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Shi Han

《产业生态学报》

2004 年冬, 第 8 卷第 1-2 期, 11-21 页

题目: 土地利用的影响评价: 选用土地表面利用指标进行采矿业的生命周期评价

作者: Duane A. Tolle, David V. Spitzley

关键字: 环境表现, 测量, 等价因子, 土地利用度量, 生命周期评价(LCA), 生命周期影响评价(LCIA), 采矿

摘要: 土地利用越来越成为可持续性评价中一项重要的内容, 并为此而发展了多种评价指标。但决策者在选择合适的土地利用定量指标时仍面临很大的挑战。传统的关于土地利用环境影响的评价方法, 往往很难提供有意义的生命周期影响评价结果。本文旨在辅助决策者和生命周期方法的使用者更有效地评估土地利用的一个重要方面——土地表面利用。文中首先讨论了现有的环境表现评价指标及其适用情况。随后在生命周期评价最新研究成果的基础上提出了一种衡量表面土地占用情况的改进方法。该方法被用于分析几个采矿实例, 包括三座金矿、一座铝土矿和一座铜矿。文中讨论了具体的数据需求并给出了最终的地表占用等价因子: 金矿的等价因子(700 英亩年/吨)比铝土矿(0.004 英亩年/吨)和铜矿(0.03 英亩年/吨)高出了几个数量级。由此说明在分析需要使用多种矿产和原材料的生命周期过程的土地利用情况时, 地表使用的等价因子作为一项重要的因素不可或缺。

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Evaluating Land Use Impacts: Selection of Surface Area Metrics for Life Cycle Assessment of Mining

Duane A. Tolle and David V. Spitzley

KEYWORDS:

environmental performance, measurement, equivalency factors, land-use metrics, life-cycle assessment (LCA), life-cycle impact assessment (LCIA), mining

SUMMARY:

Land use is an increasingly important component of sustainability evaluations, and numerous performance metrics have evolved to meet this need. The selection of appropriate landuse metrics for decision makers, however, remains an ongoing challenge. Additionally, life-cycle practitioners often struggle to provide meaningful impact assessment because of challenges associated with traditional land-use impact metrics. This article is intended to assist decision makers and life-cycle practitioners who wish to more effectively measure and evaluate one aspect of land use: surface area occupation. Existing performance metrics are discussed, and the specific circumstances under which each is appropriate are identified. Building on leadingedge research and analysis in the field of life-cycle impact assessment, a modified methodology for evaluating surface area occupation is proposed. This approach is demonstrated for a series of mining practices including three individual gold mines, a bauxite mine, and a copper mine. The specific data requirements and resulting equivalency factors for each mine are discussed. Results indicate that equivalency factors for gold (average of 700 acre-yr/ton) are expected to be several orders of magnitude higher than for either bauxite (0.004 acre-yr/ ton) or copper (0.03 acre-yr/ton). These dramatic differences in results demonstrate that equivalency factors are appropriate and necessary for including land-use impact potential as part of a life-cycle assessment that includes several different minerals or material requirements.

《产业生态学报》

2004年冬, 第8卷第1-2期, 23-43页

题目: 过程知识、废物管理与金属材料的产业生态学

作者: E.V. Verhoef, G.P.J Dijkema, M.A. Reuter

关键字: 动态系统, 冶金工艺学, 焊料, 固体废物管理, 经验知识, 残留金属

摘要: 产业生态学的—个关键原则是材料循环利用。它是自然生态系统的特性之一, 但对人类经济系统而言仍是一个挑战。人类社会金属的供应(即从原料开采到最终废物返回岩石圈的生命周期各个过程中正在利用和可能被利用的金属总量)由于受到再生(二次)金属纯度的限制是有限的。现在人们主要通过不断引入高品位的金属原始(一次)矿来保持再生金属的纯度, 维持金属使用的可持续性和金属材料流循环。长远来看, 通过稀释去除金属中的其它杂质不利于封闭材料流循环, 但不这样做的话又会影响再生金属的质量或数量。

