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## 《产业生态学报》

1997年冬, 第1卷第3期, 15-46页

题目: 从生命周期角度出发进行购买和使用对环境有益的纸张: 造纸行业工作组报告的摘要

作者: Lauren Blum, Richard A. Denison, John F. Ruston

关键字: 生命周期评价, 物质选择, 纸张回收, 获取, 纸浆以及造纸工业, 可持续森林管理

摘要: 纸业工作组是在美国环境保护基金会(EDF)召集下由美国主要纸张采购商参加的机构, 该工作组刚刚完成了一项旨在考察不同等级纸张的经济、性能和环境问题的生命周期评价研究。这个耗时 28 个月的最终报告刚刚公布, 目的是使纸张采购商了解他们采购纸张决定的后果。报告还提供了可以增加购买和使用环境友好纸张的操作指南, 这些环境友好纸张可以在满足商业需求同时降低环境影响。纸业工作组建议的技术基础来自于对一项对不同等级纸张从森林到垃圾填埋场全过程环境影响的生命周期评价。纸业工作组的发现和建议涉及减少纸张使用环境影响各方面主要机会: 减少纸张使用、纸张回收和购买再生纸、森林管理、纸浆和纸张生产。

## Journal of Industrial Ecology

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A Life-cycle Approach to Purchasing and Using Environmentally Preferable Paper: A Summary of the Paper Task Force Report

Lauren Blum, Richard A. Denison and John F. Ruston

**Keywords:**

life cycle assessment, materials choice, paper recycling, procurement, pulp and paper industry, sustainable forest management

**Summary:**

The Paper Task Force, a group of major U.S. paper purchasers convened by the Environmental Defense Fund (EDF), recently completed a life cycle-based study of various grades of paper that examined a broad range of economic, functional, and especially environmental issues. This 28-month effort culminated in the release of a final report and recommendations intended to educate paper purchasers about the consequences of their paper purchasing decisions. The report also provides actionable steps that can be taken to increase the purchase and use of environmentally preferable paper, defined as paper that reduces environmental impacts while meeting business needs. The technical basis for the Paper Task Force recommendations is an analysis of environmental impacts associated with the entire life cycle of several major grades of paper, reaching literally from the forest to the landfill. The Task Force's findings and recommendations cover each of the major areas of opportunity to lessen the environmental impacts of using paper: reduction in paper use; paper recycling and buying recycled paper; forest management; and pulp and paper manufacturing.

## 《产业生态学报》

1997年冬, 第1卷第3期, 47-68页

## 题目: 迈向可持续的纸循环: 综述

作者: Maryanne Grieg-Gran, Stephen Bass, Joshua Bishop, Sarah Roberts, Nick Robins, Richard Sandbrook, Michael Bazett, Varsha Gadhvi, Susan Subak

关键字: 生命周期评价, 材料选择, 纸张回收, 造纸工业, 可持续发展, 可持续森林管理

摘要: 作为一个重要的经济活动, 以经济价值计算, 纸张行业占世界工业总产出的 2.5% 以及世界贸易额的 2%。纸产品对于教育、沟通、包装以及健康起到了重要的作用。近些年来, 纸的回收已经成为影响森林的环境问题, 以及来自于生产和废物的关注焦点。为解决这些问题, 世界可持续发展工商委员会(WBCSD)聘请了世界环境和发展研究所(IIED)来分析纸张再循环的可持续性。该研究的第 1 阶段集中回顾关于纸张再循环的相关文献, 以识别该领域的主要争论以及知识上的不足。接着, 进行了关于纸张回收各方面的大范围的研究和咨询项目。本文总结了对生命周期不同阶段研究的主要发现, 它们包括: 对森林的影响, 木材供应的前景, 非木质纤维的作用, 纸浆和纸张生产的环境和社会影响, 废纸的使用选择以及纸张再循环对于温室气体排放的影响。文章还对制浆造纸行业、政府、国际组织、消费者和非政府组织提出了一系列建议。

## Journal of Industrial Ecology

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## Towards a Sustainable Paper Cycle: A Summary

Maryanne Grieg-Gran, Stephen Bass, Joshua Bishop, Sarah Roberts, Nick Robins, Richard Sandbrook, Michael Bazett, Varsha Gadhvi and Susan Subak

**Keywords:**

life cycle assessment, materials choice, paper recycling, pulp and paper industry, sustainable development, sustainable forest management

