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Reducing the Use of Materials: Why and How?

Berlin Workshop in Institutional Analysis of Social-Ecological Systems WINS

Nov 19, 2015

Outline of the Talk

1) Background of the research
2) Natural Resources and Resource Efficiency: an emerging policy field
3) Discourses on resource efficiency
4) Goals and indicators of material flows
5) Instruments to increase resource efficiency
6) Impact Analysis of Strategies

1) Background of Research

Research Project „PolRess“:

- Commissioned by Federal Ministry for Environment and UBA; 2012-2015
- Motivation: facilitation of federal strategy ProgRess
- Goals:
  - Analysis of goals, indicators, action fields and instruments from economic, legal and political science perspective
  - Analysis of discourses and actors
  - Networking / Dissemination of results
- Partner:
  - Freie Universität Berlin (coordinator)
  - Ecologic Institute
  - European School of Governance (EUSG)
  - Institute for Economic Structures Research (GWS)
  - Institute for Ecological Economy Research (IÖW)
  - Öko Institut
  - Wuppertal Institute

www.ressourcenpolitik.de

2) Natural Resources and Resource Efficiency

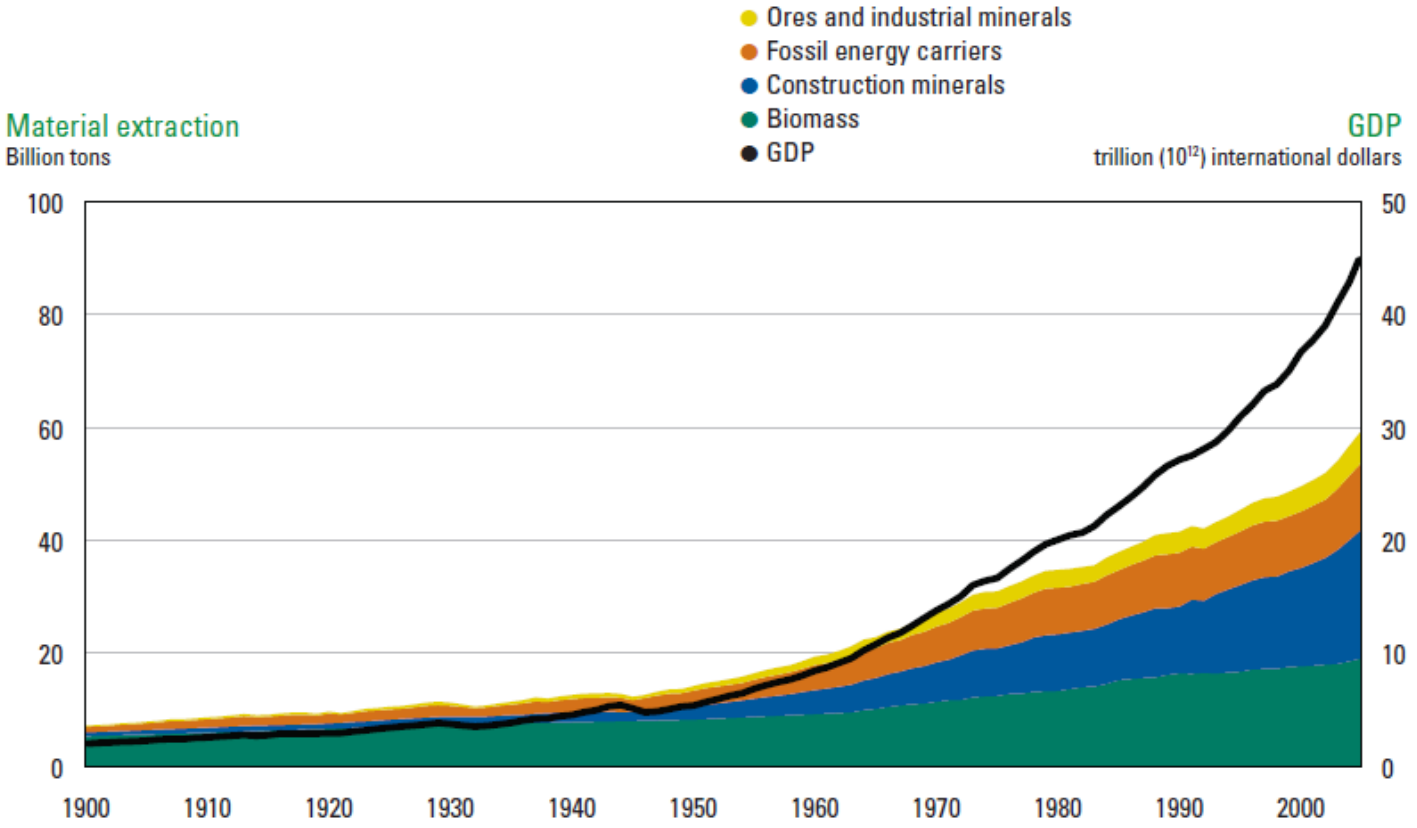
1) Environmental Policies:
   - Preserving natural resources / planetary boundaries and safe operating space
   - Impacts of using natural resources on natural systems
   - Integration of environmental concerns in sectoral policies