各种金属实际上构成一个相互联系的材料流循环系统, 不能独立地生产或回收。本文给出了一个简明但有效“金属轮”分析工具, 总结了矿物中各种金属间的物理与化学联系以及相应的冶金工艺过程, 使得多种冶金工艺以及包括原材料、废物和废旧产品在内的金属材料流循环各个阶段的科技知识一目了然。

本文还介绍了一个用于描述全球金属循环的动态材料流模型。该模型展现了金属循环结构和工艺技术的演化过程。

文中利用金属轮工具和金属循环动态模型, 以焊料的无铅化转变为例分析了金属材料流间的相互作用。制定政策时如不考虑金属循环的相互联系和动态特性, 将导致铅的替代品短缺。那么一旦铅被大量禁用, 很多相关金属的来源与再循环都会受到影响。

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Process Knowledge, Waste Management and Metal Ecology

E.V. Verhoef, G.P.J Dijkema and M.A. Reuter

KEYWORDS:

dynamic systems, process metallurgy, solder, solid waste management, tacit knowledge, tramp metals

SUMMARY:

A key principle in industrial ecology is the cyclic use of materials, a characteristic of natural ecosystems but a challenge in economic systems. Indeed, in society, metal retention, that is, the ongoing use or ready availability of metal in the economy between the life-cycle stages of resource extraction and final disposal back into the lithosphere, is finite because of the limited grade of secondary (recycled) metals. Currently, the utility of metals is maintained through the addition of high primary (virgin) metals, bringing the concentration of the recycled metals to desired levels. This mixing with high-grade primary metals keeps these recycled metals in the cycle. Long term, this practice of dilution of the undesired substances prevents a closure of the material cycles, whereas recovery without dilution reduces the quality (or quantity) of recycled metals.

Metals participate in a system of linked cycles and thus cannot be produced or recovered independently from one another. The metal wheel is introduced in this article as a concise but powerful instrument for the communication of available process knowledge in process metallurgy, the science and technology of producing metals from natural ores and societal raw materials, residues, and end-of-life products. It summarizes the chemical and physical linkages between metals found in ores and the set of metallurgical processes that has been developed to accommodate these linkages.

A dynamic mass-flow model is introduced to characterize the global metal cycles. The model facilitates the visualization of the evolution of their structure and technological content.

To illustrate the interdependency of metal cycles using the metal wheel and the dynamic model, the transition to leadfree solder is evaluated. Neglect of metal-cycle linkages and dynamics in policy formulation may lead to a shortage of lead substitutes. In case of an extended ban on lead, both the availability and recovery of a range of metals will be affected.

《产业生态学报》

2004 年冬, 第 8 第 1-2 期, 45-68 页

题目: 生态输入输出流分析法在产业系统材料流分析中的应用, 第 1 部分: 流的描述

作者: Reid Bailey, Bert Bras, Janet K. Allen

关键字: 生态建模, 流的建模, 流的描述, 投入产出分析(I-OA), 材料流分析(MFA), 物质流分析(SFA)

摘要: 投入产出方法可用于分析系统保有流之间的直接和间接的联系。20 世纪 30 年代经济学家 Leontief 将其成功用于经济学的分析, 至今已有相当长的应用历史。投入产出分析方法在产业系统的前期应用几乎全部集中在经济体的货币流分析上。然而考虑到产业系统环境影响取决于系统物理流(如物质流)的特性, 物理流似应成为产业经济系统分析的一个重要组成部分。由此, 本文提出了一套基于投入产出分析但又有别于系统货币流分析的方法, 用于模拟产业系统的物理流过程。这一输入输出流分析从生态学的角度着手, 包括两项核心的研究: 首先是追踪并描述出入于环境的系统物理流, 论文的第一部分根据现有的对自然生态系统营养流和能流循环的研究成果, 构建了一个材料流和能流分析的输入输出模型框架; 其次是描述与物理流量度相关的系统行为, 论文的第二部分就此进行讨论。本文认为环境分析是描述产业系统物理流的有效方法, 它综合考察直接和间接流的途径。文中以铝和其它五种金属为例进行了深入的环境分析。

