

2006 ConAccount Conference
13th September 2006, Wien



Modelling scenarios towards a sustainable use of natural resources in Europe

Results from the “MOSUS” project

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Overview

Introduction: MOSUS project

Model description

Scenario assumptions

Main results

Policy conclusions



Introduction

Growing importance of issues of resource use and resource productivity in national and EU environmental and economic (!) policy

Increasing data availability on past developments, but few empirical studies on outlooks and scenarios on effectiveness of policy measures for dematerialisation



www.mosus.net

Is Europe sustainable? Modelling opportunities and limits for restructuring Europe towards sustainability

- Funded by the **5th Framework Programme** of the European Union (sub-programme environment and sustainable development)
- Endorsed by the Industrial Transformation Project of the **International Human Dimensions Programme (IHDP-IT)**



Key research questions

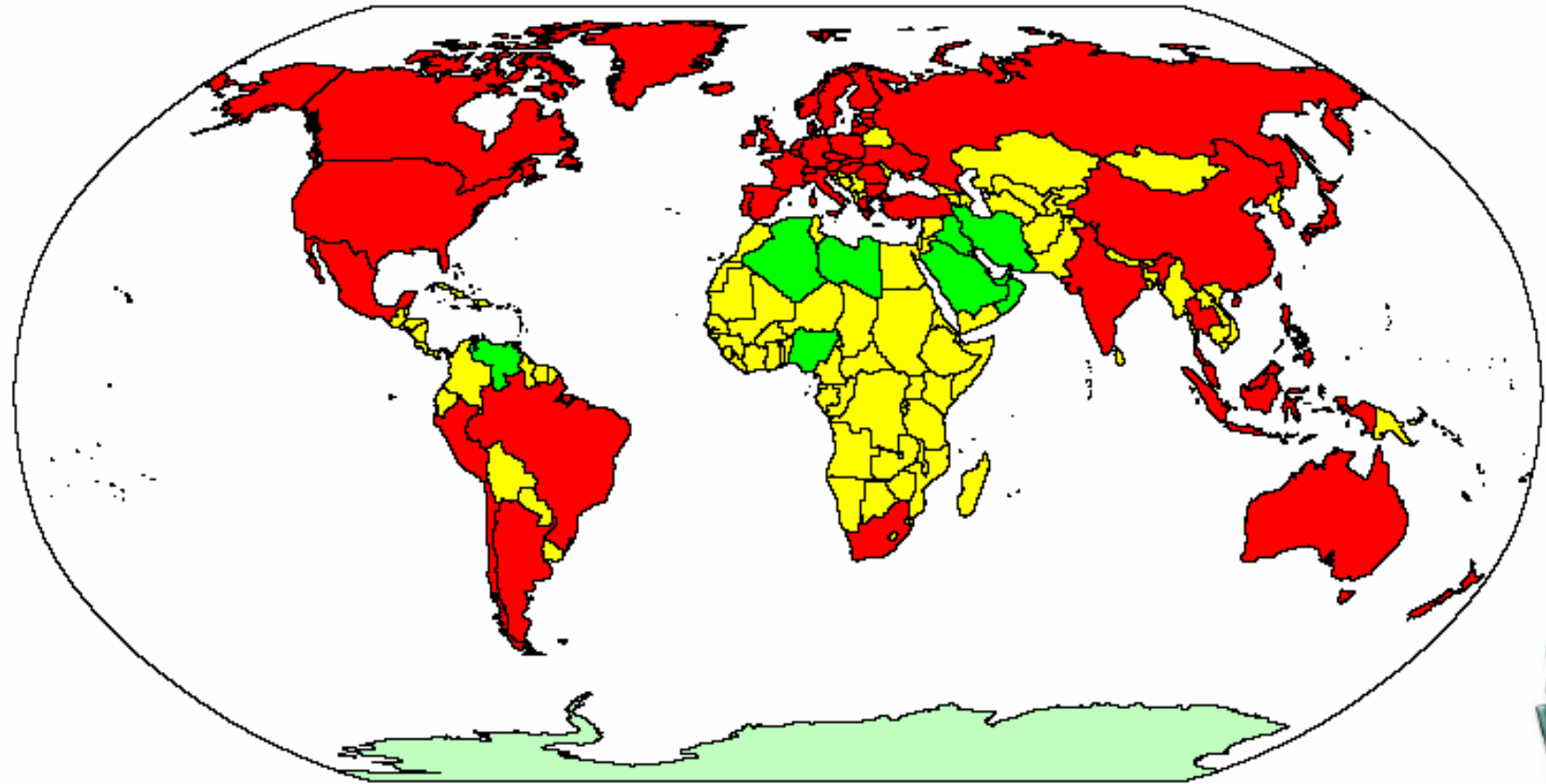
- Can environmental policy measures oriented towards higher resource and energy efficiency support goals of economic policy such as growth, competitiveness and employment?
- How effective are different policy measures to reduce environmental pressures in terms of material extraction and to contribute to dematerialisation?
- What are the impacts of the implementation of environmental policy measures for other world regions?

