PRESOURCE

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RESOURCE EFFICIENCY INDICATORS – A MACROECONOMIC VIEW

Transnational Workshop on Institutional Support Schemes and Structures for Resource Efficiency in SMEs, Berlin 2013

Macroeconomic view

- monitoring:
  - economy as whole

- required for policy making:
  - impact on enterprise level

Scope and Definition

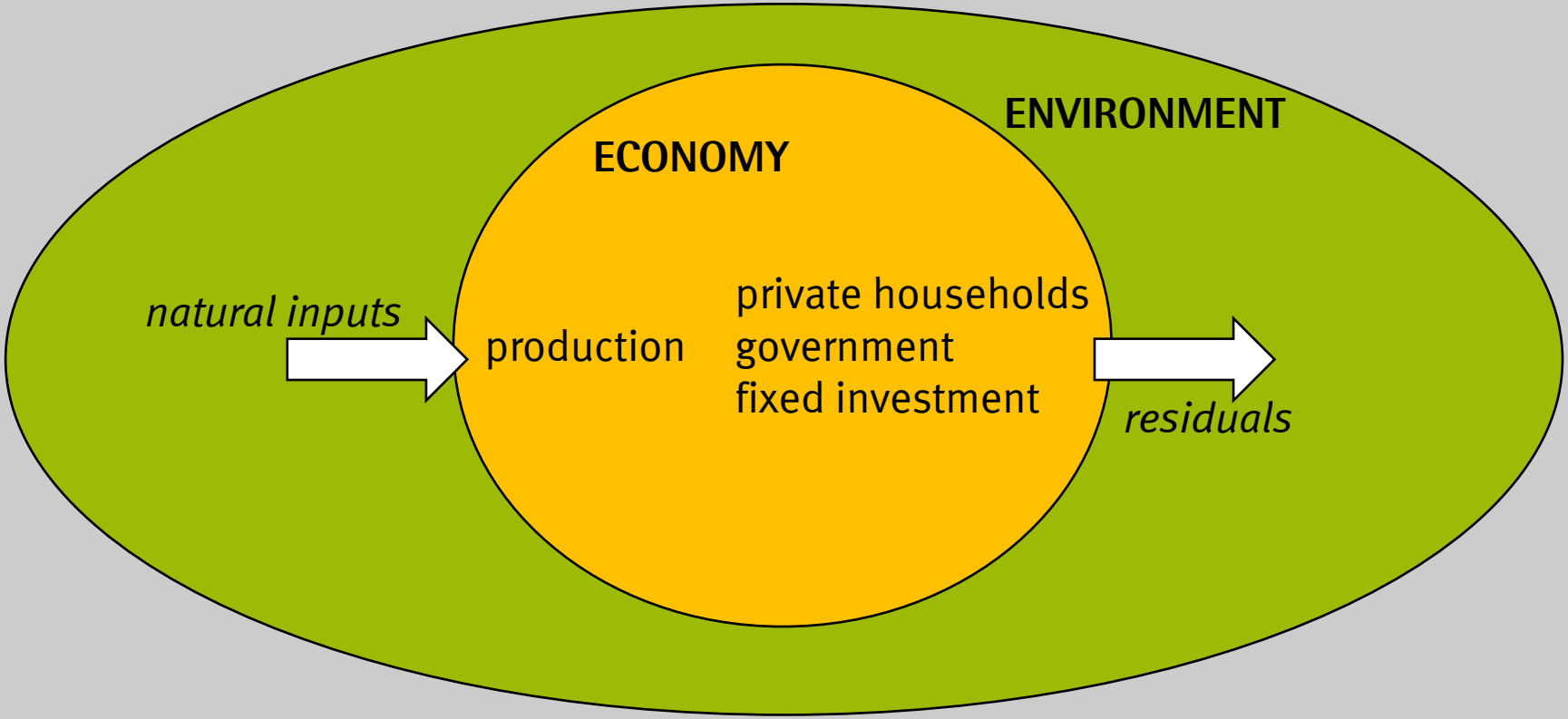
natural resources

- nature capital, usable for production or consumption
- material resources only:
  - no labour, no capital
  - no time
  - no energy, but fossil energy carriers
    (but there's energy accounts)
  - no water, no air
    (own sets of indicators)
- unit: tonne