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Applying Ecological Input-Output Flow Analysis to Material Flows in Industrial Systems Part I: Tracing Flows

Reid Bailey, Bert Bras and Janet K. Allen

KEYWORDS:

ecological modeling, flow modeling, flow tracing, input-output analysis (I-OA), materials flow analysis (MFA), substance flow analysis (SFA)

SUMMARY:

Input-output mathematics, which allows a modeler to fully consider direct and indirect relationships among conserved flows in a system, has a long history in economics with prominent use dating to Leontief in the 1930s. Nearly all previous industrial applications of input-output analysis have been grounded in the monetary flows of an economy. Here however, because of the central nature of physical flows in the environmental impact of an industrial economy, we consider physical flows to be a fundamental component of an industrial economy. Hence, we propose an input-output based approach for modeling physical flows in industry independent of their monetary implications. In this first part of a two-part article, a framework for using input-output mathematics to model material and energy flows is constructed from a foundation laid by previous research in nutrient and energy cycling in natural ecosystems. The mathematics of input-output flow analysis is presented from an ecological perspective, culminating in two core capabilities: tracing of flows with environs (investigated in this article) and characterizing system behavior with flow metrics (presented in the second article). We assert that environ analysis is an effective means for tracing flows through industrial systems while fully considering direct and indirect flow paths. We explore material flows of aluminum and five other metals in depth using environ analysis in this article.

《产业生态学报》

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题目: 生态输入输出流分析法在产业系统材料流分析中的应用, 第2部分: 流的度量

作者: Reid Bailey, Bert Bras, Janet K. Allen

关键字: 地毯, 环境定量指标, 投入产出分析(I-OA), 材料流分析(MFA), 物质流分析(SFA), 再循环

摘要: 承接论文第一部分的主题, 本文详细讨论了投入产出方法在产业系统材料流分析中的应用。材料流是关键, 它直接连接自然系统与产业系统, 决定产业系统的环境表现。文中从投入产出方法的生态学应用出发, 研究了可用于描述系统行为的材料流衡量指标, 包括几种对材料循环的度量以及一种对系统中材料所流经的过程数的度量。这些指标有助于研究材料流系统的状态, 并把输入输出流分析与综合过程联系起来, 即根据系统行为的衡量结果对系统做出修改设计, 再总体考虑材料流指标、外在环境和材料流系统的控制变量的基础上, 优化已有系统的材料流特性从而改进系统的行为表现。本文最后论述了输入输出流分析法的局限, 期望能够激起读者深入研究的兴趣。

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Applying Ecological Input-Output Flow Analysis to Material Flows in Industrial Systems Part II: Flow Metrics

Reid Bailey, Bert Bras and Janet K. Allen

KEYWORDS:

carpet, environmental metrics, input-output analysis (I-OA), materials flow analysis (MFA), substance flow analysis (SFA), recycling

SUMMARY:

This article, continuing with the themes of the companion article, expounds the capabilities of input-output techniques as applied to material flows in industrial systems. Material flows are the primary focus because of their role in directly linking natural and industrial systems and thereby being fundamental components of environmental issues in industrial economies. The specific topic in this article concerns several material flow metrics used to characterize system behavior that are derived from the ecological development of input-output techniques; most notable of these metrics are several measures of material cycling and a measure of the number of processes visited by material while in a system. These metrics are shown to be useful in analyzing the state of material flow systems. Furthermore, the metrics are shown to be a central link in connecting input-output flow analysis to synthesis (i.e., the process of using measurements of system behavior to design changes to that system). By connecting the flow metrics to both environmental objectives and controllable aspects of flow models, changes to existing flow systems are synthesized to generate improved system behavior. To bring this pair of articles to a close, several limitations of input-output flow analysis are summarized with the goal of stimulating further interest and research.

