



Development of Material Flow Accounting (MFA) for the global level

7th Joint OECD/UNECE Seminar on Implementation of SEEA

Heinz Schandl | 31 March 2022



University of Natural Resources
and Life Sciences, Vienna





A Decade of Developing the Global Material Flow Knowledge Base, UNEP and partners

- Science for evidence based policy making
- Integration of environmental and economic policy
- Development of global knowledge base on material use (territorial/production and final demand base)
- Co-development of policy ambition and data availability
- Providing data and indicators for the Sustainable Development Goals and the SEEA Data Initiative



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, c}

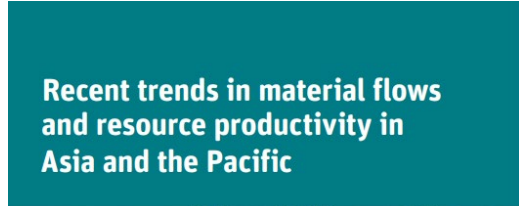


Global Environmental Change
Volume 20, Issue 4, October 2010, Pages 636-647



Resource use and resource efficiency in the Asia-Pacific region

Heinz Schandl ^{a, *}, Jim West



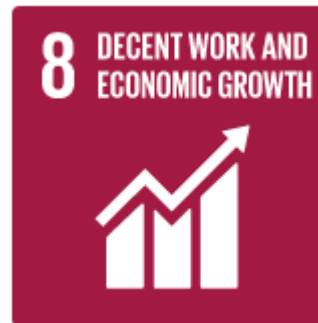
2013

Policy report and peer-review

Translation to Spanish

'Tendencias del flujo materiales y productividad de recursos en América Latina'

Towards the SDGs



UNEP Discussion Papers

Sustainable Consumption and Production (SCP) Targets and Indicators and the SDGs, 2014

IISD and CSIRO

Sustainable Consumption and Production Indicators for the Future SDGs, March 2015

IISD, CSIRO, and UNEP

The material footprint of nations

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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

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 Fishman⁷

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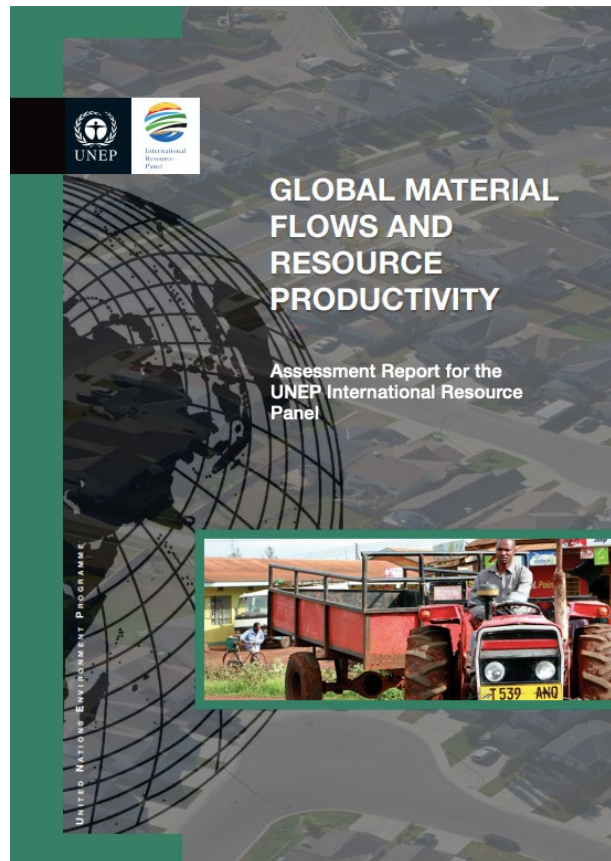
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Keywords:

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 ▼

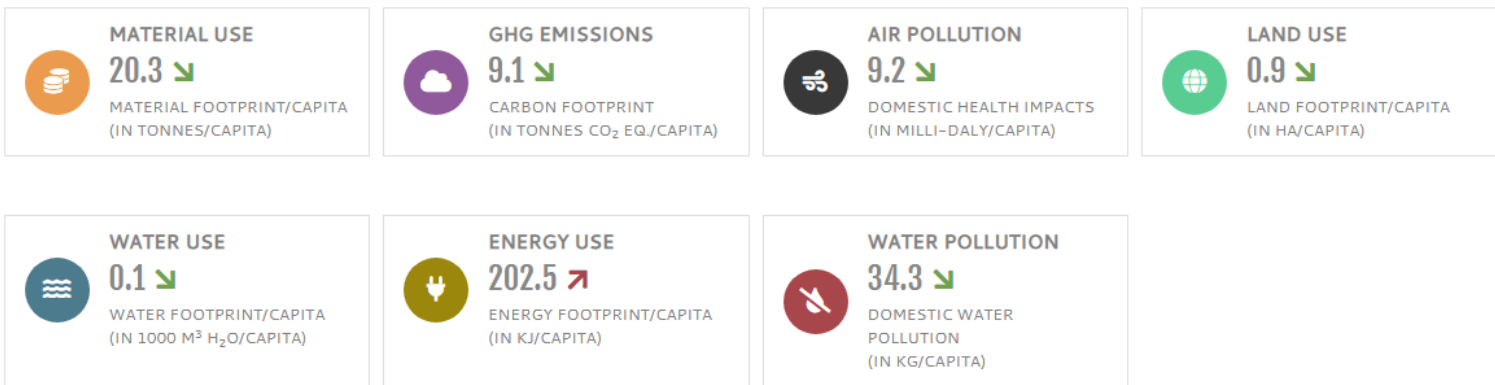
Filter categories: Select categories ▼

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

 Download data for all sections



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.



2019

GLOBAL RESOURCES OUTLOOK 2019

NATURAL RESOURCES FOR THE FUTURE WE WANT



Trends 1970-2017

Outlook to 2060

Economic and Policy
Implications

Environmental
impacts of material
use













Based on EUROSTAT and OECD guidance

Adapted for global application

Improved methods and modular approach



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

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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.



Ongoing work

- Online Training Materials and Capacity Building for NSOs for Economy-Wide Material Flow Accounts (UNEP Nairobi)
- Next update of the Global Material Flow and Resource Productivity Database and Scenarios for Global Resources Outlook 2023 (UNEP IRP)
- Building a Global Footprint Facility (UNEP Nairobi)
- Consolidating and institutionalising the knowledge base
- Contribution to several policy agendas – resource conservation, circular economy, GHG abatement (IPCC), Biodiversity Conservation and Ecosystem Health (IPBES)

Thank you

Land and Water/Sustainability Pathways

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