➢ raw material = extracted natural resource

Scope and Definition

environment and economy

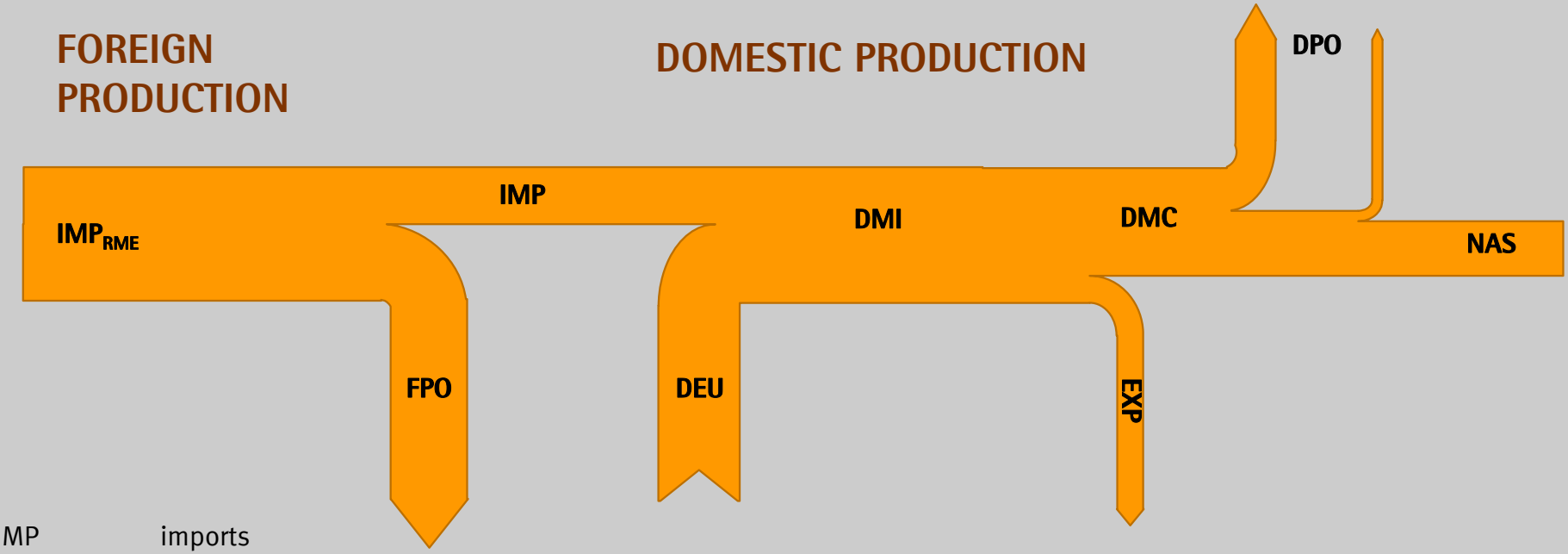


Scope and Definition

extraction (following SEEA-CF)

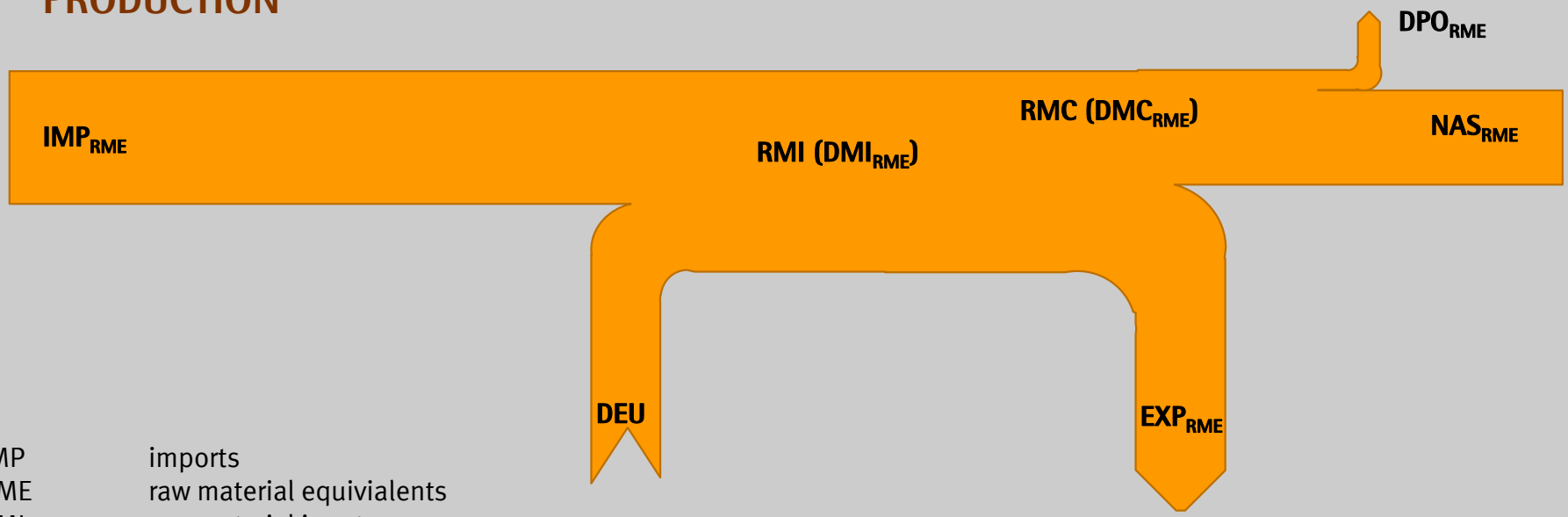
- **anthropogenic transport of material from environment into economy**
  - **used:** material enters economy for further processing or treatment
  - **resource residuals**
    - **unused extraction:** extractor does not what to keep material and directly transfers it back into environment
    - **reinjection:** extractor stores material in environment
    - **extraction losses:** material gets lost to environment during extraction