**Summary:**

The production of paper is a key economic activity accounting in value terms for about 2.5% of the world's industrial production and 2% of world trade. Paper products make a vital contribution to education, communications, packaging, and health care. In recent years the paper cycle has become the focus of environmental concerns about the impacts of forestry, pollution from manufacturing, and waste. To address these concerns, the World Business Council for Sustainable Development commissioned the International Institute for Environment and Development (IIED) to examine the sustainability of the paper cycle. The first phase of the study involved a review of literature related to the paper cycle to identify the main debates and gaps in knowledge. This was followed by a wide-ranging program of research and consultation on various aspects of the paper cycle. This article summarizes the key findings of the study for different stages of the cycle covering issues such as the impacts of forestry, the outlook for fiber supply, the role of nonwood fiber; the environmental and social impacts of pulp and paper manufacturing, the choice of options for wastepaper and the contribution of the paper cycle to greenhouse gas emissions. The study makes a number of recommendations for the pulp and paper industry, governments, international agencies, consumers, and nongovernmental organizations.

## 《产业生态学报》

1997年冬, 第1卷第3期, 69-85页

**题目: 美国造纸工业及其可持续生产展望**

作者: Maureen Smith

**关键字:** 材料政策, 非木质纤维, 污染预防, 纸浆和造纸业, 固体废物管理, 减少木材消耗

**摘要:** 在过去的 15 年中, 美国造纸行业不寻常地成为环境关注的焦点。这些关注主要集中在该行业在森林和生物多样性减少、城市固体废物管理危机以及各种有毒化学污染等问题中所扮演的角色。虽然这些问题传统上是独力的环境政策领域, 但随着造纸业在这些领域的影响日益突出, 导致各方面的环境关注集中到纸张生产和消费和造纸行业本身的现状。本文建议现代工业结构自身应该建立在一个更加综合的环境视野之上, 以便能够有效平衡可持续发展的社会、经济以及生态目标。我们正是以此为出发点展开对纸张回收和非木质纤维使用这两个问题的讨论。文章结论是开展造纸行业的环境分析可以用来帮助制定该行业未来的发展战略构想, 并设计有效的公共政策和战略。

## Journal of Industrial Ecology

1997, Vol. 1, Issue 3, pp. 69-85

**Perspectives on the U.S. Paper Industry and Sustainable Production**

Maureen Smith

**Keywords:**

materials policy, nonwood fibers, pollution prevention, pulp and paper industry, solid waste management, wood use reduction

**Summary:**

In the past decade and a half, the U.S. paper industry became the target of an unusual convergence of environmental concerns. These concerns have focused on the industry's role in forest and biodiversity depletion, the municipal solid waste management crisis, and various toxic chemical pollution problems. Although such concerns are traditionally treated as distinct environmental policy areas, the prominence of the paper industry's impacts in each area gave rise to an increasingly integrated environmental perspective fixed on the system of paper production and consumption, and on the paper industry itself. The argument advanced here suggests that the structure of the modern industry itself must be a central focus in a more integrated environmental perspective that can meaningfully accommodate the multiple social, economic, and ecological goals of sustainability. Two issues, paper recycling and the use of nonwood fiber sources, are discussed from this point of view. The article concludes with a discussion of how a sectoral analysis of environmental problems can be used to frame a comprehensive strategic vision of alternative futures in the industry, and to design effective public policies and strategies.

## 《产业生态学报》

1997 年冬, 第 1 卷第 3 期, 125-145 页

题目: 寻求保护森林的杠杆作用: 美国林产品的产业生态学

作者: Iddo K. Wernick, Paul E. Waggoner, Jesse H. Ausubel

关键字: 林地, 森林管理, 产业生态学, 使用强度, 物质效率, 伐木

**摘要:** 森林以及栖息其中的各种生命代表了自然界, 而伐木则代表了人类活动的影响。美国在 20 世纪 90 年代每年从森林砍伐的木材要比 1900 年多 70%。从 1900 年到现在, 人口增长了三倍以上, 人均 GDP 增长了近五倍。尽管人口增加, 财富增长, 以及砍伐量加剧, 但是美国的森林面积基本保持不变。自 20 世纪中叶以来, 木材积蓄量增加了近 30%。正是消费者、木材加工和森林企业在生产和消费方式、伦理标准和技术方面的改变导致了这种结果。我们从森林产业生态学的角度检查了上述参与者在保护森林中的杠杆作用。在 20 世纪, 消费者单位 GDP 林制品使用强度每年减少 2.5%, 从而抵消了人口增长和人均 GDP 增长的效果, 这个趋势可以保持或者降低预期人口和财富增长带来的木材消费。木材加工在利用木材方面的效率提高, 并且通过回收生产废料来回收能源和木材。森林企业已经可以使得树木在更小的林地上生长、收割, 并且具有更高的生长率。高效森林生产以及对林产品需求的稳定甚至下降, 使得更多的美国森林可以发挥自然界固碳、生态系统服务以及自然栖息地等作用。

