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《产业生态学报》

2000年冬, 第4卷第1期, 13-28页

题目: 生命周期评价的理论基础: 认识价值观在环境决策中的作用

作者: Edgar G. Hertwich, James K. Hammit 和 William S. Pease

关键词: 经济损害指数 (EDI), 科学认识论, 全球变暖潜值 (GWP), 影响评价, ISO14042, 生命周期评价 (LCA)

摘要: 在生命周期影响评价 (LCIA) 中进行价值判断一直引发争议。根据一般的解释, LCIA 国际标准要求比较不同产品的评估方法不能受到价值取向的影响。认识论者指出, 即便是自然科学也依赖于“基本的”和“背景”的价值判断。通过对确定不同温室气体产生相当气候变化影响的基本概念——GWP 的案例分析, 我们发现任何影响评价方法不仅无可避免地包含基本价值和背景价值, 而且还包含偏好价值。因此, LCA 不论是作为一个整体还是它的每个步骤都不可能摆脱价值观的影响。因此, 我们对 LCA 的客观性提出一个更全面的定义, 以便开展价值讨论, 并将价值与事实联系起来。我们区分对真理的三种认识: 基于自然科学的事实论; 针对偏好价值的规范论; 以及强调实际知识与价值之间的合理关系的关系论。每一种评价方法, 包括 GWP, 需要从这三个方面考查。上述每一方面都可以得到恰当的论证。事实论可以用科学方法来评估。规范论可以伦理观来证明。而个体或者群体的价值观可以用各种社会科学方法来阐述。合理的论证必须符合逻辑。关系论对影响评价方法的发展最为重要。因为 LCA 是用来帮助决策者分析判断环境影响, 关于影响评价方法的关系论应该满足这个需求。本文介绍了影响环境决策的因素, 同时还讨论了 LCA 如何能够合理地应对把不确定的科学信息应用到政策领域所面临的挑战。

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Forum: A Theoretical Foundation for Life-Cycle Assessment: Recognizing the Role of Values in Environmental Decisionmaking

Edgar G. Hertwich, James K. Hammit and William S. Pease

KEYWORDS:

economic damage index (EDI), epistemology of science, global warming potential (GWP), impact assessment, ISO 14042, life-cycle assessment (LCA)

SUMMARY:

The presence of value judgments in life-cycle impact assessment (LCIA) has been a constant source of controversy. According to a common interpretation, the international standard on LCIA requires that the assessment methods used in published comparisons be 'value free.' Epistemologists argue that even natural science rests on 'constitutive' and 'contextual' value judgments. The example of the equivalency potential for climate change, the global warming potential (GWP), demonstrates that any impact assessment method inevitably contains not only constitutive and contextual values, but also preference values. Hence, neither life-cycle assessment (LCA) as a whole nor any of its steps can be 'value free.' As a result, we suggest a more comprehensive definition of objectivity in LCA that allows arguments about values and their relationship to facts. We distinguish three types of truth claims: factual claims, which are based on natural science; normative claims, which refer to preference values; and relational claims, which address the proper relation between factual knowledge and values. Every assessment method, even the GWP, requires each type of claim. Rational arguments can be made about each type of claim. Factual truth claims can be assessed using the scientific method. Normative claims can be based on ethical arguments. The values of individuals or groups can be elicited using various social science methods. Relational claims must follow the rules of logic. Relational claims are most important for the development of impact assessment methods. Because LCAs are conducted to satisfy the need of decision makers to consider environmental impacts, relational claims about impact assessment methods should refer to this goal. This article introduces conditions that affect environmental decision making and discusses how LCA values and all can be defended as a rational response to the challenge of moving uncertain scientific information into the policy arena.