Modelling material flows with the extended GINFORS model

GINFORS (Global Interindustry Forecasting System),
Provided by Institute for Economic Structures Research
(GWS)

Multi-country (56 countries/world regions), multi-sectoral
(41 sectors) input-output model system, including
international trade and energy use / CO₂ emissions

◆ country coverage



country models

OPEC ex. Indonesia

ROW



Extension by material input models

Data base on material extraction for 188 countries

Time period: 1980 – 2002

Categorisation of materials following *Handbook for Economy-Wide Material Flow Accounting*
(EUROSTAT, 2001)

Used extraction plus estimation of unused extraction
(e.g. overburden)

www.materialflows.net

The online portal for material flow data



[Background](#)

[Global trends](#)

[Data sets](#)

[Literature](#)

[Links](#)

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www.materialflows.net is an online portal for material flow data, providing links and access to material flow data sets on the national level.

- » [Learn more about the importance and policy relevance of material flows](#)
- » [Explore world-wide trends of natural resource use](#)
- » [Jump directly to the material flow data sets](#)

Featured publication **[September 2006]**

Tracking Europe's Natural Resource Consumption

A Consensus Statement on the Importance of National Material Flow Accounting

The consensus statement was developed by SERI, the Wuppertal Institute, the Global Footprint Network and Friends of the Earth Europe and is so far endorsed by Best Foot Forward, the Charles University Environment Center and the Factor 10 Institute.

In the statement, we emphasise that providing for the well-being of a still growing world population within the limits of a finite planet is the key challenge for our future. Physical



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Drivers of material extraction

6 material categories

Category	Explanatory parameter		
	Type 1 country	Type 2 country	Type 3 country
Biomass	Output of agriculture and forestry sector	GDP and demand for agriculture and forestry exports	GDP
Coal	Energy model		
Crude Oil	Energy model		
Natural Gas	Energy model		
Metal Ores	Global production and demand for metals		
Industrial/ construction minerals	GDP		

3 Scenarios: BASE, LOW, HIGH

6 packages of policy measures

	LOW	HIGH
(1) Technical Change	Assumptions on sectoral changes starting in 2010 (LOW) and starting in 2020 (HIGH)	
(2) Transport costs	+ 5% until 2020	+ 10% until 2020
(3) (a) Higher levels of metal recycling (b) Higher efficiency of non-metallic minerals	+ 0.1% p.a.	+ 0.3% p.a.
	+ 0.2% p.a.	+ 0.4% p.a.
(4) Increase in material productivity in basic industry sectors ("Aachen scenario")	+ 10% until 2020	+ 20% until 2020
(5) (a) R&D of Firms (b) Technical Progress	Subsidised with 1% of public consumption between 2006 and 2010	
	Total factor productivity (excl. labour productivity) increases by 0.15% p.a.	
(6) Emission trading (a) Changes in consumption structures (b) CO ₂ tax prices in 2020 (c) Share of biofuels in 2020 (exogenous)	Target: Kyoto	Target: IPCC
	Based on Kratena and Wöger (2004)	
	40 €/t	120 €/t
	8-10%	15-20%