   ⇒ Increase of use

   ⇒ Increase of impact

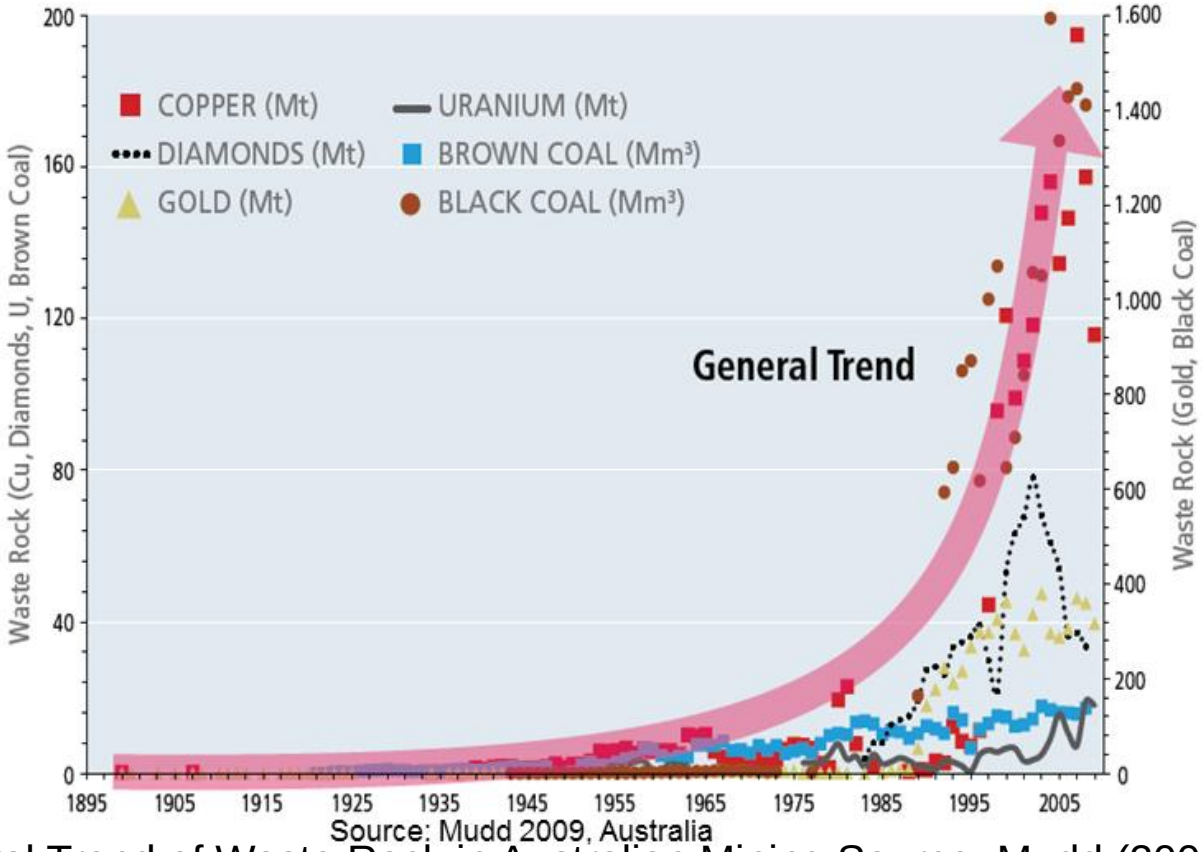
Increasing demand for materials

Figure 1. Global material extraction in billion tons, 1900–2005



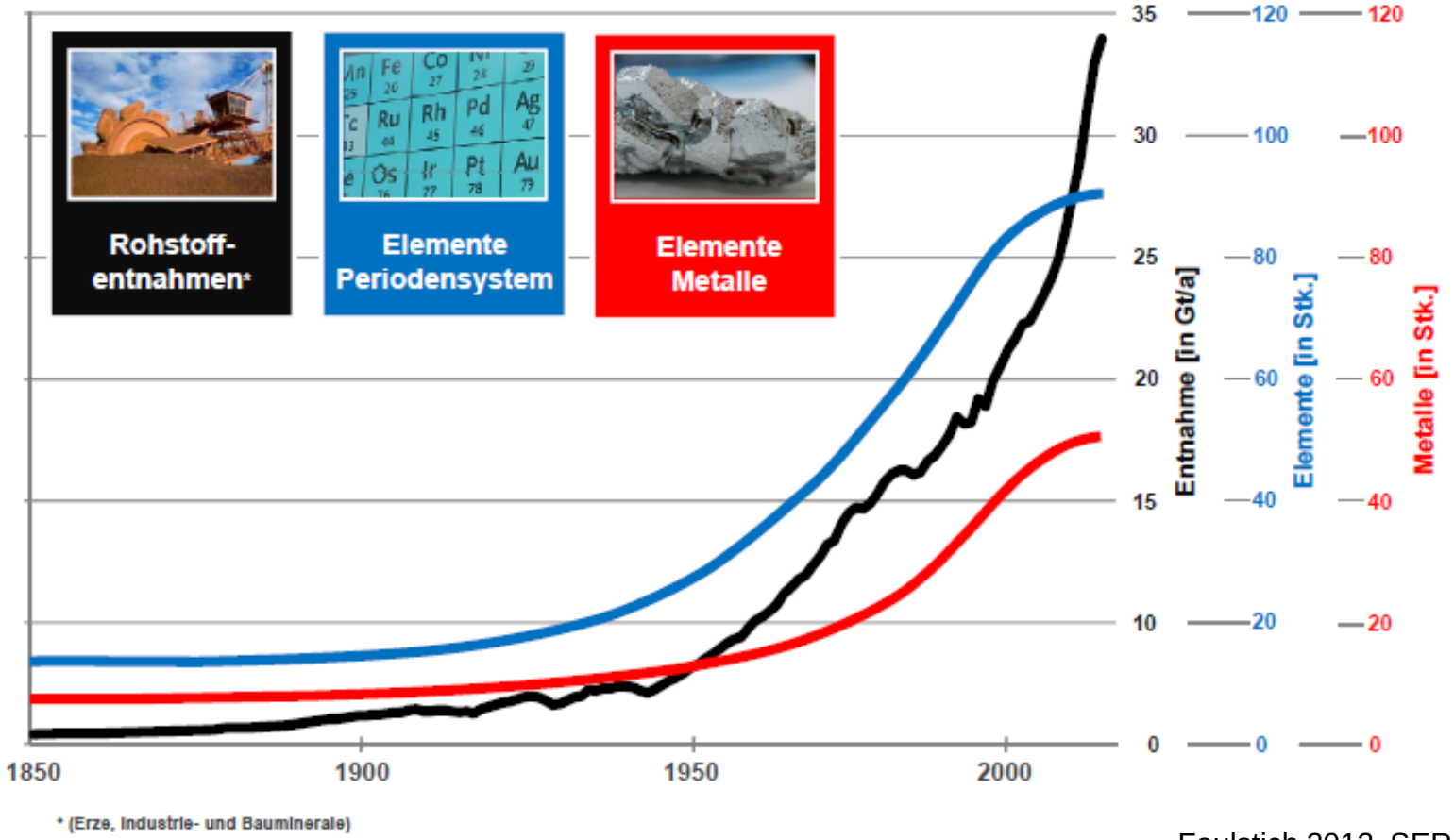
Source: Krausmann *et al.*, 2009

Increasing amount of unused material



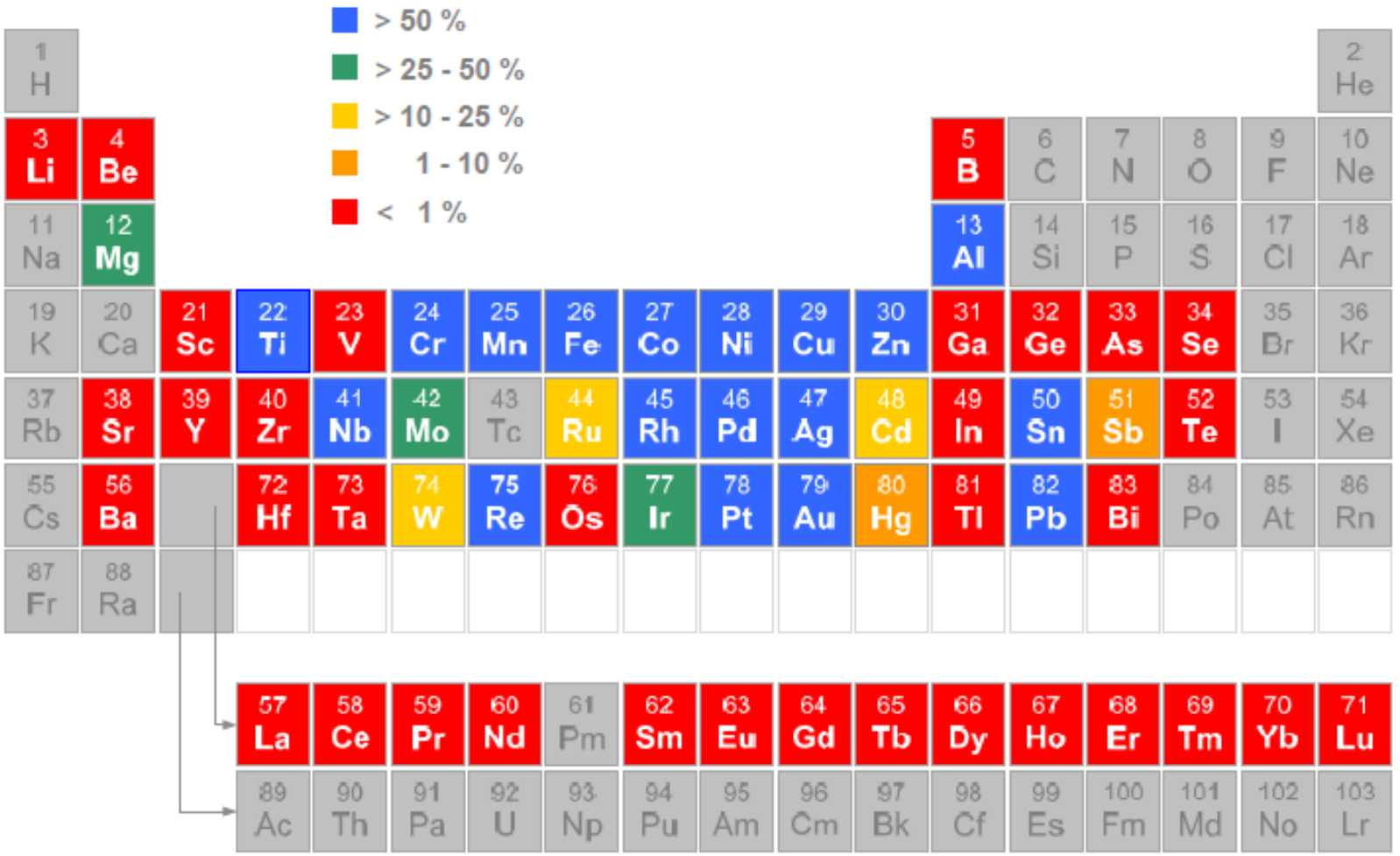
General Trend of Waste Rock in Australian Mining Source: Mudd (2009), Data for Australia.