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题目: 关于市场化过程与闭合“工业循环”的历史回顾**作者:** Pierre Desrochers**关键词:** 动物副产品, 闭环, 产业共生, 市场失灵, Peter Lund Simmonds, 资源回收

摘要: 很多产业生态学家认为传统经济发展的特征是物质和能源的开采、加工、使用和排放都是以线形方式进入、通过和流出经济系统的。然而, 许多证据表明历史上工业资源回收远比我们目前想象的要普遍。本文通过回顾了过去的各种相关文献, 并向读者提供了一个从新石器时代到 20 世纪中叶的动物副产品回收的简要的案例分析。本文的主要发现是, 早期的市场参与者在闭合工业循环中毫无作为的认识是错误的。文章还进一步指出, 产业生态学的理念在 19 世纪中期已经得到很好的理解。

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Market Processes and the Closing of 'Industrial Loops': A Historical Reappraisal

Pierre Desrochers

KEYWORDS:

animal by-products, closed loops, industrial symbiosis, market failure, Peter Lund Simmonds, resource recovery

SUMMARY:

Many industrial ecologists assume that traditional economic development was characterized by a linear approach in which materials and energy were extracted, processed, used, and dumped in a linear flow into, through, and out of the economy. Much historical evidence, however, indicates that industrial resource recovery was much more widespread than currently thought. This article reviews the available evidence by introducing the reader to earlier literature on the topic and by providing a short case study of animal by-products recovery from the Neolithic period to the middle of the twentieth century. The main finding of this article is that the belief that market actors systematically failed to close 'industrial loops' in earlier eras is inaccurate. Furthermore, it is pointed out that the industrial ecology metaphor was actually well understood in the middle of the nineteenth century.

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题目: 环境分析的完全模式和特性模式

作者: Helias Udo de Haes, Reinout Heijungs, Gjalt Huppes, Ester van der Voet and Jean-Paul Hettelingh

关键词: 特性, 能源分析, 投入产出分析 (IOA), 生命周期评价 (LCA), 材料流会计 (MFA), 物流分析 (SFA)

摘要: 目前有多种工具可以用来评价过程链或者过程网络的环境影响。这些相对简单的工具均基于固定的投入产出关系, 它们包括: 材料流分析 (MFA), 物流分析 (SFA), 生命周期评价 (LCA), 能源分析和环境投入产出分析 (IOA)。这些评价方法的分析对象都具有流的特点, 如产品、材料、能源、物质、或资金流等, 而且还具有时间和空间特征。但是这些特征并不能很好地反映其方法论的特点, 有时还会导致其误用。为了更好地指导其恰当的应用和发展更一致方法, 进一步阐述十分有用。除了上述流的本质和时空特征外, 这些方法的另一个重要特征是过程流是如何纳入到分析系统中去的。

过程流可以采用两种不同的方式纳入系统: 一是根据完全分析模式, 即将在某一地区、某一特定时期的全部流动和相关过程最大限度地包括到发现系统中来; 二是根据特性分析模式, 即只是把与某一特定的社会需求、功能或者活动直接相关的过程流考虑进来, 原则上是在这些过程发生的时候和地方。这种分类方法, 将传统属于同一家族的分析工具一分为二, 显然具有重要的方法论和实用意义。因此, 这种两类分析手段的区分方法, 增强了环境系统分析工具家族内在的一致特点。

Full Mode and Attribution Mode in Environmental Analysis

Helias Udo de Haes, Reinout Heijungs, Gjalt Huppes, Ester van der Voet and Jean-Paul Hettelingh

KEYWORDS:

attribution, energy analysis, input-output analysis (IOA), life-cycle assessment (LCA), materials flow accounting (MFA), substance flow analysis (SFA)

SUMMARY:

Several tools exist for the analysis of the environmental impacts of chains or networks of processes. These relatively simple tools include materials flow accounting (MFA), substance flow analysis (SFA), life-cycle assessment (LCA), energy analysis, and environmentally extended input-output analysis (IOA), all based on fixed input-output relations. They are characterized by the nature of their flow objects, such as products, materials, energy, substances, or money flows, and by their spatial and temporal characteristics. These characteristics are insufficient for their methodological characterization, and sometimes lead to inappropriate use. More clarity is desirable, both for clearer guidance of applications and for a more consistent methodology development. In addition to the nature of the flow object and to spatial and temporal characteristics, another key feature concerns the way in which processes are included in a system to be analyzed. The inclusion of processes can be done in two fundamentally different ways: according to a full mode of analysis, with the inclusion of all flows and related processes to their full extent as present in a region in a specific period of time; and according to an attribution mode, taking processes into account insofar as these are required for a given social demand, function, or activity, in principle whenever and wherever these processes take place. This distinction, which cuts across families of tools that traditionally belong together, appears to have significant methodological and practical implications. Thus the distinction between the two modes of analysis, however crucial it may be, strengthens the idea of one coherent family of tools for environmental systems analysis.