Economic development and energy use

Economic growth:

BASE: 18,000 €/ capita (2005) to 24,000 € (2020)

HIGH: + 4% (2020) – “Aachen Scenario”

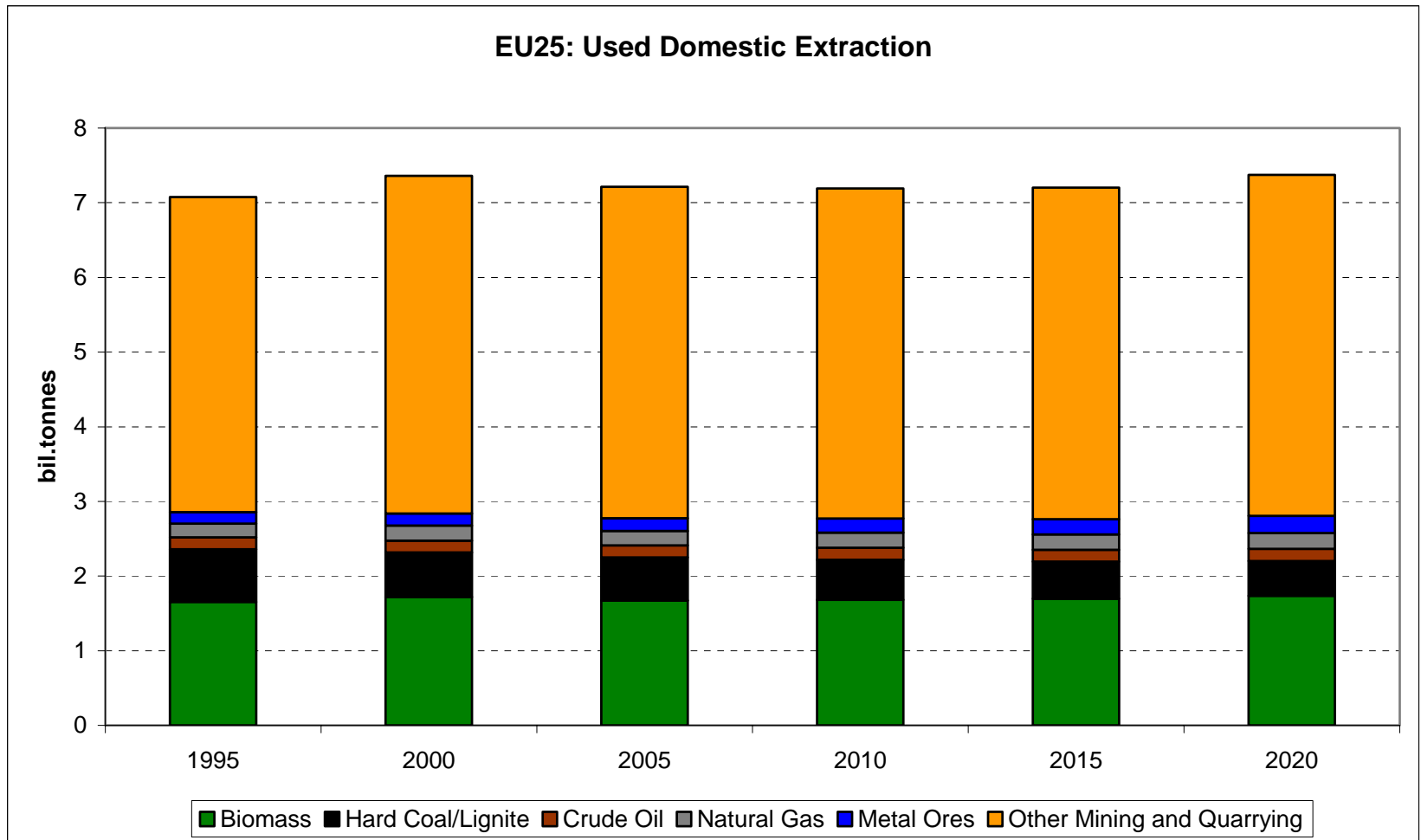
Structural change towards “resource light” industry and services

