Национальное научное агентство Австралии

# Разработка системы учета материальных потоков (УМП) для глобального уровня

## 7-й совместный семинар ОЭСР/ЕЭК ООН по внедрению СЭЭУ

Хайнц Шандль| 31 марта 2022 г.

WU WIRTSCHAFTS UNIVERSITÄT WIEN VIENNA UNIVERSITY OF ECONOMICS AND BUSINESS

THE UNIVERSITY OF SYDNEY

BOKU University of Natural Resources and Life Sciences, Vienna

名古屋大学 NAGOYA UNIVERSITY

NORTHEASTERN UNIVERSITY 1923

# Десятилетие развития базы знаний о глобальном материальном потоке, ЮНЕП и партнеры

- Применение науки для разработки политики на основе фактических данных
- Объединение экологической и экономической политики
- Формирование глобальной базы знаний по использованию материалов (территориальная/производственная база и база конечного спроса)
- Совместная разработка политических целей и доступ к данным
- Предоставление данных и показателей для Целей устойчивого развития и Инициативы по данным СЭЭУ

# 2013

Ecological Economics
Volume 94, October 2013, Pages 19-27

Analysis

## Material use and material efficiency in Latin America and the Caribbean

James West [a], Heinz Schandl [a, b]


Global Environmental Change
Volume 20, Issue 4, October 2010, Pages 636-647

## Resource use and resource efficiency in the Asia–Pacific region

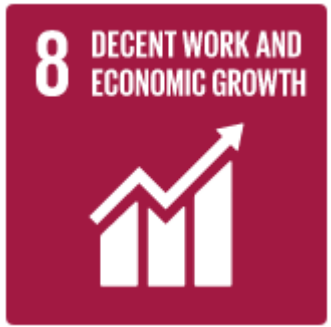
Heinz Schandl, Jim West


Отчет о политике и экспертная оценка

Перевод на испанский язык ‘Tendencias del flujo materiales y productividad de recursos en América Latina’

2014

# На пути к достижению ЦУР





Документы для обсуждений ЮНЕП
Цели и показатели устойчивого потребления и производства (УПП) и ЦУР, 2014 г.
МИУР и Государственное объединение научных и прикладных исследований
Показатели устойчивого потребления и производства для будущих ЦУР, март 2015 г.
МИУР, Государственное объединение научных и прикладных исследований и ЮНЕП

2015

# The material footprint of nations

Thomas O. Wiedmann[a,b,c,1], Heinz Schandl[b,d], Manfred Lenzen[c], Daniel Moran[c,e], Sangwon Suh[f], James West[b], and Keiichiro Kanemoto[c,g]

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Edited by Joan Martínez Alier, Autonomous University of Barcelona, Barcelona, Spain, and accepted by the Editorial Board August 1, 2013 (received for review November 30, 2012)

**Metrics on resource productivity currently used by governments suggest that some developed countries have increased the use of natural resources at a slower rate than economic growth (relative decoupling) or have even managed to use fewer resources over time (absolute decoupling). Using the material footprint (MF), a consumption-based indicator of resource use, we find the contrary: Achievements in decoupling in advanced economies are smaller than reported or even nonexistent. We present a time series analysis of the MF of 186 countries and identify material flows associated with global production and consumption networks in unprecedented specificity. By calculating raw material equivalents of international trade, we demonstrate that countries' use of nondomestic resources is, on average, about threefold larger than the physical quantity of traded goods. As wealth grows, countries tend to reduce their domestic portion of materials extraction through international trade, whereas the overall mass of material consumption generally increases. With every 10% increase in gross domestic product, the average national MF increases by 6%. Our findings call into question the sole use of current resource productivity indicators in policy making and suggest the necessity of an additional focus on consumption-based accounting for natural resource use.**

raw material consumption | multiregion input–output analysis | sustainable resource management

plus all physical imports minus all physical exports). It does not include the upstream raw materials related to imports and exports originating from outside of the focal economy.

This truncation might mislead assessments of national resource productivity and supply security of natural resources as the increasing spatial separation of production and consumption in global supply chains leads to a shift of resource use and associated environmental pressures among countries. This has been demonstrated well for greenhouse gas emissions (9–11), land use (12, 13), water use (14–17), and threats to species (18). The "carbon footprint" indicator has especially been used to quantify and monitor carbon leakage among countries (19). Although the direct and indirect flow of materials across nations has been studied well (20–27), a consumption-based material flow indicator equivalent to the carbon footprint has only recently been investigated more closely using the notion of raw material consumption (RMC) (28–35).