Material flow chart



IMP	imports
RME	raw material equivialents
FPO	foreign processed output
DEU	domestic extraction used
DMI	direct material input
DMC	domestic material consumption
EXP	exports
DPO	domestic processed output
NAS	net additions to stock

Material flow chart in RME



IMP	imports
RME	raw material equivialents
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DEU	domestic extraction used
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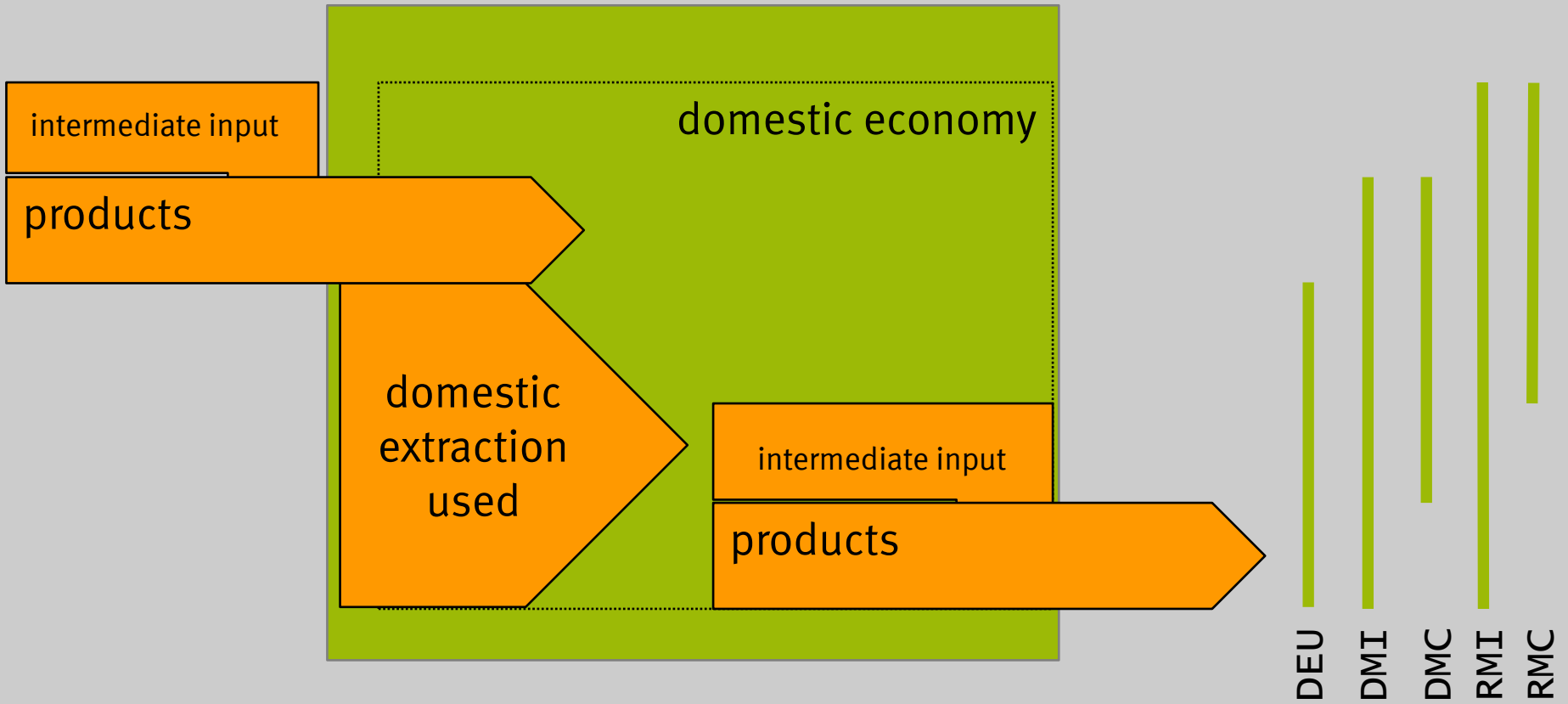
selected material flow indicators

