between technology and policy choice at various levels of system organization. On the basis of that discussion, new roles for systems thinking and modeling, systems engineering, and technology and industrial policy are identified to promote the development of industrial ecosystems that minimize their environmental impacts.

《产业生态学报》

1998年冬, 第2卷第2期, 23-42页

题目: 印度废纸贸易与再循环的经济和环境影响: 物质平衡研究方法

作者: Pieter van Beukering, Anantha Duraiappah

关键字: 印度, 国际贸易, 非木质纤维, 纸浆和造纸工业, 再循环, 废纸

摘要: 随着各国都应处理好自身废物的观点不断流行, 政府和非政府组织对限制废物国际贸易的呼声越来越大。我们建立了一个部门流模型, 来研究非有毒废物的自由贸易能否在促进经济发展的同时减少环境污染。这是一个以环境和经济成本最小化为目标函数的非线性规划模型。该模型原则上涵盖了印度纸张的整个生命周期。初步研究结果显示印度废纸贸易对经济和环境都有利。研究结果还表明国产废纸和进口废纸是相互补充的, 废纸进口并不“排斥”印度国内废纸回收行业。这意味着当前日益增长的废纸国际贸易确实对印度纸张可持续循环作出了贡献。

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The Economic and Environmental Impact of Waste Paper Trade and Recycling in India: A Material Balance Approach

Pieter van Beukering and Anantha Duraiappah

Keywords:

India, international trade, nonwood fiber, pulp and paper industry, recycling, wastepaper

Summary:

There have been increasing pressures by governments and nongovernmental organizations to restrict international trade in waste in the conviction that each nation has to take care of its own waste. We develop a sectoral flow model to investigate if free trade in nontoxic waste can support economic development and simultaneously reduce environmental degradation. The model is formulated as a nonlinear programming model with an objective function that minimizes environmental and economic costs. The model in principle describes the life cycle of Indian paper. Preliminary results suggest that trade in wastepaper is both economically and environmentally advantageous. The results also show that domestic and imported wastepaper are complementary and that import of wastepaper does not "crowd out" the domestic waste paper sector. This implies that the current trend of increasing trade of wastepaper does contribute to a more sustainable paper cycle in India.

《产业生态学报》

1998年冬, 第2卷第2期, 43-62页

题目: 从材料流分析的角度来考察作为 CO₂ 源和汇的西欧材料

作者: Dolf J. Gielen

关键字: CO₂, 水泥, 林产品, 材料流分析(MFA), 石化产品, 钢铁

摘要: 因为利用自然资源生产材料的过程会向排放大量 CO₂, 而且产品和废物都是重要的 CO₂ 汇, 所以材料使用是影响 CO₂ 排放的一个重要因素。本文分析了西欧的材料使用对 CO₂ 排放的影响。本文对钢铁、水泥、石化产品和林产品的材料流进行了更详细的分析。分析表明, 制定温室气体减排战略必须考虑材料系统的特点。为减少跨界效应的影响, 选择象西欧这样相对封闭的系统来制定有关政策是很必要的。储存在产品中的材料, 以及材料、产品和废物的净出口都限制了实施再循环战略的前景。储存在产品和废物处置场的碳对人工合成和天然有机材料而言都很重要, 但是目前的温室气体排放统计并没有包含天然有机材料储存的碳。因此, 排放清单统计应当加以修正, 以反映这种材料的碳储存。

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Western European Materials as Sources and Sinks of CO₂: an MFA Perspective

Dolf J. Gielen

Keywords:

carbon dioxide, cement, forest products, materials flow analysis, petrochemicals, steel

Summary:

Materials use is an important factor influencing carbon dioxide (CO₂) emissions because significant amounts of carbon dioxide are released during the production of materials from natural resources, and because products and wastes can function as important sinks for CO₂. This article analyses the impact of Western European materials use on CO₂ emissions. The material flows for steel, cement, petrochemicals, and wood products are analyzed in more detail. The analysis shows that particular characteristics of the materials system must be considered in the development of emission reduction strategies. It is important to select a relatively closed system for policymaking, as in Western Europe, in order to prevent unwanted transboundary effects. The materials stored in the form of products, and the net exports of materials, products, and waste limit the potential of a recycling strategy. Carbon storage in products and waste disposal sites is significant both for synthetic and natural organic materials, but is not accounted for in natural organic materials in current emissions statistics. Accordingly, the emissions accounting practices should be modified to reflect the storage of such materials.