Trends in use of raw materials



Faulstich 2012, SERI 2011

Recycling rates



Faulstich 2012

Nexus Analysis

- Nexus of Resource Efficiency and Energiewende: Werland, Stefan; Graaf, Lisa; Jacob, Klaus; Bringezu, Stefan; Bahn-Walkowiak, Bettina; Hirschnitz-Garbers, Martin; Schulze, Falk; Meyer, Mark (2014) Nexus Ressourceneffizienz und Energiewende – Eine Analyse der Wechselwirkungen. Berlin: FFU, Ecologic & Öko-Institut / Wuppertal: Wuppertal Institut / Osnabrück: GWS. Online: http://edocs.fu-berlin.de/docs/servlets/MCRFileNodeServlet/FUDOCS_derivate_000000004260/Nexus_Ressourceneffizienz.pdf
- Nexus Resource Efficiency and Land Use: Wunder, Stephanie; Hirschnitz-Garbers, Martin; Kaphengst, Timo (2014) Ressourcenpolitik und Flächeninanspruchnahme. Berlin: Ecologic. Online: http://edocs.fu-berlin.de/docs/servlets/MCRFileNodeServlet/FUDOCS_derivate_000000004762/Nexus_RE-Flaeche.pdf
- Nexus Resource Policy and Biodiversity: Werland, Stefan (2015): Nexus Ressourceneffizienz und Biodiversität. Eine Analyse der Wechselwirkungen. Berlin. i.E.
- Nexus Resource Efficiency and Water: Graaf, Lisa; Werland, Stefan; Jacob, Klaus (2015) Ressourceneffizienz und Wasser - Eine Analyse der Wechselwirkungen. Berlin: FFU. Online: http://edocs.fu-berlin.de/docs/servlets/MCRFileNodeServlet/FUDOCS_derivate_000000004763/Nexus_RE-Wasser.pdf

Impacts of Renewable Energies on Resource use

***Direkte* Auswirkungen des Ausbaus der Erneuerbare Energien auf die Ressourcentypen*)**

Anmerkung: die Tabelle dient dem Überblick – die darin enthaltenen Pfeile stellen Tendenzen dar; tatsächlich sind die Wirkungen in hohem Maße von Bedingungen abhängig und die Pfeile für Einzelfälle daher zu hinterfragen.

Wirkung auf die Nutzung von: / Maßnahme	Massen-metalle	„kritische" Rohstoffe	Baumineralien	Industrie-mineralien	Energieträger (fossile und Kernbrennst.)	Biomasse		Wasser	Fläche Boden	Biodiv	Atmosphäre
						Stoffl.	Energ.				
Windenergie	↑	↑			↓						↓
Wasserkraft		↑			↓						↓
Biomasse	↑		↑	↑	↓		↑	↑	↑	↑	↑↓
Photovoltaik		↑			↓						↓

*) Auswirkungen auf den Bestand und den Neubau konventioneller Kraftwerke sind hier nicht berücksichtigt.

2) Natural Resources and Resource Efficiency

1) Environmental Policies:
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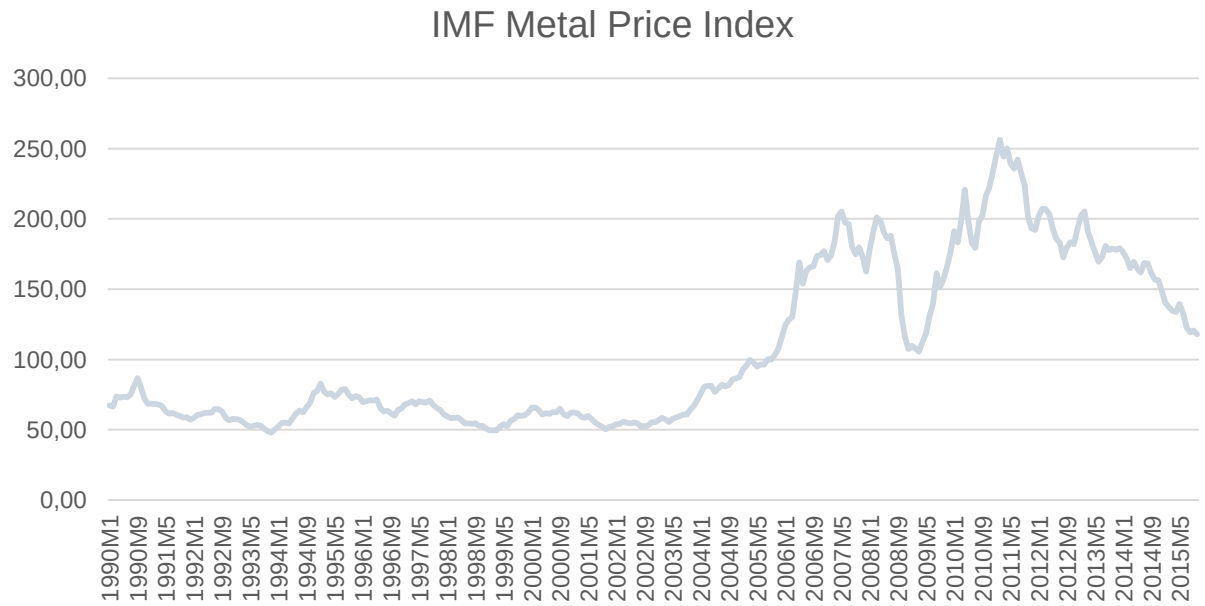
2) Economic policies
   - Security of supply /volatility of prices
   - Costs of materials
   - Markets for resource efficient technologies
-

Prices for commodities and economic opportunities



- Costs of materials in manufacturing industries: 2002: 577 bln EUR => 2013: 861 bln EUR
- On average: 45% of costs (compared to 2% for energy, 18% for labor)
- Global markets for RE technologies: 2011: 1 trillion EUR

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   - Markets for resource efficient technologies
3) Development cooperation
   - Unfair share of burden of environmental costs and economic benefits
   - Conflict minerals

Resource Policies as emerging policy field

Germany:

- National Strategy for Sustainable Development
- Raw Material Strategy
- Resource Efficiency Program (ProgRess)
- Waste Policies

Europe:

- Flagship Initiative Resource Efficiency
- Circular Economy package

OECD and UN:

- Green Growth and Green Economy Initiatives

3) Discourses on Resource Efficiency: Security of Supply Discourse

- Resource policy as raw material policy
- Problem: Security of supply, rising/volatile prices, not physical, but economic scarcity, politically motivated trade barriers, export of secondary materials via waste streams
- Business is aware of efficiency potentials
- Goals: Neither decoupling nor environmental aspects are of concern. Absolute reduction is strictly opposed.
- General scepsis against political intervention. Justified as foreign trade policies and innovation policies
- Instruments: bilateral trade and investment agreements (raw material partnerships), increased exploitation of raw materials in Europe, support for exploration abroad, innovation of improved efficiency of exploration and use of secondary materials, incentives for consumers to recycle
- Focus on rare / strategic materials

Ecological Modernisation Discourse

- Problem: Scarcity of supply, costs for business and environmental impacts
- Demand for raw materials is addressed; European consumption is disproportionately high
- Increased demand for RE technologies, international competition and demand for innovation
- Goal: Decoupling of raw material use from creating economic value
- Indicators: Efficiency (material use per GDP) and innovation
- Instruments: Innovation policies, demand creating policies (e.g. procurement, environmental standards, incentives)
- Focus on materials