Because of its analogy to other footprint indicators (14, 17, 36), we suggest using the term "material footprint" (MF) for this indicator and define it as the global allocation of used raw material extraction to the final demand of an economy. In contrast to indicators of standard economy-wide material flow accounting, which are based on apparent physical consumption (35, 37–39), the MF does not record the actual physical movement of materials

2016

RESEARCH AND ANALYSIS

# Global Material Flows and Resource Productivity

## Forty Years of Evidence

*Heinz Schandl,[1,2] Marina Fischer-Kowalski,[3] James West,[1] Stefan Giljum,[4] Monika Dittrich,[5] Nina Eisenmenger,[3] Arne Geschke,[6] Mirko Lieber,[4] Hanspeter Wieland,[4] Anke Schaffartzik,[3] Fridolin Krausmann,[3] Sylvia Gierlinger,[3] Karin Hosking,[1] Manfred Lenzen,[6] Hiroki Tanikawa,[7] Alessio Miatto,[7] and Tomer Fishman[7]*

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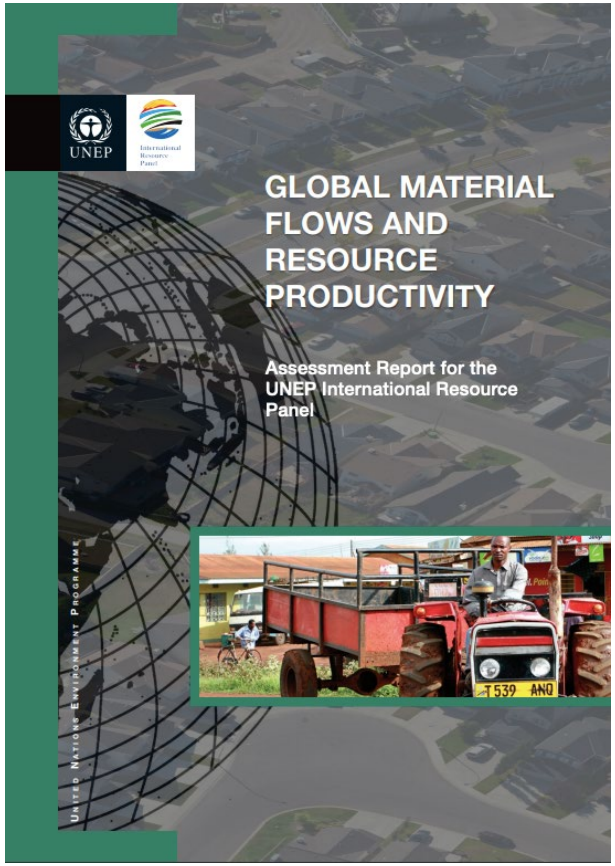
**Keywords:**

environmental policy
global material flows
industrial ecology
material flow accounting (MFA)
resource productivity
trade

**Summary**

The international industrial ecology (IE) research community and United Nations (UN) Environment have, for the first time, agreed on an authoritative and comprehensive data set for global material extraction and trade covering 40 years of global economic activity and natural resource use. This new data set is becoming the standard information source for decision making at the UN in the context of the post-2015 development agenda, which acknowledges the strong links between sustainable natural resource management, economic prosperity, and human well-being. Only if economic growth and



2016

**National 4+ categories material flows** | **National 13+ categories material flows** | **National material totals and ratios**

Filter countries: Select countries

Filter categories: Select categories

Filter flow types: Select flow types

| Country | Category | Flow | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|---|---|
| Afghanistan | Biomass | DE | 29,427,854 | 28,777,035 | 27,200,896 | 29,147,772 | 30,519,158 |
| Afghanistan | Biomass | DMC | 29,476,560 | 29,136,965 | 27,290,656 | 29,112,673 | 30,433,539 |
| Afghanistan | Biomass | DMI | 29,617,873 | 29,282,898 | 27,485,608 | 29,306,247 | 30,656,605 |
| Afghanistan | Biomass | EXP | 141,313 | 145,933 | 194,952 | 193,574 | 223,066 |
| Afghanistan | Biomass | IMP | 190,019 | 505,863 | 284,712 | 158,475 | 137,447 |
| Afghanistan | Biomass | MF | 20,572,390 | 20,415,010 | 18,274,760 | 19,127,390 | 20,290,270 |
| Afghanistan | Biomass | PTB | 48,706 | 359,930 | 89,760 | -35,099 | -85,619 |
| Afghanistan | Biomass | RME_EXP | 16,001,040 | 15,485,140 | 15,970,290 | 17,176,940 | 17,773,520 |
| Afghanistan | Biomass | RME_IMP | 7,145,576 | 7,123,111 | 7,044,155 | 7,156,558 | 7,544,633 |