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题目: 经济增长中的减水化: 如何解释随着收入的增长用水强度降低?

作者: Michael T. Rock

关键词: 非物质化, 环境与发展, 环境 Kuznets 曲线, 使用强度, 水消耗, 水回收

摘要: 近期研究显示, 当水资源供应量、经济结构和其它几个政策变量保持不变时, 耗水量和收入之间存在着倒U型关系。这表明, 耗水强度将随收入的增长而不断下降。本文通过建立了一个的跨国家、时间序列的简单、非正式淡水使用强度模型来验证这个假说。研究结果表明, 耗水强度在全世界各种人均收入水平上均呈下降趋势。研究还表明, 耗水强度与收入之间的关系受到一个国家的水资源拥有量、经济结构和政府政策的共同影响。四种政策对一个国家的耗水强度影响特别显著。开放的贸易政策和严格的环保法规降低耗水强度, 狭隘的粮食自给政策以及社会主义发展政策增加耗水强度。这些发现表明, 那些关注水问题、水资源稀缺性和水政策的人士, 若要改进水资源管理, 就必须从过去单纯研究水的消费模式和狭义水政策(例如水的定价)中解放出来。

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Research and Analysis: The De-Watering of Economic Growth: What Accounts for the Declining Water Use Intensity of Income?

Michael T. Rock

KEYWORDS:

dematerialization, environment and development, environmental Kuznets curve, intensity of use, water consumption, water withdrawals

SUMMARY:

Recent research has found an inverted U relationship between freshwater use and income after controlling for freshwater availability, the structure of the economy, and several policy variables. This suggests that the intensity of freshwater use must be declining with income growth. This hypothesis is tested by developing a simple, informal model of the determinants of freshwater-use intensities across countries and over time. Results suggest that water-use intensity declines across the entire range of per capita incomes extant in the world today. They also show that the relationship between intensity of use and income is mediated by an economy's natural water endowment, the structure of the economy, and government policies. Four policies, in particular, affect the water-use intensity of economies. Open trade policies and tough environmental regulatory policies lower water use intensities, and narrowly defined food self-sufficiency policies and socialist development policies increase water-use intensities. These findings suggest that those interested in water, water scarcity, and water policy need to extend beyond simple extrapolations of past consumption patterns and narrowly focused water policies (such as water pricing) if they want to improve water management practices.

《产业生态学报》

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题目: 1980-1995年荷兰能源效率与结构的变化: 能源效率、非物质化和经济结构对荷兰能源消耗的影响

作者: Jacco C.M. Farla 和 Kornelis Blok

关键词: 分解分析, 非物质化, 能源消耗, 能源效率, 特殊能源消耗, 结构改变

摘要: 各国达成协议在全球范围减少温室气体排放。使CO₂排放与经济增长脱钩的一个重要途径就是采取技术手段提高能效。本文评估了荷兰在1980-1995年期间能源效率提高以及产业结构变化对一次能源消耗总量的影响。我们发现在这15年中, 经济增长与能源消耗明显脱钩。我们用单位产品或者单位生产活动的能耗变化来反映能源效率(技术)的变化。在1980-1995年期间, 能源效率每年提高1.4%。使用物质生产指标使我们无需在很小的产业部门上进行详细调查就可以衡量能源效率的变化趋势。当我们考查这段时间的经济结构变化时, 我们发现: (1) 我们没有发现经济结构发生重大变化; (2) 高能耗行业的增长速度要比总体经济增长快得多; (3) 在分行业水平上, 实际产量与产业增加值之间有较大的出入。因此我们得出结论, 在1980-1995年期间荷兰经济结构变化并没有导致其能源强度下降。

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Energy Efficiency and Structural Change in the Netherlands, 1980-1995: Influence of Energy Efficiency, Dematerialization and Economic Structure on National Energy Consumption

Jacco C.M. Farla and Kornelis Blok

KEYWORDS:

decomposition analysis, dematerialization, energy consumption, energy efficiency, specific energy consumption (SEC), structural change

SUMMARY:

International agreement has been reached to reduce greenhouse gas emissions worldwide. One important way of decoupling CO₂ emissions from economic growth is by introducing technical measures to improve energy efficiency. In this article, we assess the influence of developments in energy efficiency and economic structure on the total primary energy consumption in the Netherlands over the period 1980D1995. We find a distinct decoupling of the economic growth and energy consumption of 1.5% per year in the 15-year analysis period. We measure (technical) changes in energy efficiency by changes in the energy consumption per physical unit of production or activity. The aggregate rate of (technical) energy-efficiency improvement was 1.4% per year over the period 1980D1995. The use of physical production indicators makes it possible to measure energy-efficiency developments without detailed surveys at a very low level of aggregation. When we look at economic structural changes over this period, we find that (i) no substantial shift took place at the level of the economic sectors that we distinguish; (ii) the most energy intensive subsectors grew much faster than the total economy; and (iii) at the subsector level, on average, a sizable decoupling of physical production and value added occurred. We conclude that structural changes, that is, changes in the composition of the economy, did not lead to a net decrease in the energy intensity of the Netherlands over the period 1980D1995.

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题目: 节能与节材: 日本寒冷地区住宅的生命周期清单分析

作者: Yurika Nishioka, Yukio Yanagisawa 和 John D. Spengler

关键词: CO₂ 排放, 能耗, 绿色建筑, 生命周期清单分析 (LCI), 材料强度, 一体化住宅

摘要: 为了减少住宅建设中的能耗和 CO₂ 排放, 我们应该发现并整合高能耗的过程和生命周期阶段。我们对日本北部的 Hokkaido 岛上的增加材料消耗, 建造一体化工厂式住宅 (VIH) 的环境影响进行了生命周期清单分析 (LCI)。根据材料投入, 我们对 VIH 住宅建设过程中的能源和 CO₂ 强度进行了评价, 并且将 VIH 与假想中按照目前 Hokkaido 岛传统住宅的材料使用标准、采用一体化工厂式方法建造的住宅 (CH) 进行比较。并且根据不同生产阶段计算和比较它们的累计能源消耗与 CO₂ 排放。本文对 Hokkaido 岛上的一体化工厂式住宅 (VIH)、传统材料住宅 (CH) 和现有普通住宅的年能源消耗加以比较。对于每平方米住宅, VIH 生产过程的能源强度是 3.9GJ, 比 CH 高出了 59%。扣除树木生长过程的固碳作用后, 每平方米 VIH 生产过程的 CO₂ 净排放是 293 kg。在 VIH 住房使用期间减少的总能耗和 CO₂ 排放会在不到 6 年时间内超过生产阶段增加的能耗和 CO₂ 排放。虽然 VIH 平均多容纳 21% 的住户, 但是每平米的能耗却比 CH 少 17%。这表明在住宅建设阶段多使用一些材料将会实现更高的能源效率。

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Saving Energy versus Saving Materials: Life-Cycle Inventory Analysis of Housing in a Cold Climate Region of Japan

Yurika Nishioka, Yukio Yanagisawa and John D. Spengler

KEYWORDS:carbon dioxide (CO₂) emissions, energy consumption, green buildings, life-cycle inventory (LCI) analysis, materials intensity, vertical integration**SUMMARY:**

To reduce energy consumption and carbon dioxide (CO₂) emissions in housing construction, the energy-intensive processes and life-cycle stages should be identified and integrated. The environmental impact of vertically integrated factory-built homes (VIHs) constructed with increased material inputs in Japan's northern island of Hokkaido was assessed using life-cycle inventory (LCI) analysis methods. Manufacturing process energy and CO₂ intensities of the homes were evaluated based on the material inputs. They were compared with those of a counterpart home hypothetically built using the vertically integrated construction methods, but in accordance with the specifications of a less material-intensive conventional home (CH) in Hokkaido today. Cumulative household energy consumption and CO₂ emissions were evaluated and compared with those of the production stages. The annual household energy consumption was compared among a VIH, a CH, and an average home in Hokkaido. The energy intensity of the VIH was 3.9 GJ production energy per m² of floor area, 59% higher than that of the CH. Net CO₂ emissions during VIH manufacturing processes were 293 kg/m², after discounting the carbon fixation during tree growth. The cumulative use-phase household energy consumption and CO₂ emissions of a VIH will exceed energy consumption and CO₂ emissions during the initial production stage in less than six years. Although VIHs housed 21% more residents on average, the energy consumption per m² was 17% lower than that of a CH. This may indicate that using more materials initially can lead to better energy efficiency.