relations



selected material flow indicators

what do they tell us

- **DEU:** amount of used material domestically extracted within a period
- **DMI:** amount of material used by domestic economy within a period
- **DMC:** DMI - exports
- **RMI:** amount of raw material needed to satisfy intermediate domestic consumption within a period (could be for export or final domestic demand)
- **RMC:** amount of raw material needed to satisfy final domestic demand within a period

selected material flow indicators

additivity

- geographically
  - Σ_{World} DEU = Σ_{World} DMC = Σ_{World} RMC
    = global used extraction
    = global (raw) material consumption
  - Σ_{EU} DEU ≠ Σ_{EU} DMC ≠ Σ_{EU} RMC, but:
  - Σ_{EU} DEU = used extraction within Europe
  - Σ_{EU} DMC = material consumption within Europe
  - Σ_{EU} RMC = material consumption in RME within Europe
  - DMI, RMI: no geographical additivity

selected material flow indicators

which is the correct indicator?

- depending on the question
- each indictor answers to specific questions
  - resources‘ extraction
  - resources‘ consumption
  - final resources‘ demand
- but, ought implies can

selected material flow indicators

production

- DEU, DMI, DMC
  - based on statistical sources
    - production surveys (industries, agriculture)
    - administrative sources (geological surveys)
    - foreign trade statistics
- RMI, RMC
  - based on the above, and
    - economic models (IOT analysis)
    - LCA-analysis (cradle-to-factory-gate)

selected material flow indicators

availability

- European level
  - DEU, DMI, DMC
    - EU regulation in force
    - data should be available for all Member States
    - quite detailed by resource
  - RMI, RMC
    - project for “EU total”
    - external contractor
    - detailed by resource and industry starting 2000