Total Primary Energy Supply (TPES):

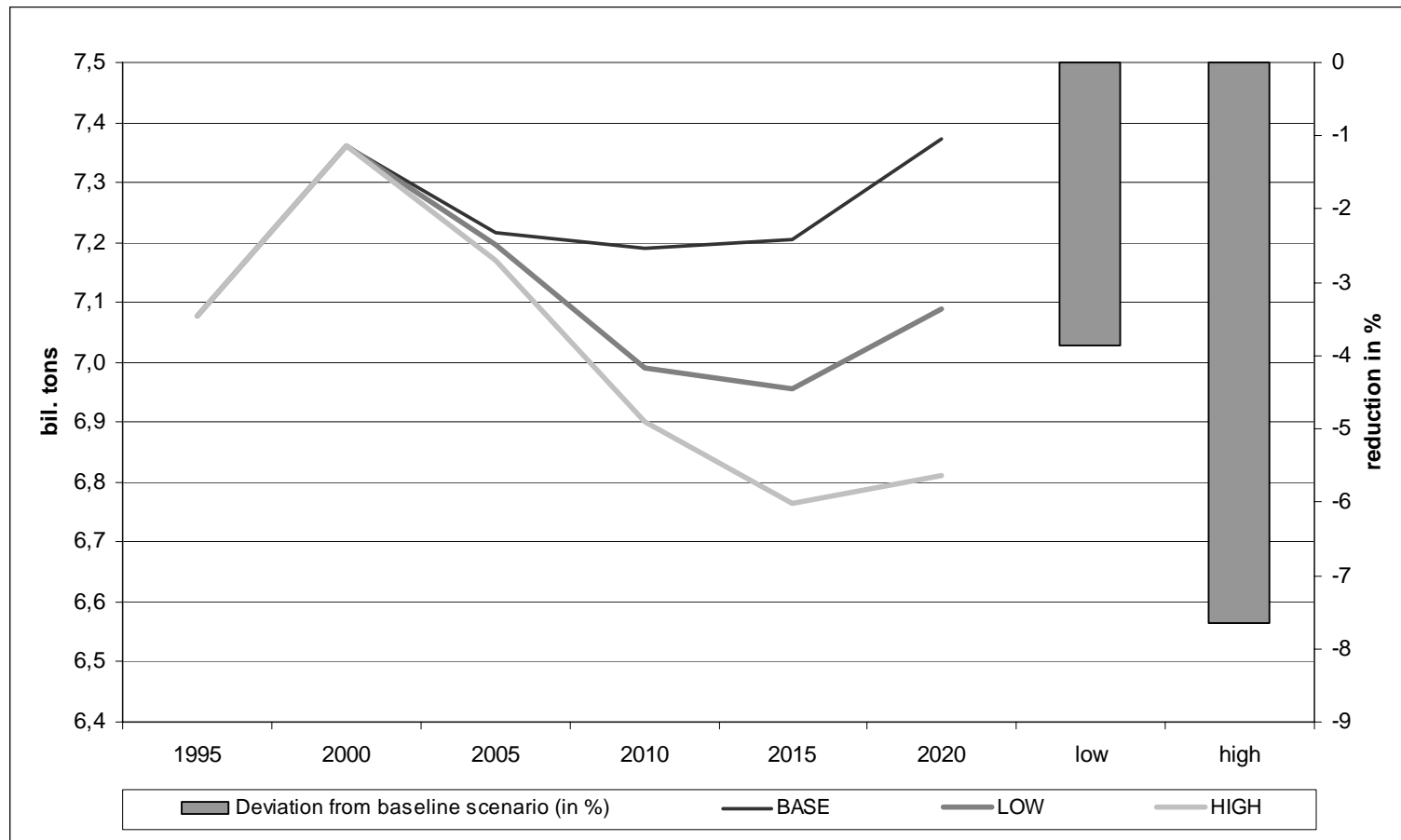
BASE: + 16% (2005 → 2020)