《产业生态学报》

2004 年冬, 第 8 卷第 1-2 期, 93-118 页

题目: 多种生命周期环境影响评价的数据在决策分析中的应用, 第 1 部分: 理论基础

作者: Mansour Rahimi, Merrill Weidner

关键字: 决策论, 终点, 中间点, 多属性, 多属性评价理论 (MAVT), 评价

摘要: 生命周期评价 (LCA) 中的生命周期影响评价 (LCIA) 部分, 目前有多种方法得到普遍的应用。这些方法多为孤立的单一层面上的分析, 受限于具体模型中的环境影响结果、影响种类、损害情况和环境压力等因素。因此, LCA 学界建议在进行基于 LCA 的决策时, 应综合使用多方法、多层面的 LCIA 数据, 涵盖各类终点和中间点指标, 以期做出更好的决策, 或至少提供给决策者更多的信息。

在由两部分组成的论文中, 作者提出了一系列基于 LCA 的决策模型。这些模型都以多属性评价理论 (MAVT) 为基础, 采用了多方法、多层面的 LCIA 分析数据。完成上述分析的关键在于确定用来反映决策分析中特定属性和代理属性的 LCIA 环境损害指标。在决策模型中人们多采用代理属性, 但这会带来一些问题, 如因为 LCA 方法和具体知识的限制而导致的决策者的选择偏差。作为系列论文的第一部分, 本文简述了 MAVT 和其它决策理论, 分析了现有 LCIA 方法的理论内涵。文中不但运用 MAVT 开发了一个基于单一 LCIA 环境损害指标的决策模型, 还进一步研究了综合多方法、多层面的 LCIA 指标进行决策所存在的理论问题。最后, 作者提出了一种的利用相关终点指标构建单一决策属性的方法, 并定义和评价了代理属性。

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Decision Analysis Utilizing Data from Multiple Life-Cycle Impact Assessment Methods. Part I: A Theoretical Basis

Mansour Rahimi and Merrill Weidner

KEYWORDS:

decision theory, end point, midpoint, multiattribute, multiattribute value theory (MAVT), valuation

SUMMARY:

Numerous methodologies for the life-cycle impact assessment (LCIA) step of life-cycle assessment (LCA) are currently in popular use. These methods, which are based on a single method or level of analysis, are limited to the environmental fates, impact categories, damage functions, and stressors included in the method or model. Because of this, it has been suggested within the LCA community that LCIA data from multiple methods and/or levels of analysis, that is, end-point and midpoint indicators, be used in LCA-based decision analysis to facilitate better or, at least more informed, decision making.

In this (two-part) series of articles, we develop and present a series of LCA-based decision analysis models, based on multiattribute value theory (MAVT), which utilize data from multiple LCIA methods and/or levels of analysis. The key to accomplishing this is the recognition of what LCIA damage indicators represent with respect to decision analysis, namely, decision attributes and, in most cases, proxy attributes. The use of proxy attributes in a decision model, however, poses certain challenges, such as the assessment of decision-maker preferences for actual consequences that are only known imprecisely because of inherent limits of both LCA and scientific knowledge. In this article (part I), we provide a brief overview of MAVT and examine some of the decision-theoretic issues and implications of current LCIA methods. We illustrate the application of MAVT to develop a decision model utilizing damage indicators from a single LCIA methodology; and, we identify the decision-theoretic issues that arise when attempting to combine LCIA indicators from multiple methods and/or levels of analysis in a single decision model. Finally, we introduce the use in our methodology of constructed attributes to combine related end-point damage indicators into single decision attributes and the concept and evaluation of proxy attributes.