Planetary Boundaries and Environmental Impacts Discourse

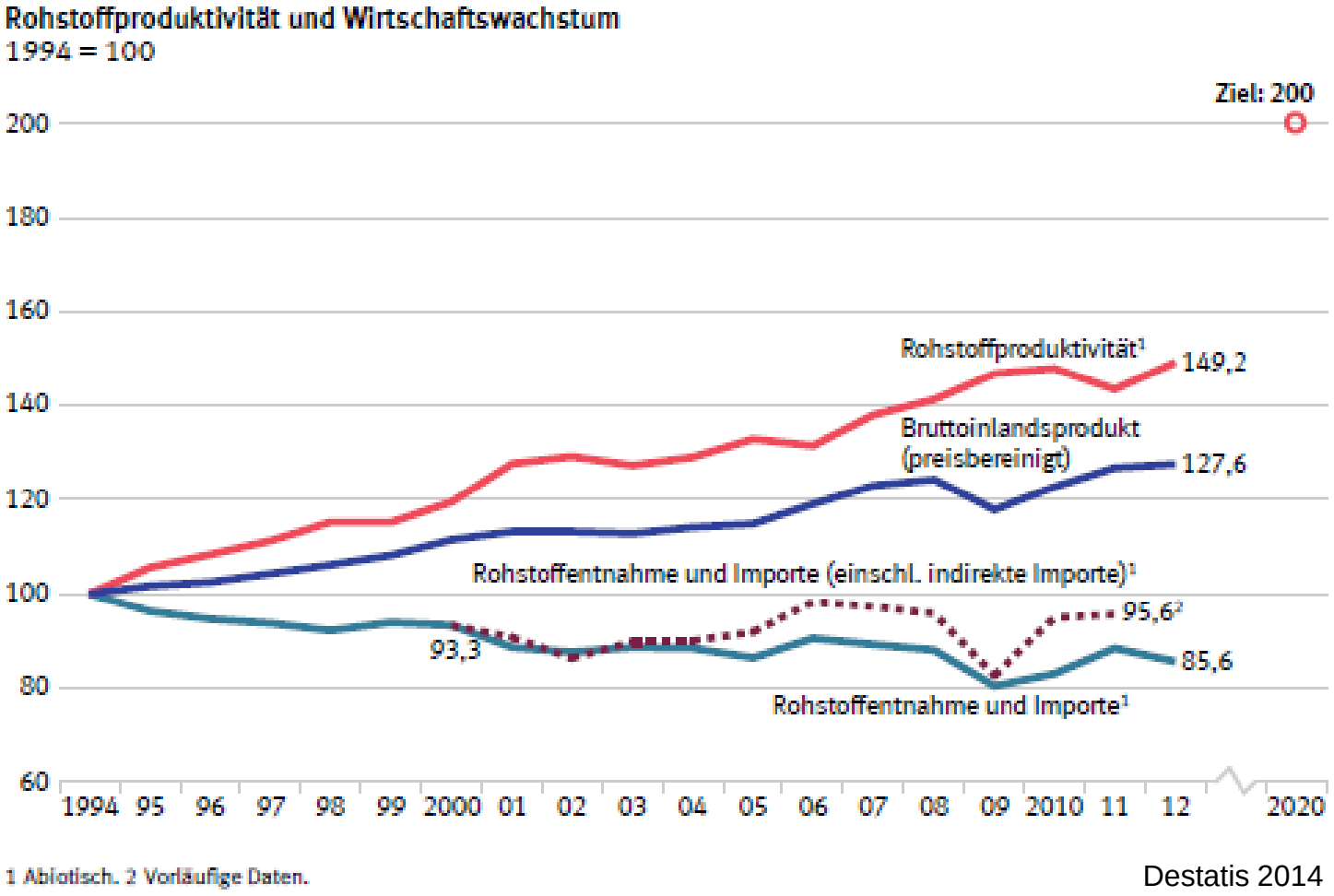
- Problem: Eco-systems deteriorate because of material extraction and use
- Goal: absolute limit or reduction of material consumption
- Indicators: Including non-used materials and environmental impacts
- Instruments: e.g. tradeable permits, transparency along value chains, internalization external costs, purposeful shortening of supply
- Coverage of all natural resources

Limits of Growth Discourse

- Problem: Innovation and efficiency is no solution. RE Innovation leads to decrease in costs, and thereby to increase in demand. Rebound and increase in available income inevitably leads to increase in resource consumption.
- Globally unfair distribution of access to resources, global transport of materials is problematic
- Causal relation between financial crisis and ecological crisis
- Need to overcome resource intensive status symbols and seek for other indicators of welfare and quality of life
- Vision: Post-Growth economy, social innovation which spread by imitation, rarely environmental policies. More often: policies for ensuring basic needs and equality, decentralization and participation.
- Protection of resources is result of comprehensive cultural, economic and political transformation.

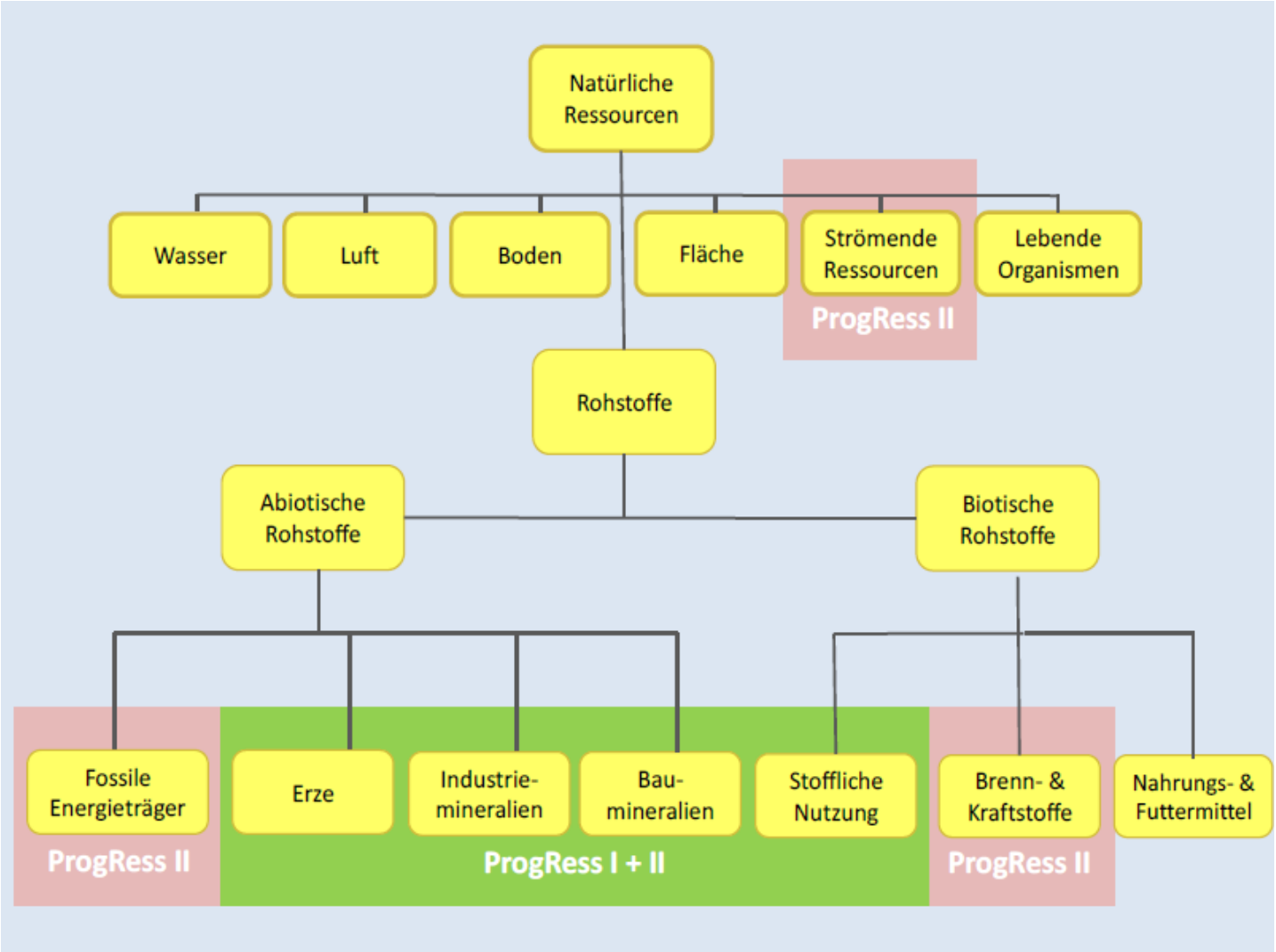
4) Goals and Indicators of Material flows

