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International Resource Panel

GLOBAL MATERIAL FLOWS AND RESOURCE PRODUCTIVITY

Assessment Report for the UNEP International Resource Panel

United Nations Environment Programme

Acknowledgements

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We wish to thank all participants of the global material flows and resource productivity working group meeting in Tokyo, Japan on 24-25 September 2014: Chika Aoki-Suzuki, Souvik Bhattacharjya, Christelle Beyers, Shaofeng Chen, Anthony Chiu, Nicklas Forsell, Seiji Hashimoto, Yuri Hayashi, Yasuhiko Hotta, Masatoshi Kaneta, Satoshi Kojima, Shaoyi Li, Choudhury Rudra Charan Mohanty, Yuichi Moriguchi, Keisuke Nansai, Kazunobu Onogawa, Nobuhiko Shimizu, Sangwon Suh, Tomohiro Tasaki, Steven Textoris, Ryuji Tomisaka, Arnold Tukker, Maria Cristina Vallejo, Zhou Xin, and Koji Yamada. We are grateful to the Japanese Ministry of Environment and the Institute of Global Environmental Strategies (IGES) for hosting the working group meeting.

We thank all members of the regional reference group established for this report: Adel Abdel-Kader, Alicia Bárcena, Charles Davis, Ananda Dias, Stefanos Fotiou, Stephan Moll, Hitomi Rankine, Anna Stabrawa and Ron Witt.

We are very grateful to the peer-review coordinator A. Erinç Yeldan, reviewers Christelle Beyers, Shaofeng Chen, Anthony Chiu, Roland Clift, Satoshi Kojima, Simron Singh, Fatma Taskin and Tommy Wiedmann, and Minpeng Chen. We thank Shaoyi Li, Tomas Marques and Vera Günther of the Secretariat of the International Resource Panel.

Copy Editor: Karin Hosking

Design and layout: Valeta Designs

Printed by: UNESCO

Photos: istock

The full report should be referenced as UNEP (2016). Global Material Flows and Resource Productivity. An Assessment Study of the UNEP International Resource Panel. H. Schandl, M. Fischer-Kowalski, J. West, S. Giljum, M. Dittrich, N. Eisenmenger, A. Geschke, M. Lieber, H. P. Wieland, A. Schaffartzik, F. Krausmann, S. Gierlinger, K. Hosking, M. Lenzen, H. Tanikawa, A. Miatto, and T. Fishman. Paris, United Nations Environment Programme.

ISBN: 978-92-807-3554-3

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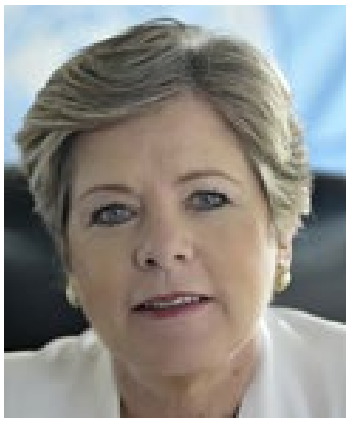
Preface

Janez Potočnik



Alicia Bárcena

In recent years, interest in resource efficiency and sustainable management of natural resources has increased considerably, standing out as one of the top priorities on the international political agenda.

With the historic adoption of the 2030 Agenda for Sustainable Development in September 2015 in New York, the international community committed itself to 17 Sustainable Development Goals to transform our world into a better place for current and future generations. It has been widely acknowledged that such a world can only be achieved and sustained if we better take care of, conserve and use natural resources and significantly improve resource efficiency in both consumption and production in the years to come. The SDGs emphasize the pressing need to decouple economic growth and human well-being from ever-increasing use of natural resources and related environmental impact.

As part of this historic recognition, the leaders of the G7, at their summit in Germany in 2015, decided to champion ambitious actions to improve resource efficiency as a core element of a broader strategy in pursuit of sustainable development.

All around the world, strategies and programmes that are mainstreaming sustainable natural resource management into national development plans are being designed and implemented. A growing number of countries are promulgating laws and regulations and implementing effective policy frameworks that support resource efficiency and guide investments into green and greening sectors of the economy.

Accurate, reliable data and scientific information are essential to economic planning and policymaking. Robust indicators are needed to measure progress with decoupling and resource efficiency and identify areas for improvement.

The International Resource Panel has produced several scientific assessment reports on resource efficiency and decoupling and is therefore in the perfect position to provide precisely such scientifically profound, policy-relevant information.

With this report, the Working Group on Global Material Flows of the International Resource Panel provides, for the first time, a comprehensive and harmonized data set of material use and movement in the global economy for the past 40 years. Based on this solid data set, it analyses status, trends, structure and dynamics of resource use, including extraction, trade and consumption of biomass,

fossil fuels, metal ores and non-metallic minerals. The report finds that global material use has tripled over the past four decades, with annual global extraction of materials growing from 22 billion tonnes (1970) to 70 billion tonnes (2010).