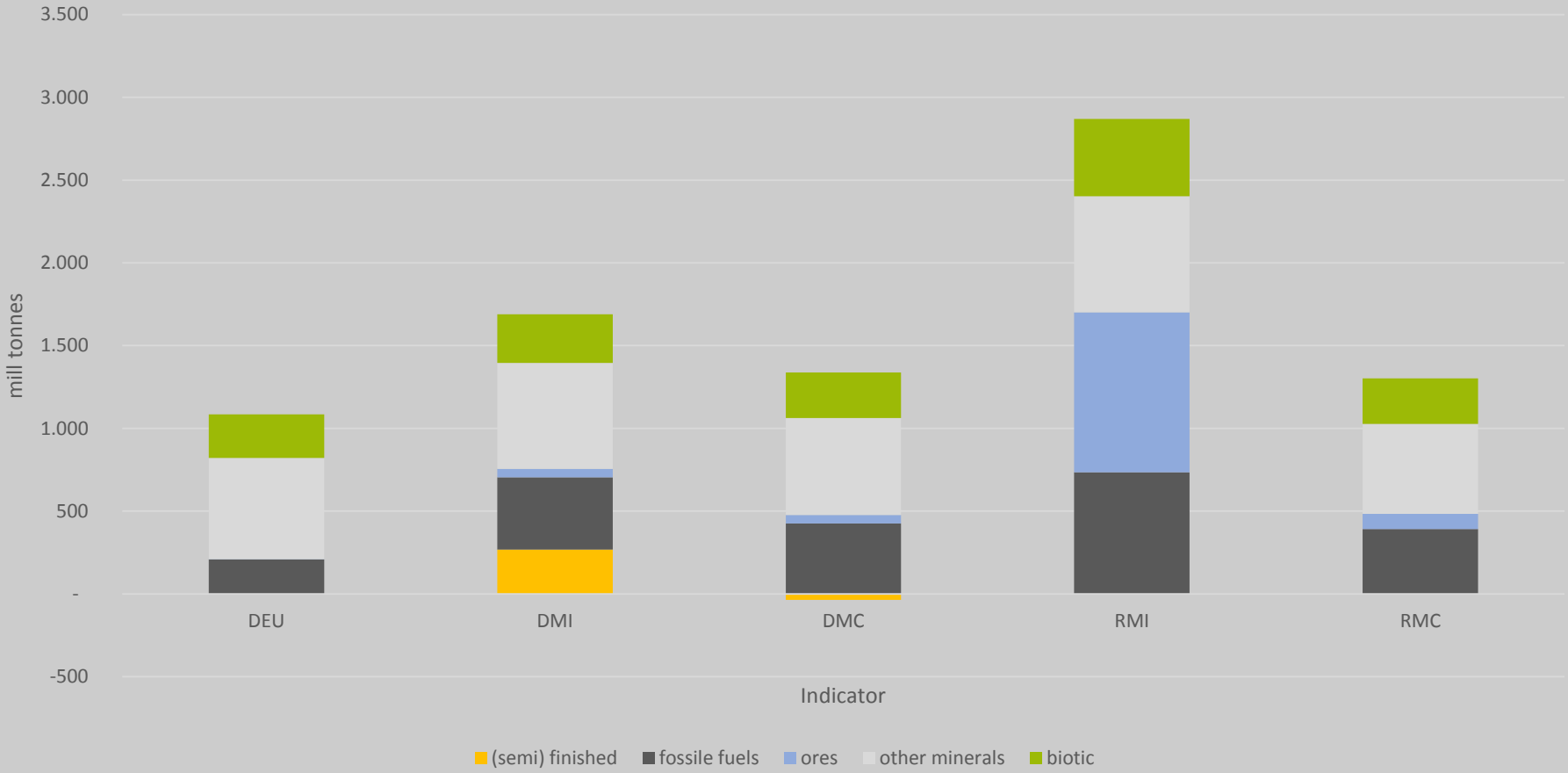
selected material flow indicators

availability

- Germany
  - DEU, DMI, DMC
    - long time series
    - very detailed by resource
  - RMI, RMC
    - time series back to 2000
    - detailed information starting 2008 currently up to 2009
    - Data for 2010 in Q1 2014

selected material flow indicators

Germany 2008



National Strategy for Sustainable Development

intergenerational equity

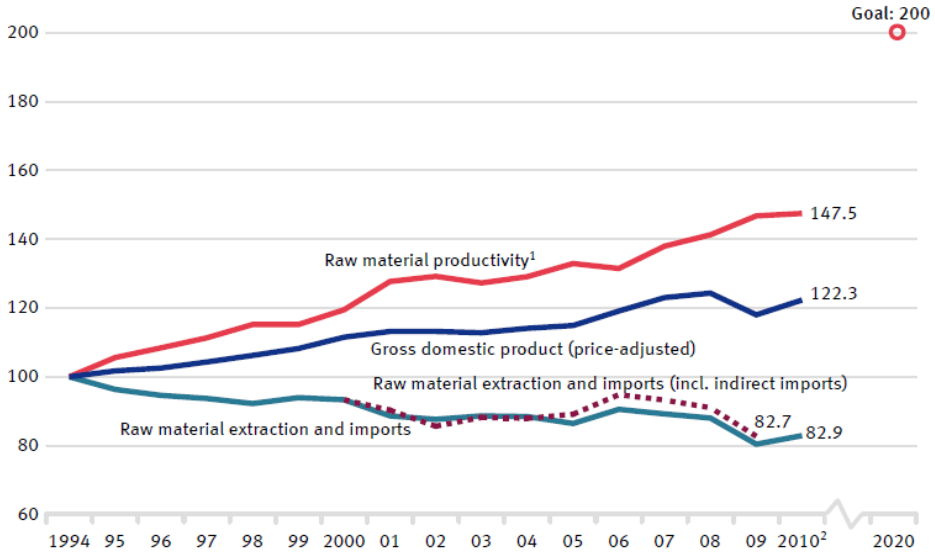
- resource conservation
  "using resources economically and efficiently"
  - energy productivity
  - primary energy consumption
  - "raw material productivity"
    - $\frac{\text{GDP}}{\text{DMI}_{\text{abiot}}}$
    - target: 1990 -› 2020: +100%