《产业生态学报》

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题目: 多种生命周期环境影响评价的数据在决策分析中的应用, 第 2 部分: 模型开发

作者: Mansour Rahimi, Merrill Weidner

关键字: 决策论, 终点, 中间点, 多属性, 多属性评价理论 (MAVT), 评价

摘要: 在系列论文第 1 部分讨论了决策分析理论以及代理属性这一核心概念。在此基础上, 本文作为第 2 部分开发并给出了一系列基于生命周期评价 (LCA) 的决策模型。这些模型以多属性评价理论 (MAVT) 为基础, 采用了多方法、多层面的生命周期影响评价 (LCIA) 数据。

论文第 2 部分对第 1 部分的决策模型作了扩充, 在模型中 (1) 引入来自多种 LCIA 评价的终点指标; (2) 引入中间点指标; (3) 集成单一决策模型中的多种终点和中间点环境损害指标。作者探讨了在新的模型中如何使用 LCIA 损害指标作为反映实际结果的代理属性的问题。为了更好地综合应用方法的 LCIA 指标, 决策者在考虑实际结果的代理属性时, 必须结合价值判断与事实判断。为了解决 LCIA 损害指标 (或代理属性) 与实际结果间的关系不确定问题, 文中使用了一种为多数决策者所乐见的语义变量 (例如“大得多”) 模糊描述法。通过第一部分论文和本文所述的方法, LCA 工作者和决策者可综合来自各种 LCIA 的终点和中间点指标, 构建理论决策模型。由于 LCIA 方法存在一定的局限, 在模型实际应用时, 有必要明确评估和处理决策者的个人偏好以及多种 LCIA 数据所提供的额外信息, 以便做出更好、更全面的决策。

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Decision Analysis Utilizing Data from Multiple Life-Cycle Impact Assessment Methods. Part II: Model Development

Mansour Rahimi and Merrill Weidner

KEYWORDS:

decision theory, end point, midpoint, multiattribute, multiattribute value theory (MAVT), valuation

SUMMARY:

In this (two-part) series of articles, we develop and present a series of life-cycle-assessment-based (LCA-based) decision analysis models, based on multiattribute value theory (MAVT), which utilize data from multiple life-cycle impact assessment (LCIA) methods and/or levels of analysis. In part I of this series, we began the task of developing a theoretically sound decision analysis methodology for accomplishing this. We also provided a preliminary introduction to the concept of proxy attributes, which are central to our overall methodological approach.

In this part, we expand the decision analysis model developed previously to include (1) the combination of end-point indicators from multiple LCIA methods, (2) the combination of midpoint indicators, and (3) the combination of multiple end-point and midpoint damage indicators in a single decision model. In our models, we consider the LCIA damage indicators to be proxy attributes for actual consequences. In order to combine the LCIA indicators (as proxy attributes) from multiple methods, the decision maker must make a combination of value- and factual-based judgments concerning the actual consequences associated with the proxy attributes. We address the imprecise relationship between damage indicators and actual consequences in a way that we believe to be more appealing to most decision makers, based on linguistic variables (e.g., "much greater") represented as fuzzy variables. By utilizing the methodological approaches presented here and in part I, an LCA practitioner or decision maker can construct theoretically based decision models utilizing damage indicators (including both end points and midpoints) from any combination of LCIA methods. Given the inherent limits of LCIA, we believe that decision models developed on this basis provide for better and more informed decision making, through the explicit assessment and treatment of individual decisionmaker preferences and the additional information provided through the use of data from multiple LCIA methods.