## Journal of Industrial Ecology

1997, Vol. 1, Issue 3, pp. 125-145

**Searching for Leverage to Conserve Forests: The Industrial Ecology of Wood Products in the U.S.**

Iddo K. Wernick, Paul E. Waggoner and Jesse H. Ausubel

**Keywords:**

forest land, forest management, industrial ecology, intensity of use, material efficiency, timber removals

**Summary:**

The forest and the creatures it shelters exemplify nature, and logging exemplifies the impacts of humans. In the 1990s Americans annually removed 70% more timber from the forest than in 1900. Since 1900 population rose more than three times and gross domestic product (GDP) per person almost five. Despite more people, affluence, and logging, U.S. forest area remained constant. Since mid-century, standing timber volume rose nearly 30%. Consumers, millers, and foresters, responding to changes in style, ethics, and technology, have contributed to these outcomes. We examine the role of each actor in the industrial ecology of forests for their leverage for sparing forests. Consumers lessened their use of wood products per GDP (Intensity of Use) during the century by 2.5% annually to offset expanding population and GDP per person, a trend that will level or lower timber consumption if population and affluence grow as expected. Millers became highly efficient at utilizing wood and recycled fiber for their material or energy, a success that limits their future leverage. Foresters have leverage to grow trees faster and thus use less forest land to grow and harvest timber. Steady or declining demand for trees coupled to productive forests could spare more U.S. forest land for sequestering carbon, ecosystem services, and habitat for nature.

## 《产业生态学报》

1997年冬, 第1卷第3期, 147-168页

题目: 美国制浆和造纸行业物质和能量使用规律

作者: Matthias Ruth, Thomas Harrington

关键字: 动力学模型, 工业能源使用, 制浆木材, 纸张回收, 技术变化, 废纸

摘要: 本文介绍一个美国制浆和造纸行业开发的动态计算机模型, 用来帮助组织该行业的大量数据和研究该行业未来可能的物质和能源使用。我们采用一系列不同的纸张和纸板需求量增长、废纸利用率变化和行业技术传播速度的情景, 来研究该行业在 1988-2000 年期间的物质和能量使用状况。通过这个研究, 我们得到以下几个结论。首先, 在产量略微增长的前提下, 要稳定或者减少纸浆和纸张行业的总能耗, 行业节能率必须达到 1972-1992 年期间平均节能率的两倍以上。其次, 为维持或者增加该行业对生物质燃料的使用, 需要采用下列一个或多个方法, 例如迅速推广节能技术, 或者降低不断增长的废纸利用率。此外, 不断提高废纸回用率能够用再生纸替代纸浆用木材。然而, 即使是在废纸回用率超过 50%, 甚至到 2020 年废纸回用率翻三番的假设情况下, 纸浆用木材的总消费量仍然会不断上升, 以满足不断增长的纸张和纸板需求。

## Journal of Industrial Ecology

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Dynamics of Material and Energy Use in US Pulp and Paper Manufacturing

Matthias Ruth and Thomas Harrington

## Keywords:

dynamic modeling, industrial energy use, pulpwood, paper recycling, technical change, wastepaper

## Summary:

This article presents a dynamic computer model of U.S. pulp and paper production to facilitate organization of diverse industry data and to investigate the industry's likely material and energy use in the future. A set of probable scenarios of growth in paper and paperboard production, wastepaper utilization rates, and diffusion of technologies within the industry is used to assess the realm of material and energy use profiles for the period 1988-2020.

Several conclusions emerge from this study. First, stabilizing or reducing total energy consumption in pulp and paper production, in combination with moderate production growth, requires that future annual increases in energy efficiency must be almost twice as high as the efficiency improvements achieved for the period 1972-1992. Second, to maintain or increase the industry's use of biomass fuels depends on one or a combination of different approaches, such as rapid dissemination of energy-saving technology, or reduction in the rate of growth of wastepaper utilization. Third, increased wastepaper utilization rates lead to a significant replacement of pulpwood by recycled fiber. Yet total pulpwood consumption continues to increase to satisfy the requirements of increased paper and paperboard production, even under the assumption that the wastepaper utilization rate passes 50% and wastepaper utilization triples by the year 2020.