I. Intergenerational equity

Resource conservation

Using resources economically and efficiently

Raw material productivity and economic growth
1994 = 100



1 Abiotic. 2 Preliminary results.

1c Raw material productivity

The use of raw materials is indispensable to economic development. However it also has environmental implications. Moreover, the non-renewable natural resources consumed today will no longer be available to future generations. For many companies, raw materials represent important input factors and hence cost factors. The economical and efficient use of raw materials therefore lies in the interest of all social groups. The Federal Government is pursuing the target of doubling raw material productivity by 2020 from the level recorded in the base year of 1994.

Raw material productivity expresses how much gross domestic product (in euros, adjusted for price) is obtained per tonne of abiotic primary material used. Abiotic primary materials include the raw materials taken from domestic natural sources – excluding agricultural and forestry products – as well as all imported abiotic materials (raw materials, semi-finished and finished products).

Raw material productivity increased by 47.5 % between 1994 and 2010. While

National Strategy for Sustainable Development

"raw material productivity"

- based on DMI_{abiot}
  - technically speaking:
    - not raw material productivity, but
    - material productivity
  - no biotic resources included
    - they renew themselves, but
    - limitation per period -› competition

National Strategy for Sustainable Development

"raw material productivity"

- based on DMI_{abiot}
  - target:
    - increasing productivity (by 100%)
    - not absolute reduction of resource use/extraction
    - absolute reduction of DMI not effective
      - separate DMI interpretation difficult
      - DMI measures to some extend economic integration; productivity calculation partly overcomes this problem

European Headline Indicators

future plans

- “resource productivity”
  - roadmap for a resource efficient Europe
  - resource efficiency scoreboard (DG ESTAT)
  - provisional: $\frac{\mathbf{GDP}}{\mathbf{DMC}}$
  - depending on availability: $\frac{\mathbf{GDP}}{\mathbf{RMC}}$
- “material productivity”
  - European resource efficiency platform (EREP)
  - $\frac{\mathbf{GDP}}{\mathbf{RMC}}$

European headline indicators

What do they tell us?

- "resource/material productivity": $\frac{\mathbf{GDP}}{\mathbf{RMC}}$
  - GDP measures in general domestic value added
  - RMC measures raw material needed to satisfy final domestic demand
  - Is this really an indicator for resource efficiency?
    - GDP contains value added for exports
    - RMC does not include exported material
    - i.e.: increasing exports would increase this indicator

future needs

on national and European level

- separate interpretation of some indicators difficult
- developing meaningful relations
  - comparability over time and national economies
  - headline indicator for communication
  - no “one size fits all” indicator
  - tailor made indicators measuring political targets to be defined
- meso-indicators
  - macro-indicators good for communication
  - more details needed for policy making

meso-indicators

Germany

- implementation phase
- information in RME by
  - resource
    - four groups of fossil energy carriers,
    - four groups of ore,
    - eight groups other mineral resources, and
    - three groups of biotic resources
  - final demand (export, household consumption, government, buildings, fixed investment)
  - industries

resource residuals

definitions

- SEEA 1993: unused extraction
  - some indicators defined: TMI; TMR, TMC
- SEEA-CF: three different kinds:
  - unused extraction: extractor does not what to keep material and directly transfers it back into environment
  - reinjection: extractor stores material in environment
  - extraction losses: material gets lost to environment during extraction
  - boundaries ambiguous

resource residuals

problems

- what to include?
- amount depending on definition dominating other materials
- material remains in environment = multipliable counting
- allocation problems when disaggregating indicators
- ...

- currently no internationally harmonized approach for including resource residuals

resource residuals

OECD: *"Such an expanded indicator would be important to **raise awareness** about the overall material 'footprint' of an economy in a communication logic, but cannot easily be linked to particular policy areas, and may thus be of **limited use for policy making**. Its inclusion in the OECD set requires further review."*

Material Flow and Resource Productivity Indicators, Proposal for a set of OECD indicators; Paris 2012 (ENV/EPOC/WPEI(2011)4/REV

THANKS FOR YOUR KIND ATTENTION!

Sven C. Kaumanns
Federal Statistical Office
Environmental-Economic Accounts
tel: +49 228 99 643 8555
e-mail: sven.kaumanns@destatis.de
www.destatis.de