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2004, Vol. 8, Issue 1-2, pp. 143-172

题目: 环境表现评价之改进: 排放目录化学品影响权重的比较分析

作者: Michael W. Toffel, Julian D. Marshall

关键字: 排放, 环境健康, 环境管理, 定性指标, 定量指标, 毒性化学品排放清单 (TRI)

摘要: 公司管理人员、管理学研究人员、政府机构、非营利性组织以及传媒等越来越多地使用排放清单数据来衡量一个机构的环境表现。尽管很多研究人员使用排放总量数据, 但一些人已经更多地利用污染物毒性权重数据库来预测污染物排放的环境与健康影响。有关如何选用这些数据库的研究目前还很少。本文分析了 13 种相关评价指标体系的复杂性和广泛性。文中利用美国环保局 (EPA) 有毒物质排放清单数据分析了其中 7 种方法的有效性, 并对 3 对方法作了逐一比较。作者推荐使用美国 EPA 的环境风险监控指标 (U.S. EPA's Risk Screening Environmental Indicators) 评价人类健康方面的影响, 使用化学品影响消减与评价工具 (The tool for the Reduction and Assessment of Chemical Impacts) 估测人类健康和生态环境方面的影响。

Improving Environmental Performance Assessment: A Comparative Analysis of Weighting Methods Used to Evaluate Chemical Release Inventories

Michael W. Toffel and Julian D. Marshall

KEYWORDS:

emissions, environmental health, environmental management, indicators, metrics, toxic release inventory (TRI)

SUMMARY:

Managers, management scholars, regulators, nonprofit organizations, and the media are increasingly using emissions inventory data to measure organizations' environmental performance. Whereas some analysts use total mass emitted, others have applied one or more of the growing number of toxicity weighting databases aimed at predicting the environmental and health impacts of emissions. Little research is available to guide analysts in selecting among these databases. This article compares 13 methods in terms of their sophistication, complexity, and comprehensiveness. Seven of these methods are then evaluated as to their usefulness in weighting emissions data from the U.S. Environmental Protection Agency's (U.S. EPA's) toxic release inventory, and three pairwise comparisons are conducted. We recommend the U.S. EPA's Risk Screening Environmental Indicators for estimating impacts to human health. We recommend U.S. EPA's Risk Screening Environmental Indicators for estimating impacts to human health and the environment.

《产业生态学报》

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题目: 汽车组装喷漆过程的能耗、环境和经济改进评价**作者:** Geoffrey J. Roelant, Amber J. Kemppainen, David R. Shonnard**关键字:** 汽车产业, 节能, 热交换网络, 热量集成, 喷漆过程能量模型, 夹点分析

摘要: 一层表面油漆极大地提高了一辆汽车的价值。喷漆过程能耗可占汽车装配厂总能耗的 60%, 此外还产生了相当的经济与环境影响。改造现有汽车喷漆工艺的热量集成系统能够在多大程度上改善经济成本和环境方面的表现? 本文就此提出了一个描述汽车组装喷漆过程的能耗、成本以及与能耗相关的环境影响等因素的数学模型。该模型的输入参数来自美国密歇根州的一个卡车生产企业, 喷漆过程的热电消耗约占该企业总能耗的 15%。热夹点分析显示, 最大节能潜力可达喷漆过程总能耗的 58%。文中对热交换网络作了优化设计, 以确定可在多大程度上实现这一目标。按现值计算的现金流量分析表明, 热交换网络优化设计有很大经济回报, 对一个大型汽车生产商来说, 它可使企业总能耗降低 16%。

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Assessment of the Automobile Assembly Paint Process for Energy, Environmental and Economic Improvement

Geoffrey J. Roelant, Amber J. Kemppainen and David R. Shonnard

KEYWORDS:

automobile industry, energy conservation, heat exchanger network, heat integration, paint process energy model, pinch analysis

SUMMARY:

A coat of paint adds considerable value to an automobile. In addition to consuming up to 60% of the energy needed by automobile assembly plants, however, the painting process also creates both economic and environmental impacts. This study investigated the degree of cost and environmental impact improvement that can be expected when modifications are considered for existing paint processes through heat integration. In order to accomplish this goal, a mathematical model was created to describe the energy use, costs, and environmental impacts from energy consumption in an automobile assembly painting facility. The model agrees with measured energy consumption data for process heating and electricity demand to within about 15% for one Michigan truck facility from which model input parameters were obtained. Thermal pinch analysis determined an energy conservation target of 58% of paint process energy demand. A heat exchanger network optimization study was conducted in order to determine how closely the network design could achieve this target. The resulting heat exchanger network design was profitable based on a discounted cash flow analysis and may achieve reductions in total corporate energy consumption of up to 16% if implemented corporatwide at a major automobile manufacturer.