German objective: Doubling Raw material productivity

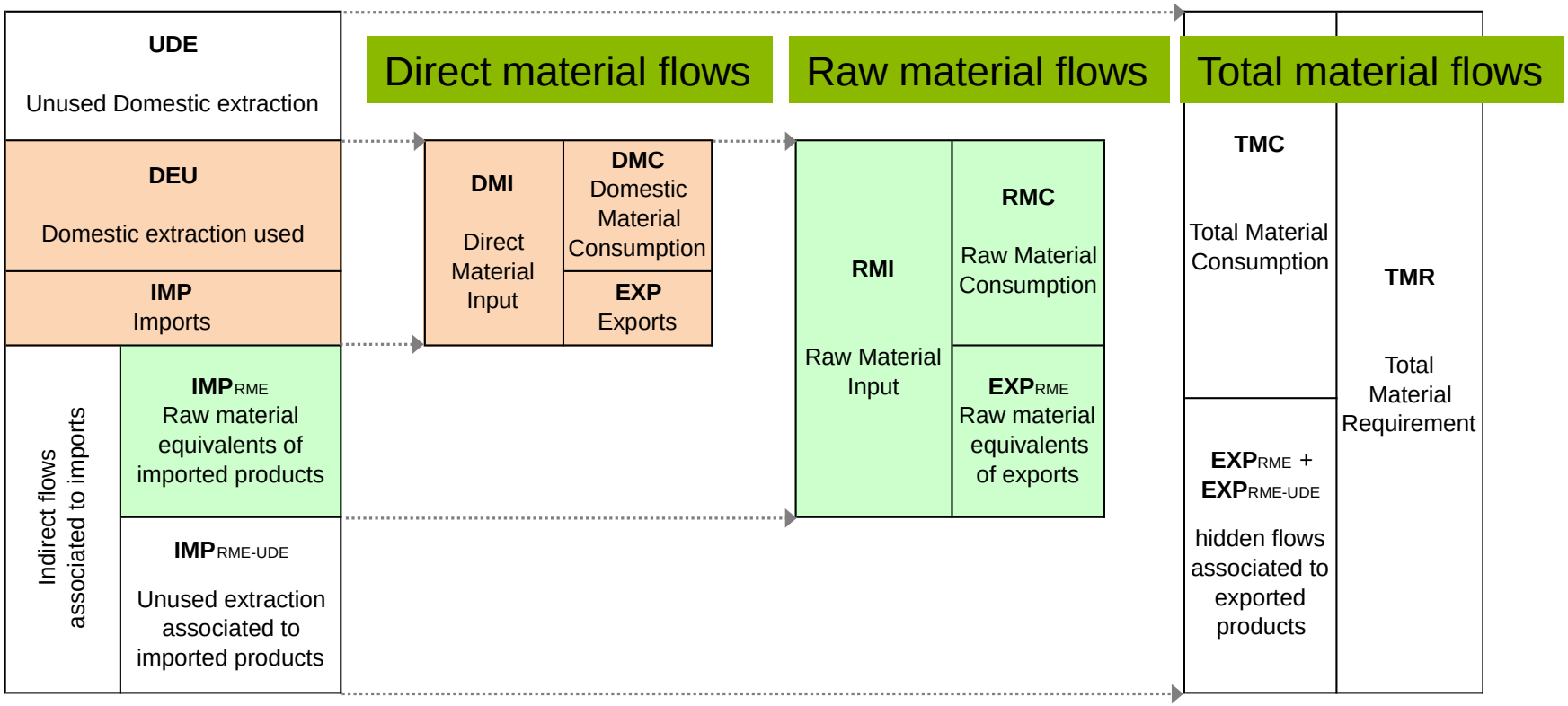


Destatis 2014

Focus of ProgRess



Overview of economy-wide material flow indicators



covered by legal base (Regulation No 691/2011 on European Environmental Economic Accounts)

estimated by Eurostat (aggregated EU27)

Unused extraction and TMR accounted for USA, Japan, China, Brazil, EU-27, Austria, Czech Republic, Denmark, Finland, France, Germany, Hungary, Netherlands, Italy, Poland, Portugal, Spain, Sweden, Switzerland, UK, Venezuela by institutes and national statistical services

Source: based on Eurostat

PolRess proposal: Raw Material use within safe operating space

Risk avoiding level of extraction:

- Planetary Boundaries for raw material consumption are not known
- Proposal for a goal: return to level of extraction of the year 2000 until 2050 and equal share per capita (9 bln. People): 10t $TMC_{abiot.}$ per cap; in GER currently 43t per capita (= -77%).
- TMC: unused extraction is highly relevant for environmental impacts

(Bringezu und Schütz 2013)

- Dashboard von indicators:
  - Material flows and recycling
  - Environmental impacts
  - Indicators on innovation

(Jacob, Münch und Werland 2014)

5) Instruments to improve resource efficiency

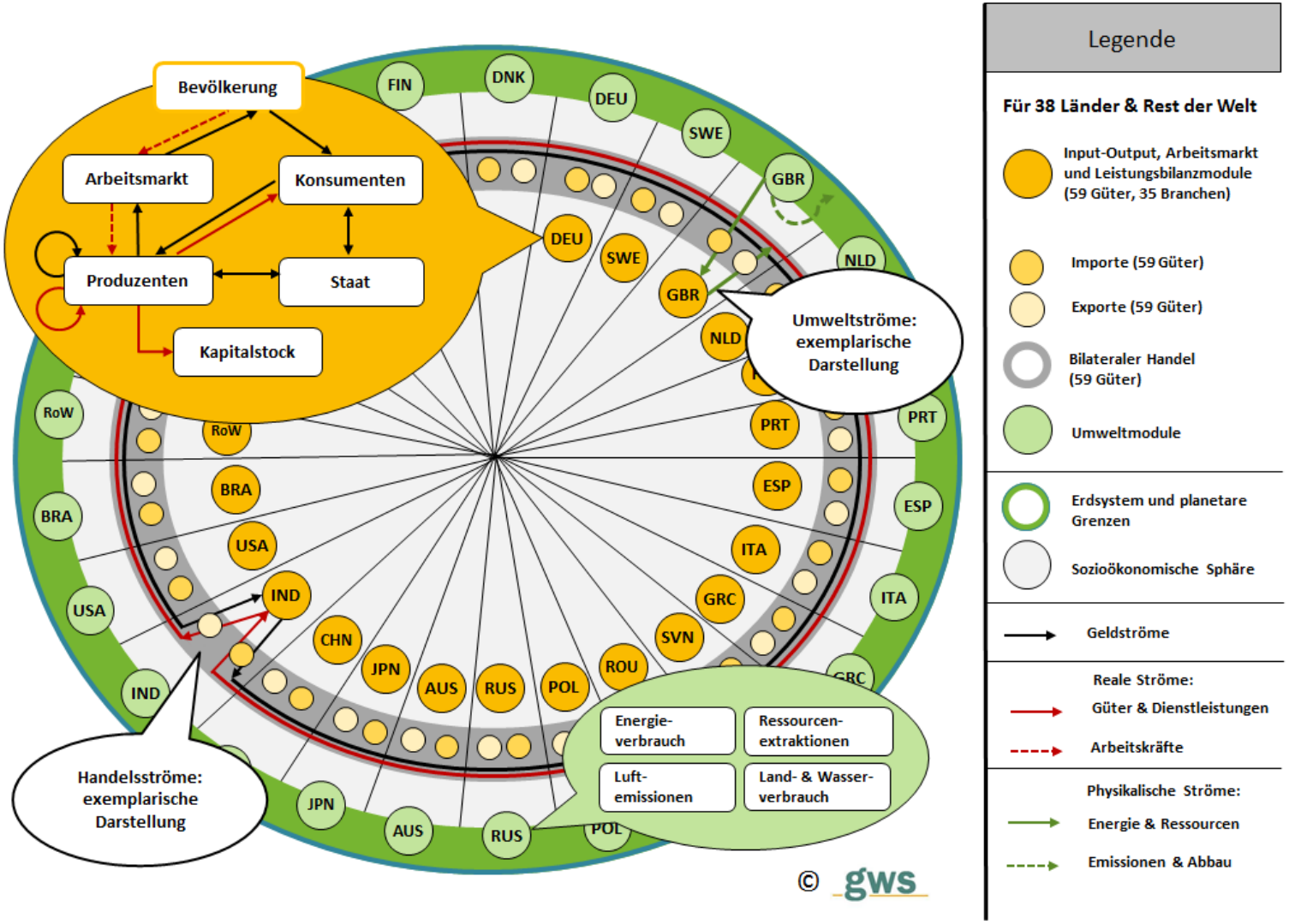
1) Creating awareness for Resource Efficiency
   - Expansion of products equipped with eco-labels in trade (Scholl and Herr 2014; Scholl 2015),
   - Consultancy for businesses (Bienge and Berg 2015),
   - Information campaigns for consumers (Hirschnitz-Garbers and Langsdorf 2015),
   - Incentives for environmental management systems (Werland und Range 2015),
   - Development of key performance indicators for businesses (Bienge und Berg 2015).
2) Providing price signals
   - Imposing taxes on the use of primary raw materials (Keimeyer et al. 2013),
   - Removing environmentally harmful subsidies (Münch und Jacob 2014; Werland 2013),
   - Reform of value-added taxes (Bahn-Walkowiak 2015),
   - Guarantees for financing activities to increase resource efficiency (Hirschnitz-Garbers und Porsch 2013),
   - Feed in provisions in support of resource efficient products (Jacob und Schulz 2015).
3) Promoting Resource Efficient modernization
   - Research and innovation promotion through subsidies (Bär 2015) or tax incentives
   - (Graaf and Jacob 2015)
   - Resource efficiency during the economic-activity promotion of municipalities (Werland 2015c)
   - Resource efficiency and innovation orientation in public procurement (Münch and Jacob 2013)