《产业生态学报》

1998 年冬, 第 2 卷第 2 期, 63-87 页

题目: 酸化生命周期评价的地点相关性

作者: Jose Potting, Wolfgang Schopp, Kornelis Blok, Michael Hauschild

关键字: 酸化系数, 实际影响, 关键负荷, 生命周期影响评价, RAINS 模型, 地点相关的影响评价

摘要: 因为生命周期评价目前缺乏空间差别, 直接影响了评价结果的相关性。本文首先提出了建立一个地区排放和沉降地区的酸度影响之间关系的概念框架。然后, 利用 RAINS 模型, 我们为欧洲 44 个地区建立了影响因素。RAINS 是一个综合评价模型, 结合地区排放水平和长距离大气输送两方面信息, 用以估计沉积模式, 并将沉积浓度与临界负荷, 以及空气酸化、富营养化、对流层臭氧形成的极限进行比较。在生命周期影响评价中对酸化系数的应用非常直接。唯一需要添加的数据——排放地理位置——通常可以从现有生命周期清单分析中得到。酸化系数使得分辨能力在最高与最低评分之间的差别增加了 1000 倍, 而且由于覆盖了更大范围的生态系统, 最大程度地减少了在 RAINS 模型中组合的不确定性。本文提出的研究框架也适用于在欧洲以外建立富营养化和对流层臭氧生成的类似模型。

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Site-dependent life-cycle assessment of acidification

Jose Potting, Wolfgang Schopp, Kornelis Blok and Michael Hauschild

Keywords:

acidification factors, actual impact, critical load, life-cycle impact assessment, RAINS, site-dependent impact assessment

Summary:

The lack of spatial differentiation in current life-cycle impact assessment (LCIA) affects the relevance of the assessed impact. This article first describes a framework for constructing factors relating the region of emission to the acidifying impact on its deposition areas. Next, these factors are established for 44 European regions with the help of the RAINS model, an integrated assessment model that combines information on regional emission levels with information on long-range atmospheric transport to estimate patterns of deposition and concentration for comparison with critical loads and thresholds for acidification, eutrophication via air, and tropospheric ozone formation. The application of the acidification factors in LCIA is very straightforward. The only additional data required, the geographical site of the emission, is generally provided by current life-cycle inventory analysis. The acidification factors add resolving power of a factor of 1,000 difference between the highest and lowest ratings, while the combined uncertainties in the RAINS model are canceled out to a large extent in the acidification factors as a result of the large number of ecosystems they cover. The framework presented is also suitable for establishing similar factors for eutrophication and tropospheric ozone formation for regions outside Europe as well.

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题目: 消费品电机的再使用: 电子数据记录的设计和分析

作者: Markus Klausner, Wolfgang M. Grimm, Chris Hendrickson

关键字: 零部件再使用, 面向环境的设计 (DfE), 绿港, 产品管理, 产品回收, 再循环

摘要: 产品回收制度要求有很好的产品回收管理策略。策略之一就是产品零部件的再使用。诸如电动工具等消费品中最有价值的零部件——电机——具有再使用的潜力。经验表明, 电机的使用寿命往往超过使用它的工具本身的寿命。本文重点讨论电机再使用。为此, 研究人员开发了一个旨在测量、计算和记录在产品使用过程中严重影响电机磨损状况参数的专用电路。这个叫做电子数据记录仪(EDL)的电路能够提供产品使用状况的信息。所纪录的信息作为产品回收后电机再使用的决策依据。本文对增加 EDL 所导致的产品初始成本上升与旧电机再使用所节省的成本进行了比较, 并且讨论了如何解决旧电机的分类问题。分析结果表明废旧产品回收率是决定采用 EDL 装置旧电机再使用经济效率的关键因素。研究结果还表明, 采用 EDL 装置以开展旧电机再使用有可能大大节约成本。