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题目: 从生命周期环境和经济角度分析再制造发动机的价值

作者: Vanessa M. Smith, Gregory A. Keolelian

关键字: 汽车, 报废汽车 (ELVs), 生命周期清单 (LCI), 改造, 再加工, 再使用

摘要: 旧车发动机经过再制造可提供与新发动机类似的功能, 但其环境与经济成本却比生产一台新发动机低得多。通过一个生命周期评价 (LCA) 模型, 本文分析了美国中型汽油发动机再制造与全新生产相比在污染预防和节能降耗等方面的效益。美国约 55% 的汽车发动机再制造商为提供充分服务的机械修理商。文中列出了一个典型修理商的生命周期清单并分析了零部件更换的三种情景。LCA 模型说明发动机再制造可节能 68% 至 83%, 减排二氧化碳 73% 至 87%、一氧化碳 48% 到 88%、氮氧化物 72% 到 85%、硫氧化物 71% 到 84%、非甲烷烃类 50% 到 61%。另外还可降低 26% 到 90% 的原料消耗和 65% 到 88% 的固体废物产生量。在分析环境表现的同时还对再制造发动机和生产新发动机作了经济方面的调查, 二者的价差可占新发动机价格的 30% 到 53%。研究表明从再制造商那里直接购买再制造的发动机可以大大地节约成本。

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The Value of Remanufactured Engines: Life Cycle Environmental and Economic Perspectives

Vanessa M. Smith and Gregory A. Keolelian

KEYWORDS:

automobiles, end-of-life vehicles (ELVs), life-cycle inventory (LCI), rebuilding, reconditioning, reuse

SUMMARY:

Remanufacturing restores used automotive engines to like-new condition, providing engines that are functionally equivalent to a new engine at much lower environmental and economic costs than the manufacture of a new engine. A life-cycle assessment (LCA) model was developed to investigate the energy savings and pollution prevention that are achieved in the United States through remanufacturing a mid-sized automotive gasoline engine compared to an original equipment manufacturer manufacturing a new one. A typical full-service machine shop, which is representative of 55% of the engine remanufacturers in the United States, was inventoried, and three scenarios for part replacement were analyzed. The lifecycle model showed that the remanufactured engine could be produced with 68% to 83% less energy and 73% to 87% fewer carbon dioxide emissions. The life-cycle model showed significant savings for other air emissions as well, with 48% to 88% carbon monoxide (CO) reductions, 72% to 85% nitrogen oxide (NOx) reductions, 71% to 84% sulfur oxide (SOx) reductions, and 50% to 61% nonmethane hydrocarbon reductions. Raw material consumption was reduced by 26% to 90%, and solid waste generation was reduced by 65% to 88%. The comparison of environmental burdens is accompanied by an economic survey of suppliers of new and remanufactured automotive engines showing a price difference for the consumer of between 30% and 53% for the remanufactured engine, with the greatest savings realized when the remanufactured engine is purchased directly from the remanufacturer.