Instruments cont.

4) Regulatory framework for resource efficiency
   - Norms (Werland 2015a)
   - Standards for the extraction of raw materials (Schulze and Keimeyer 2014)
   - Rules on minimum proportion of secondary raw materials (Schulze 2015)
   - Recovery quotas (Hermann and Schulze 2014)
   - Extended producer responsibility (Wilts and von Gries 2014; Lambert, Hirschnitz-Garbers, et al. 2014)
5) Resource efficiency in foreign trade
   - Environmentally orientated raw material partnerships (Ferretti, Jacob, et al. 2013)
   - Promotion of exports of RE technologies (Range 2014)
   - Promotion of policy transfer (Werland 2015b)

6) Impact Analysis of Strategies

GWS GINFORS: Multisectoral and Multiregional Input-Output Model



Meyer et al. 2015

Baselines

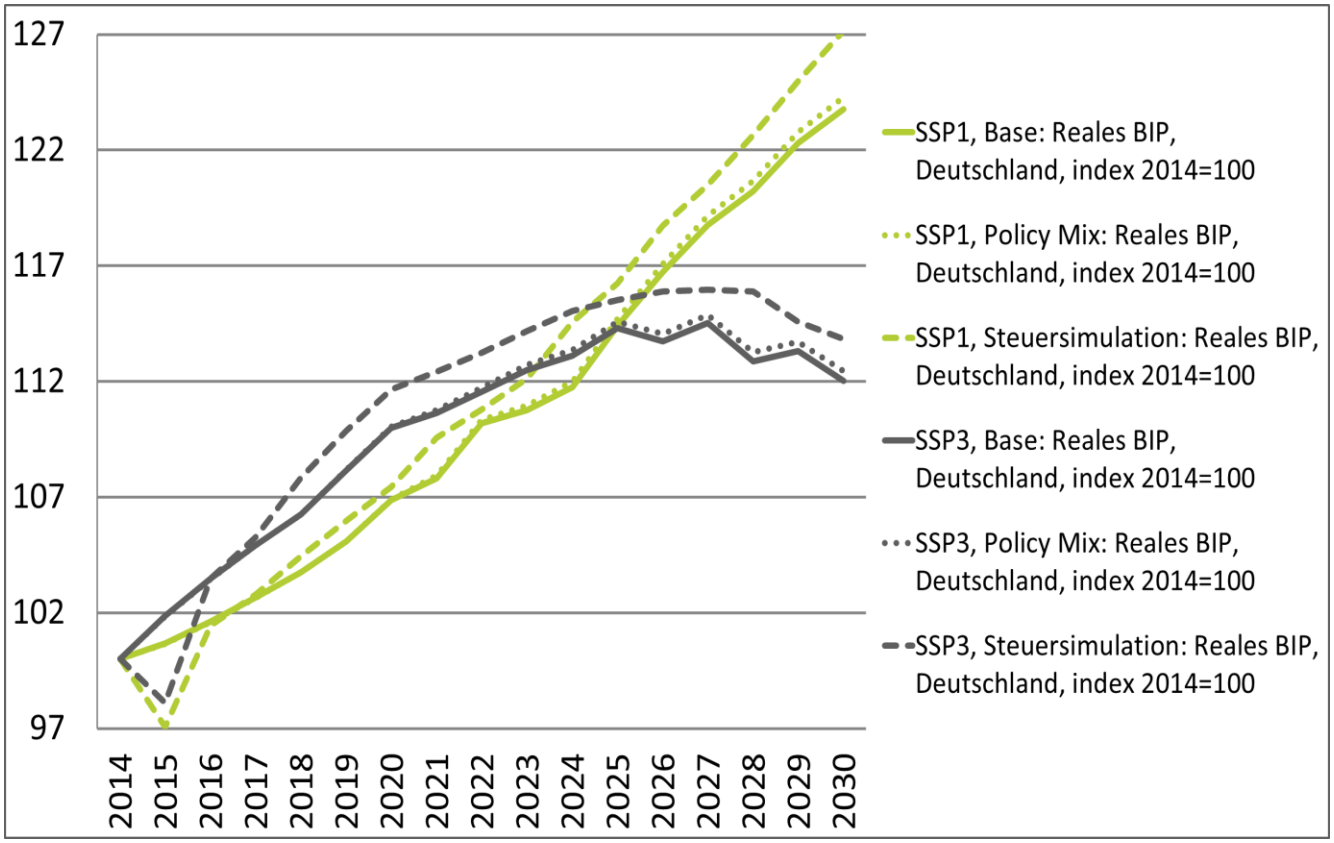
	SSP1	SSP3
World population	Increase to 8 billion, slowdown of growth to 0,5% p.a. that esp. takes place outside of the 38 states depicted in the model (rest of the world, RoW) (increase in the share from 40 to 43%)	More dynamic population growth until 8,5 billion, carried by RoW, China, India, USA; decrease in EU.
Global GDP	Doubling, esp. through growth in rest of the world, slowdown of growth in India and China. Long-term stable economic growth in EU and USA.	Growth by almost 70% until 2030, carried by RoW, China, India; Stagnation until end of simulation time in EU and USA
CO2 emissions	Significant climate policy improvements in EU. Increase (although slowed down) of emissions in China, India and rest of the world until 2030. Resulting global increase of emissions by a little over 20%.	No climate policy improvements, not even in the EU, increase of global CO_2 emissions by more than 50%; stagnation in EU.