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Reuse of Electric Motors of Consumer Products: Design and Analysis of an Electronic Data Log

Markus Klausner, Wolfgang M. Grimm and Chris Hendrickson

Keywords:

component reuse, design for environment (DfE), green port, product stewardship, product takeback, recycling

Summary:

Product takeback calls for sound strategies of product recovery management. One such strategy is the reuse of the components of a product. There are consumer products such as power tools whose most expensive component, the electric motor, offers potential for reuse. Empirical evidence reveals that the lifetime of a motor often exceeds the lifetime of the product using it. This article focuses on the reuse of electric motors. For this purpose, a novel circuit was developed that measures, computes, and records parameters strongly correlated with the degradation of a motor during the use stage of the product. This circuit, called electronic data log (EDL), provides valuable insights into the usage patterns of products. The data recorded during the use stage are retrieved after product takeback as a basis for reuse decisions. In this article, the trade-off between higher initial manufacturing cost caused by the EDL and cost savings from the reuse of used motors is analyzed. The problem of misclassifications of used motors is also addressed. It is shown that the return rate of used products is the critical parameter determining the economic efficiency of a motor-reuse strategy based on EDLs. The analysis shows that the implementation of EDLs in products as an enabler for motor reuse may be associated with large cost savings.

《产业生态学报》

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题目: 在汽车零部件设计中开展环境改善受到很大限制吗? 汽车仪表盘案例分析

作者: Greg A. Keoleian

关键字: 汽车零部件设计, 环境改善, 仪表盘, 生命周期设计, 多目标决策, 系统分析

摘要: 本文通过对汽车仪表盘的案例分析, 来分析环境、成本和性能要求对汽车零部件设计和管理的影响。为研究汽车仪表盘的环境改善是否受到很大限制, 我们使用生命周期清单分析, 对三种中型汽车通用仪表盘的主要环境负荷进行了评价。我们还进行了生命周期成本分析, 来了解作用于设备生产商、消费者和废旧汽车拆卸商的市场力量。本案例研究表明, 现有的环境法规要求、目前的成本决定因素以及数量繁多的对汽车生产和使用的性能要求都大大限制了环境改善的可能。根据目前的系统要求, 我们对减轻汽车重量、彻底取消喷涂工艺和降低原材料复杂度等具体改进策略进行了评价。我们对近期环境改善的预测并不乐观。除非影响整个汽车系统的要求发生重大改变, 否则技术创新将只会以缓慢和零碎的形式发生。

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Is Environmental Improvement in Automotive Component Design Highly Constrained? An Instrument Panel Case Study

Greg A. Keoleian

Keywords:

automotive component design, environmental improvement, instrument panel, life-cycle design, multiobjective decisionmaking, system analysis

Summary:

This article investigates the influence of environmental, cost, and performance requirements on the design and management of automotive components through a case study involving instrument panels. To address the question of whether the environmental improvement of an instrument panel (IP) is highly constrained, a life-cycle inventory analysis is used to characterize the major environmental burdens associated with a generic IP defined from an average of three mid-sized vehicle models. A life-cycle cost analysis is also conducted to understand the market forces operating in the domains of the original equipment manufacturer, consumer, and end-of-life (EOL) vehicle managers. This study indicates that the existing set of environmental requirements, in conjunction with current cost drivers and the large set of manufacturing and use phase functional performance requirements, highly constrain opportunities for environmental improvement. Specific improvement strategies--lightweighting, elimination of the painting operation, and reduction in material complexity--are examined in the context of existing system requirements. The near-term forecast for improvements is not optimistic. Innovation will continue in a slow and piecemeal fashion until requirements affecting the total vehicle system are significantly changed.