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题目: 丹麦渔业的能耗

作者: Mikkel Thrane

关键字: 生命周期评价(LCA), 捕鱼设备, 燃料消耗, 燃料效率, 资源管理, 海底

摘要: 迄今为止对丹麦和瑞典基于生命周期评价(LCA)的研究表明: 渔业, 特别是一些特定的鱼制品的生产可能成为环境热点问题。在渔业生产中, 燃料消耗是 LCA 中最重要的影响因素之一。不同的水产品, 如捕捞底栖鱼或贝类与远洋捕鱼或工业捕鱼相比燃料消耗差别很大。即使对同一种鱼, 单位捕鱼设备量的燃料消耗随着捕鱼设施和渔船尺寸的不同也变化很大。作者认为, 研究这些不同能够帮助改进渔业的燃料效率, 与此同时还应兼顾保护海底物种栖息环境以及减少副产品丢弃等目标。

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Energy Consumption in the Danish Fishery

Mikkel Thrane

KEYWORDS:

life-cycle assessment (LCA), fishing gear, fuel consumption, fuel efficiency, resource management, seafloor

SUMMARY:

Previous studies based on life-cycle assessment (LCA) in Denmark and Sweden have shown that the fishery is the environmental "hot spot" in the life cycle of certain fish products. Within the fishery, fuel consumption is one of the most important factors addressed by LCA. The present study reveals that there are great differences in fuel consumption between fisheries targeting groundfish or shellfish and those targeting pelagic fish or industrial fish. Here, I show that fuel consumption per kilogram of caught fish varies considerably as a function of fishing gear and vessel size, even considering the same target species. I argue that these differences need to be addressed in the search for a fuel-efficient fishery. Improvements in fuel efficiency may be consistent with other objectives, such as reduced impacts on seafloor habitats and reduced discard.

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题目: 发展中国家的贸易、物流与经济发展: 智利案例

作者: Stefan Giljum

关键字: 环境影响, 国际贸易, 材料流分析(MFA), 资源使用指标, 社会代谢, 评价

摘要: 材料流分析(MFA)是一个在国际上广泛采用的评价社会生物物理代谢、综合分析人类活动环境压力的工具。许多经合组织(OECD)国家已经对其经济体内的材料流状况开展核算。但对发展中国家而言, 相关研究还很不充分。本文第一次提出了智利的材料流指标体系。从 1973 到 2000 年是智利经济积极参与国际市场的转型期, 本文分析了这一期间的智利自然资源的使用情况, 并把重点放在了与国际贸易相关的材料流。结果显示智利经济的材料输入大约增长了 6 倍, 主要是鼓励资源密集型矿产、水果、林产品与渔业产品出口所致。智利目前人均年资源使用量超过 40 吨, 居世界前列。MFA 方法的缺点是只提供了基于质量的分析结果, 却没有把它们与环境影响很好地联系起来。本文提出了一些改进 MFA 方法、扩展 MFA 框架的建议, 以期 MFA 能更好的用于政策制定。

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Trade, Material Flows and Economic Development in the South: The Example of Chile

Stefan Giljum

KEYWORDS:

environmental impacts, international trade, materials flow analysis (MFA), resource use indicators, societal metabolism, valuation

SUMMARY:

Materials flow analysis (MFA) is internationally recognized as a key tool to assess the biophysical metabolism of societies and to provide aggregated indicators for environmental pressures of human activities. Economy-wide MFAs have been compiled for a number of Organisation for Economic Cooperation and Development (OECD) countries, but so far very few studies exist for countries in the South. In this article, the first materials-flow-based indicators for Chile are presented. The article analyzes the restructuring of the Chilean economy toward an active integration in the world markets from the perspective of natural resource use in a time series from 1973 to 2000. Special emphasis is placed on the assessment of materials flows related to Chile's international trade relations. Results show that material inputs to the Chilean economy increased by a factor of 6, mainly as a result of the promotion of resource-intensive exports from the mining, fruit growing, forestry, and fishery sectors. At more than 40 tons, Chile's resource use per capita at present is one of the highest in the world. The article addresses the main shortcomings of the MFA approach, such as weight-based aggregation and the missing links between environmental pressures and impacts, and gives suggestions for methodological improvements and possible extensions of the MFA framework, with the intent of developing MFA into a more powerful tool for policy use.