Jacob et al. 2015

Policy Scenarios

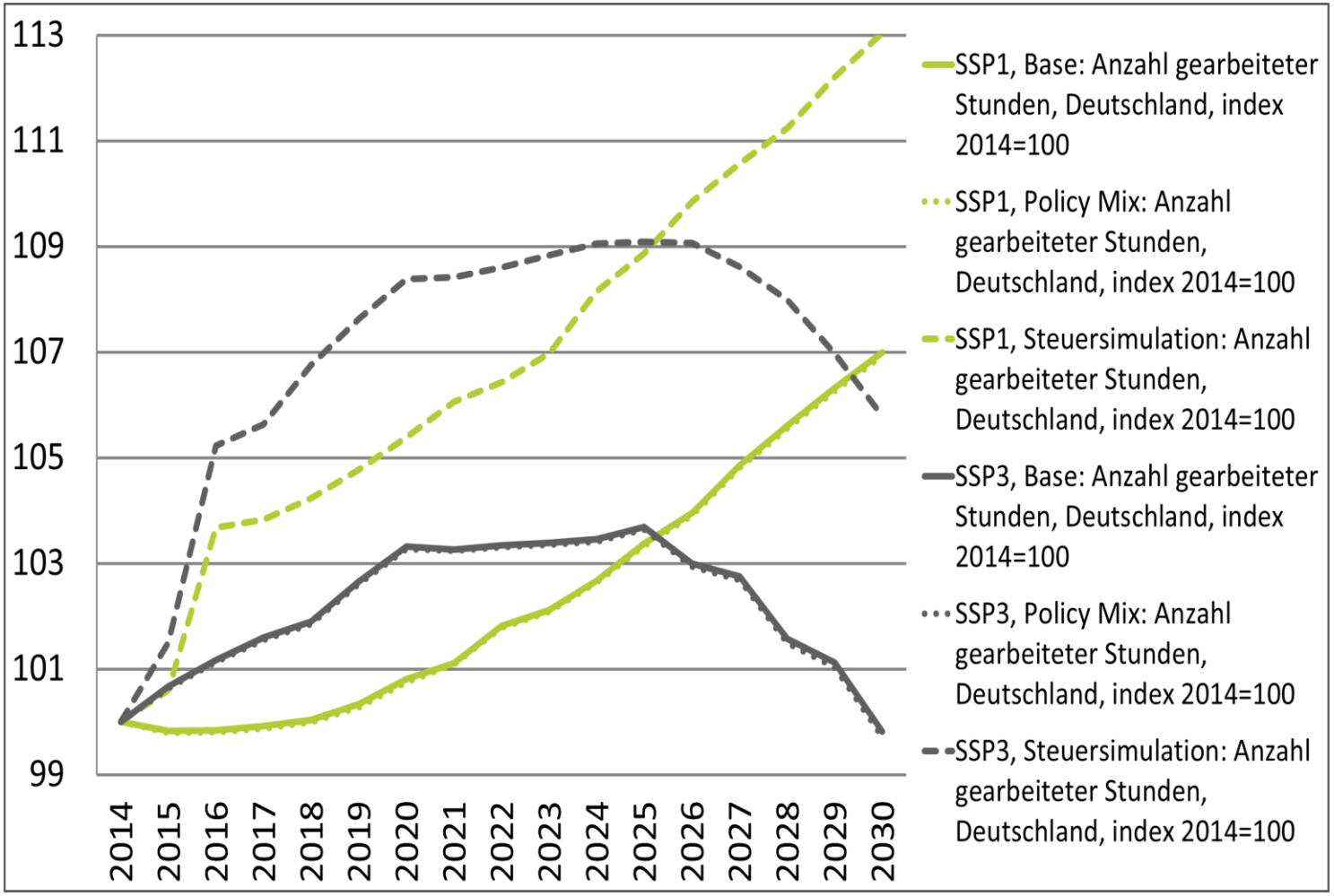
1) Policy Mix
    1) Creating awareness for resource efficiency
    2) Promoting a resource efficient modernization
    3) Creating regulatory frameworks for resource efficiency
    4) Implementing resource efficiency in foreign economy
2) Induced Structural Change
    1) commodity tax rate of 20% introduced in 2015 on commodities with above average material consumption
    2) Revenues are used to subsidies sectors with material consumption below average (14% subsidy)