www.resourcepanel.org/global-material-flows-database

# Country Profile for Germany

2019

Download data for all sections

**MATERIAL USE**
20.3 ↘
MATERIAL FOOTPRINT/CAPITA
(IN TONNES/CAPITA)

**GHG EMISSIONS**
9.1 ↘
CARBON FOOTPRINT
(IN TONNES $CO_2$ EQ./CAPITA)

**AIR POLLUTION**
9.2 ↘
DOMESTIC HEALTH IMPACTS
(IN MILLI-DALY/CAPITA)

**LAND USE**
0.9 ↘
LAND FOOTPRINT/CAPITA
(IN HA/CAPITA)

**WATER USE**
0.1 ↘
WATER FOOTPRINT/CAPITA
(IN 1000 $M^3$ $H_2O$/CAPITA)

**ENERGY USE**
202.5 ↗
ENERGY FOOTPRINT/CAPITA
(IN KJ/CAPITA)

**WATER POLLUTION**
34.3 ↘
DOMESTIC WATER POLLUTION
(IN KG/CAPITA)

## Raw material use and depletion

Our society, its production and **consumption systems**, build upon the use of **raw materials** such as biomass, fossil fuels, and minerals. With increasing material extraction, related environmental and social **impacts** are getting close or already **trespassing natural boundaries**.

The sustainable development goals (SDG) 8 (Decent work and economic growth) and 12 (Responsible consumption and production) target the achievement of a **sustainable management and efficient use of natural resources** by 2030. Also the circular economy aims at increasing material efficiency by slowing, closing, and narrowing energy and material loops.

scp-hat.lifecycleinitiative.org

2019


Тенденции 1970-2017 гг.

Перспективы развития до 2060 года

Последствия для экономики и политики

Последствия использования материалов для окружающей среды

2021


На основе данных Евростата и руководства ОЭСР

Адаптировано для глобального применения

Усовершенствованные методы и модульный подход

nature sustainability

ANALYSIS

https://doi.org/10.1038/s41893-021-00811-6

2022

Check for updates

# Implementing the material footprint to measure progress towards Sustainable Development Goals 8 and 12

Manfred Lenzen[1], Arne Geschke[1], James West[2], Jacob Fry[1], Arunima Malik[1,3], Stefan Giljum[4], Llorenç Milà i Canals[5], Pablo Piñero[4,6], Stephan Lutter[4], Thomas Wiedmann[7], Mengyu Li[1], Maartje Sevenster[2], Janez Potočnik[8], Izabella Teixeira[8], Merlyn Van Voore[8], Keisuke Nansai[9] and Heinz Schandl[2]✉

**Sustainable development depends on decoupling economic growth from resource use. The material footprint indicator accounts for environmental pressure related to a country's final demand. It measures material use across global supply-chain networks linking production and consumption. For this reason, it has been used as an indicator for two Sustainable Development Goals: 8.4 'resource efficiency improvements' and 12.2 'sustainable management of natural resources'. Currently, no reporting facility exists that provides global, detailed and timely information on countries' material footprints. We present a new collaborative research platform, based on multiregional input–output analysis, that enables countries to regularly produce, update and report detailed global material footprint accounts and monitor progress towards Sustainable Development Goals 8.4 and 12.2. We show that the global material footprint has quadrupled since 1970, driven mainly by emerging economies in the Asia-Pacific region, but with an indication of plateauing since 2014. Capital investments increasingly dominate over household consumption as the main driver. At current trends, absolute decoupling is unlikely to occur over the next few decades. The new collaborative research platform allows to elevate the material footprint to Tier I status in the SDG indicator framework and paves the way to broaden application of the platform to other environmental footprint indicators.**

# Текущая работа

- Онлайн учебные материалы и наращивание потенциала для НСО в области общеэкономических счетов материальных потоков (ЮНЕП, Найроби)
- Следующее обновление базы данных о глобальных материальных потоках и продуктивности ресурсов и прогнозы для Глобальной ресурсной перспективы на 2023 год (Международная ресурсная группа ЮНЕП)
- Создание фонда глобального воздействия (ЮНЕП, Найроби)
- Укрепление и организационное оформление базы знаний
- Содействие нескольким политическим повесткам дня - сохранение ресурсов, круговая экономика, сокращение выбросов парниковых газов (МГЭИК), сохранение биоразнообразия и здоровья экосистем (МНПБЭУ)

# Спасибо!

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