The report also provides a new material footprint indicator, reporting the amount of materials that are required for final consumption, which sheds light on the true impact of economies. By relating global supply chains to final demand for resources, the indicator is a good proxy for the average material standard of living in a country. It indicates that the level of development and well-being in wealthy industrial countries has been achieved largely through highly resource-intensive patterns of consumption and production, which are not sustainable, even less replicable to other parts of the world.

Hence, decoupling material use and related environmental impacts from economic growth is essential for ensuring the prosperity of human society and a healthy natural environment. But in order to be successful, decoupling efforts need to go beyond simple efficiency gains that arise from maturing economies.

This report also shows that consumption is the main driver of increased material use, more important than population growth in recent decades. With millions of people lifted out of poverty and a rapidly expanding middle class in the coming decades, a prosperous and equitable world calls for transformative changes in lifestyles and consumption behaviour.

The findings of this report have the potential to contribute significantly to many national and regional natural resource management and resource efficiency efforts and are particularly relevant for the implementation and monitoring of all decoupling-related Sustainable Development Goals over the next 14 years.

The International Resource Panel is committed to continuing to provide cutting-edge scientific knowledge on sustainable resource management and resource efficiency. We are very grateful to Heinz Schandl and Marina Fischer-Kowalski and their co-authors for their important contribution to the understanding of global material flows and resource productivity, and we are very much looking forward to the response of policy-makers and business leaders to the tremendous challenges, opportunities and implications highlighted in this report and data set.

Foreword

Ibrahim Thiaw

Natural resources provide the foundation of our lives on Earth. Water, soil, energy, minerals and metals underpin our standards of living. They feed and shelter us, and provide for our material needs throughout our lives.

Yet pressures on these natural resources are mounting. A growing population and heightened world economic demand in the past half century are rapidly depleting these vital resources, inflicting great harm on the natural environment and human health. In our ever-more globalized economy, sustainable management of natural resources will become increasingly important.

When the world's nations approved the Sustainable Development Goals in 2015, they set out a path towards solving some of these great challenges. These ambitious goals aim to eradicate poverty and sustain economic growth, while maintaining the natural resource base and planetary ecosystems for future generations. Turning the goals into reality will require concerted action by the entire world, developed and developing countries alike. For these reasons, we must better understand where and how natural resources are used.

This latest report from the International Resource Panel, Global Material Flows and Resource Productivity, provides a comprehensive, scientific overview of this important issue. It shows a great disparity of material consumption per capita between developing and developed countries. This has tremendous implications for achieving the SDGs in the next 14 years.

Global material use has been accelerating. Material extraction per capita increased from 7 to 10 tonnes from 1970 to 2010, indicating improvements in the material standard of living in many parts of the world. Domestic extraction of materials has grown everywhere to meet increased demand for materials. However, Europe and the Asia-Pacific region have not met all of their material demand from domestic extraction and have increasingly relied on large imports. Trade in materials is thus booming, driven mainly by consumption.

The report also lays bare the large gaps in material standards of living that exist between North America and Europe and all other world regions. Annual per capita material footprint for the Asia-Pacific, Latin America and the Caribbean, and West Asia is between 9 and 10 tonnes, or half that of

Europe and North America, which is about 20 to 25 tonnes per person. In contrast, Africa has an average material footprint of below 3 tonnes per capita. Such a distribution of materials supports unequal standards of living and highlights how much work will be needed to achieve sustainable development for all.

It is my sincere hope that the findings of this important assessment will inspire political and business leaders to take the action needed to achieve the SDGs.

I would like to express my gratitude to the International Resource Panel, under the leadership of Janez Potočnik and Alicia Bárcena, for developing this substantial report.

Ibrahim Thiaw
United Nations Assistant-Secretary-General
and UNEP Deputy Executive Director

Abbreviations

AMI	adjusted material intensity
BRIC	Brazil, Russia, India, China
CSIRO	Commonwealth Scientific and Industrial Research Organisation (Australia)
DE	domestic extraction
DMC	domestic material consumption
EEA	European Environmental Agency
EECCA	Eastern Europe, Caucasus and Central Asia
EF	energy footprint
EROEI	energy return on energy invested
ETM	elaborately transformed manufactures
FAO	Food and Agriculture Organization of the United Nations
GDP	gross domestic product
GFC	global financial crisis
GHG	greenhouse gas
GHGF	GHG emissions footprint
GHGI	GHG intensity
HDI	human development index
IEA	International Energy Agency
IMF	International Monetary Fund
IPAT	I = P x A x T equation
IRP	International Resource Panel of the United Nations Environment Programme
MF	material flows
MI	material intensity
MJ	megajoules
MRIO	multi-regional input-output
n.e.c.	not elsewhere classified
OECD	Organisation for Economic Co-operation and Development
OPEC	Organization of the Petroleum Exporting Countries