Modelling results: Economic Performance



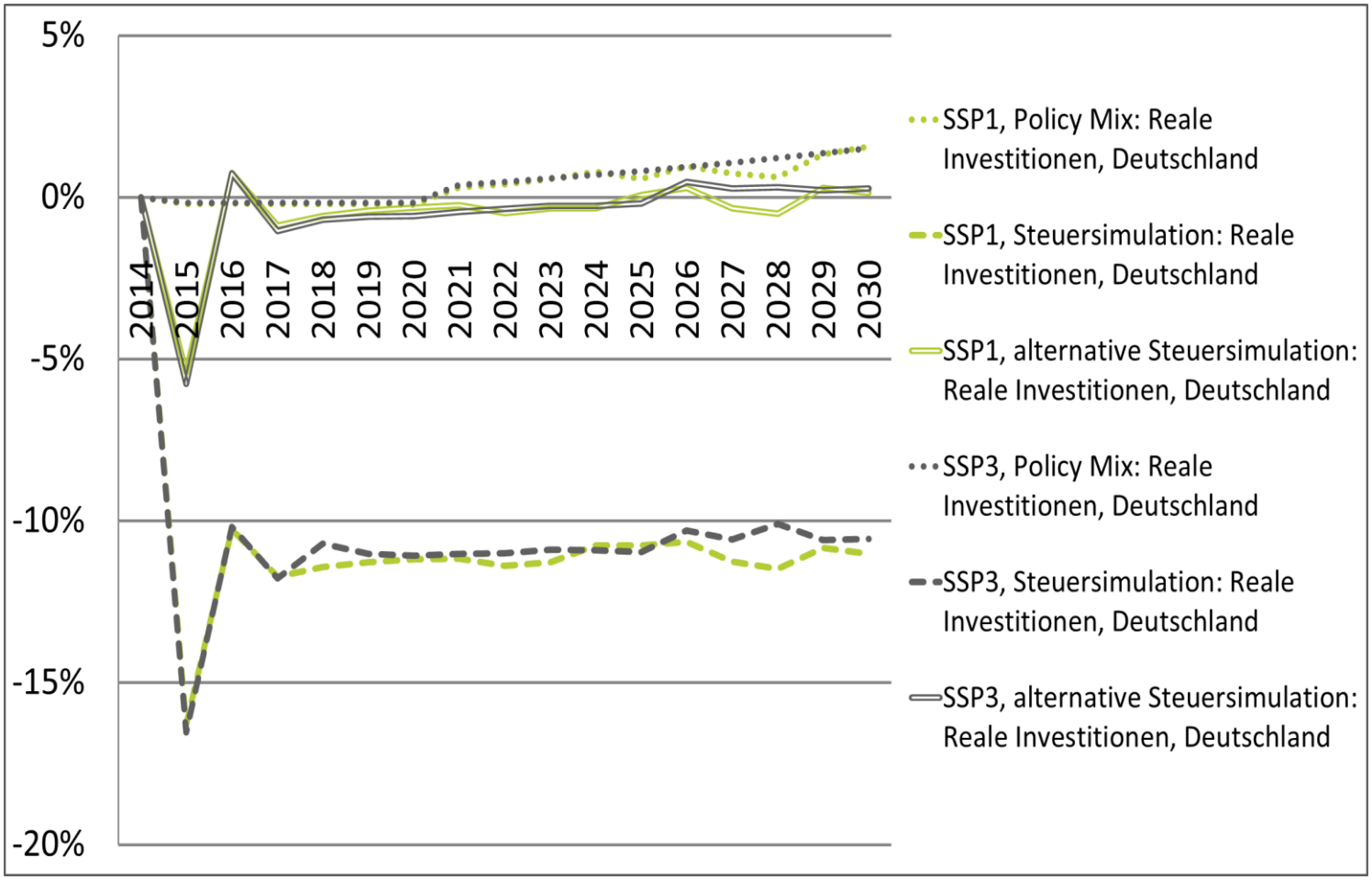
Jacob et al. 2015

Employment



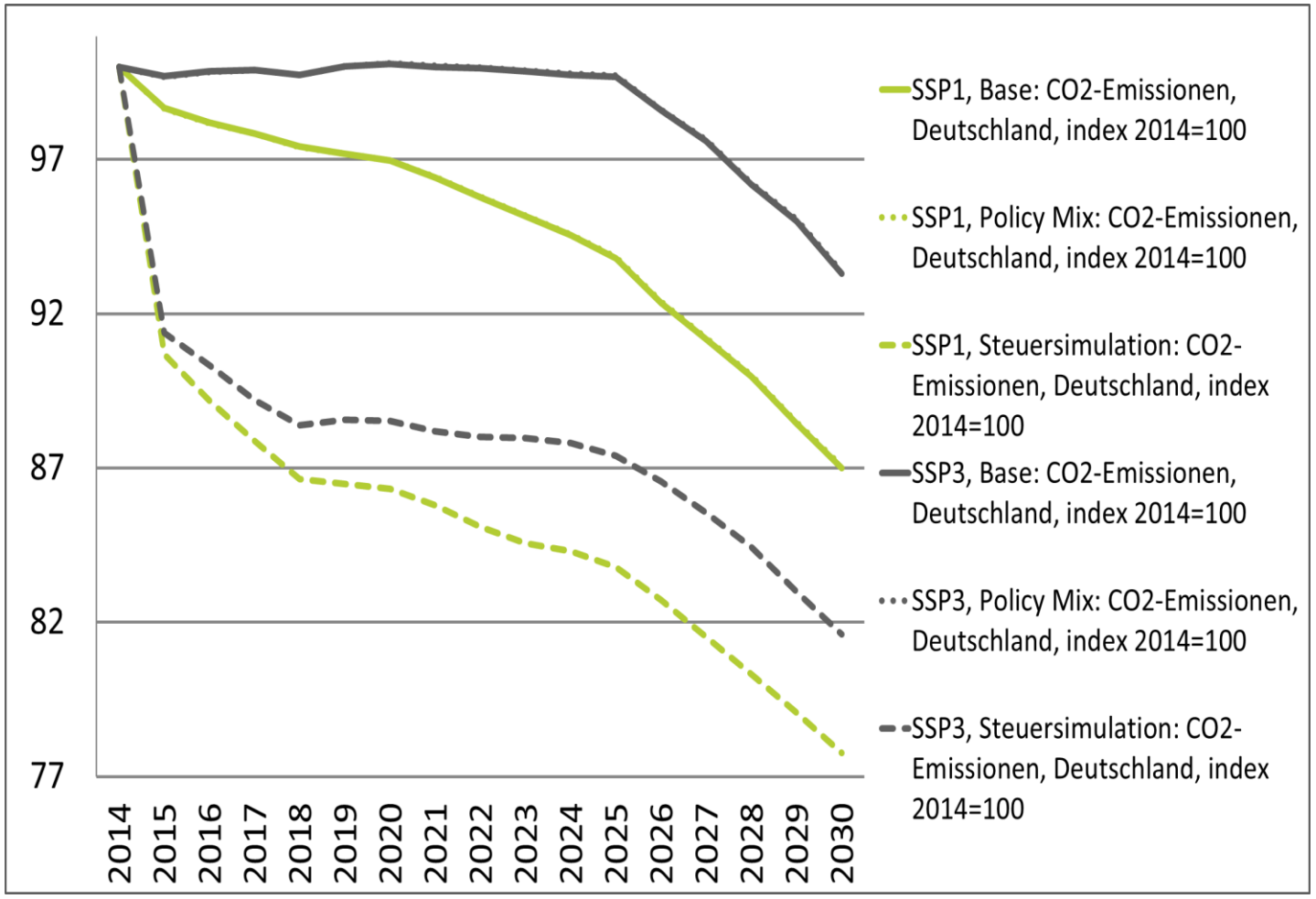
Jacob et al. 2015

Investments



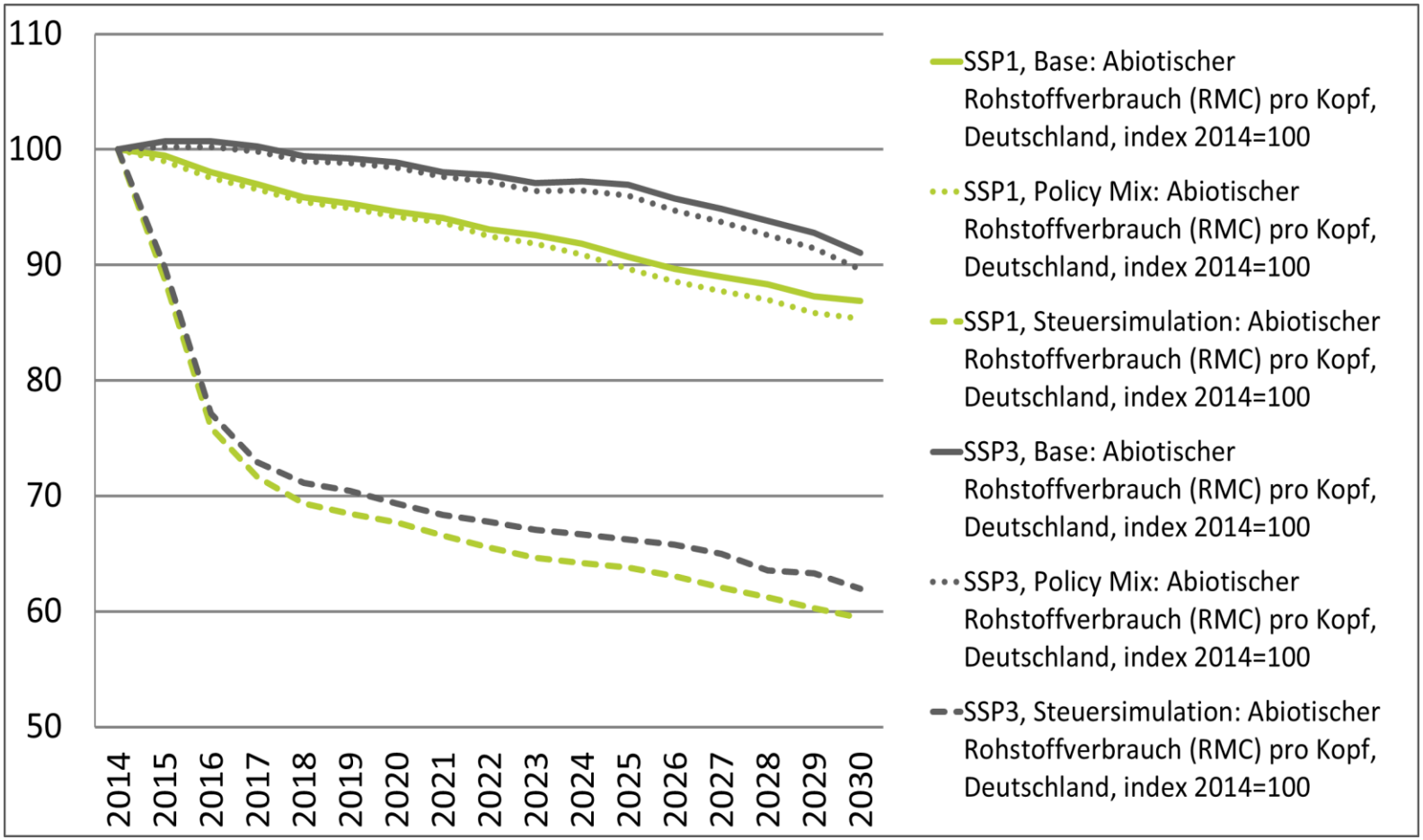
Jacob et al. 2015

CO2 Emissions



Jacob et al. 2015

Use of materials



Jacob et al. 2015

Summary

Impact Analysis:

- Policy mix covers only part of ProgRess instruments
- No economic harmful impacts of Policy mix
- Little impact on use of materials

- Induced structural change: not part of political discourse
- Considerable structural change
- Positive impacts on economic performance and employment
- Decrease of CO2 and material consumption (but still likely to fail achieving the 10 t/cap target)

Resource Policies:

- Need to address the input of the economy
- Horizontal and vertical responsibilities
- Need for robust strategies