HIGH: - 10% compared to BASE

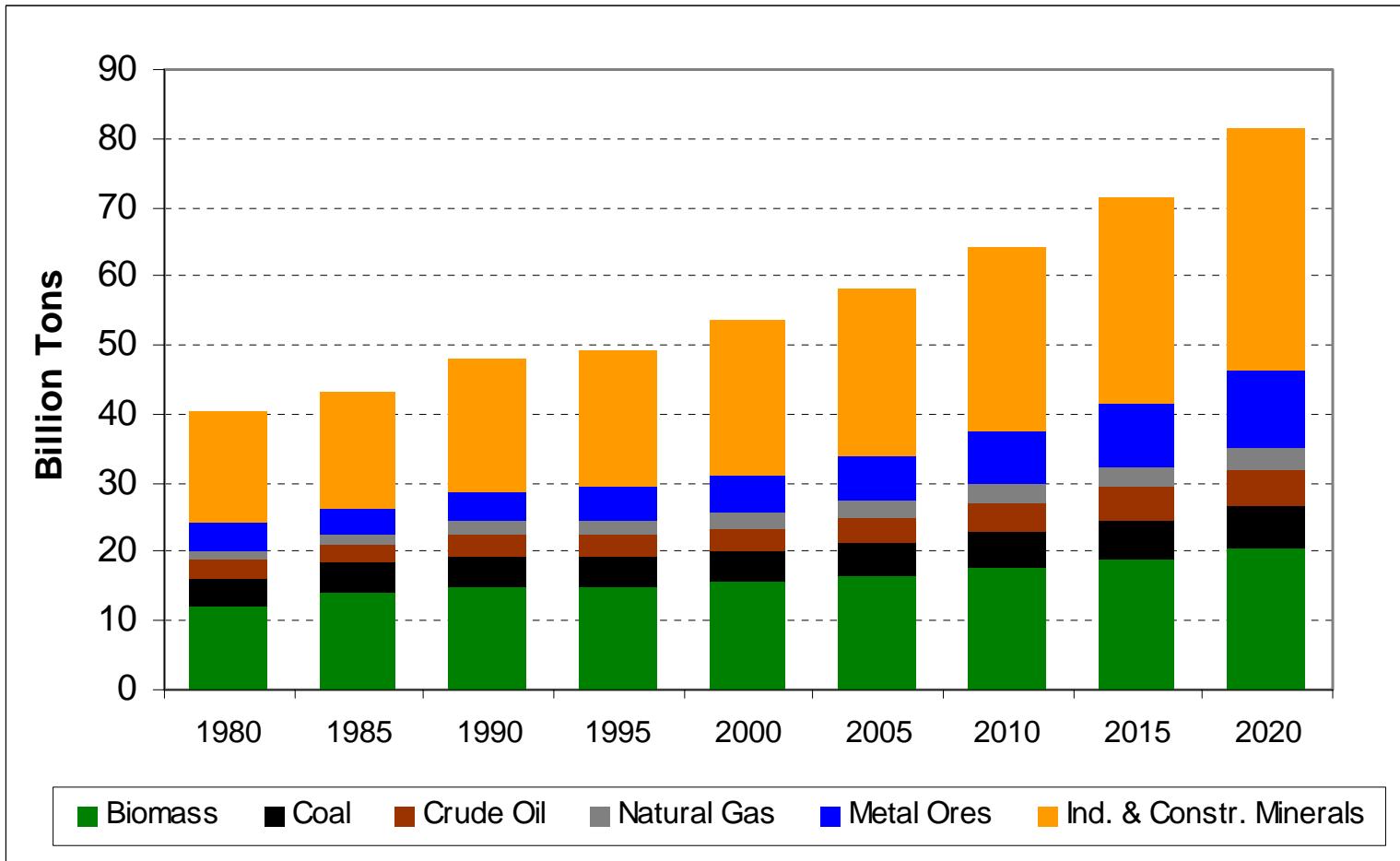
Used domestic extraction (BASE), EU-25



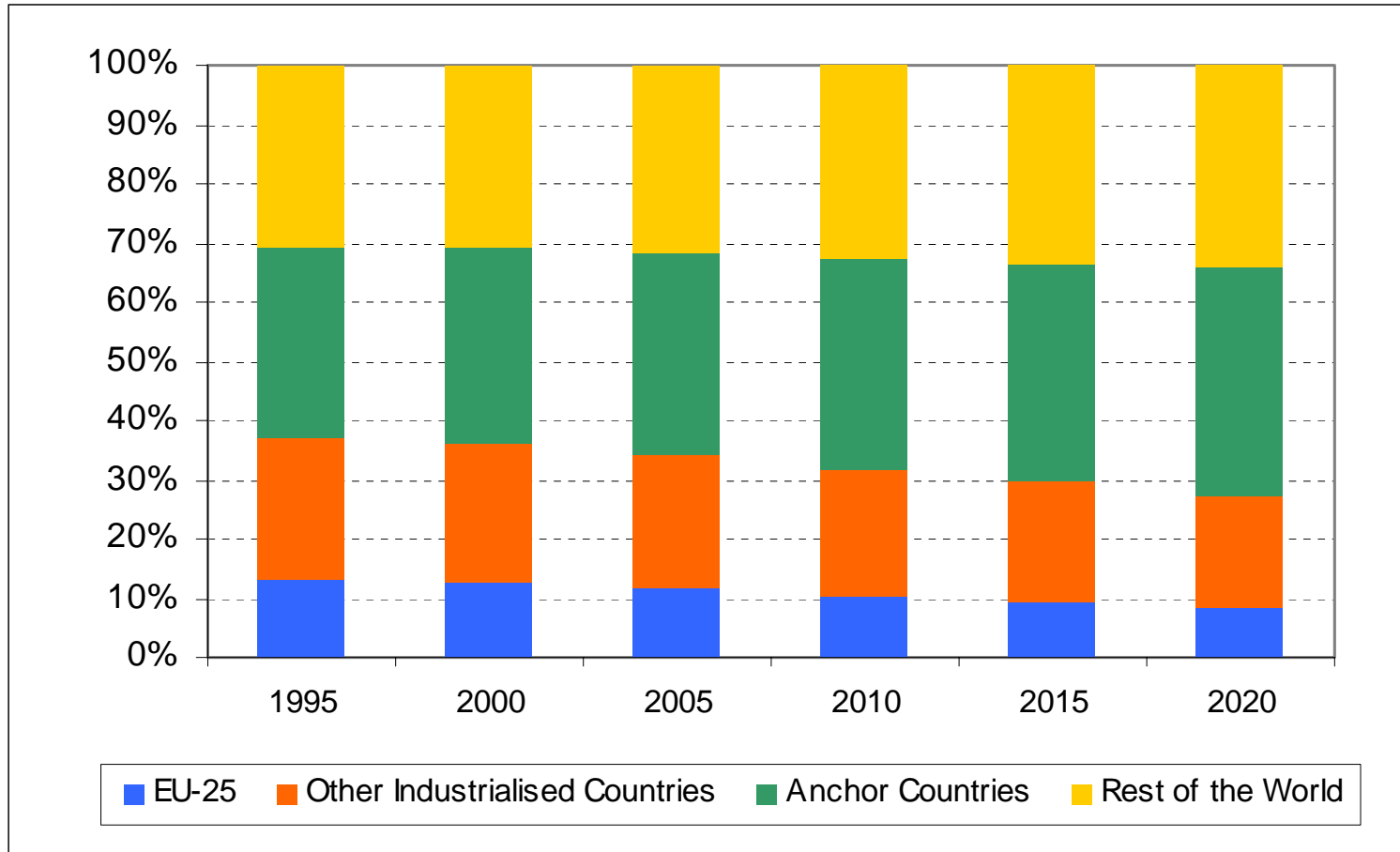
Used domestic extraction, EU-25



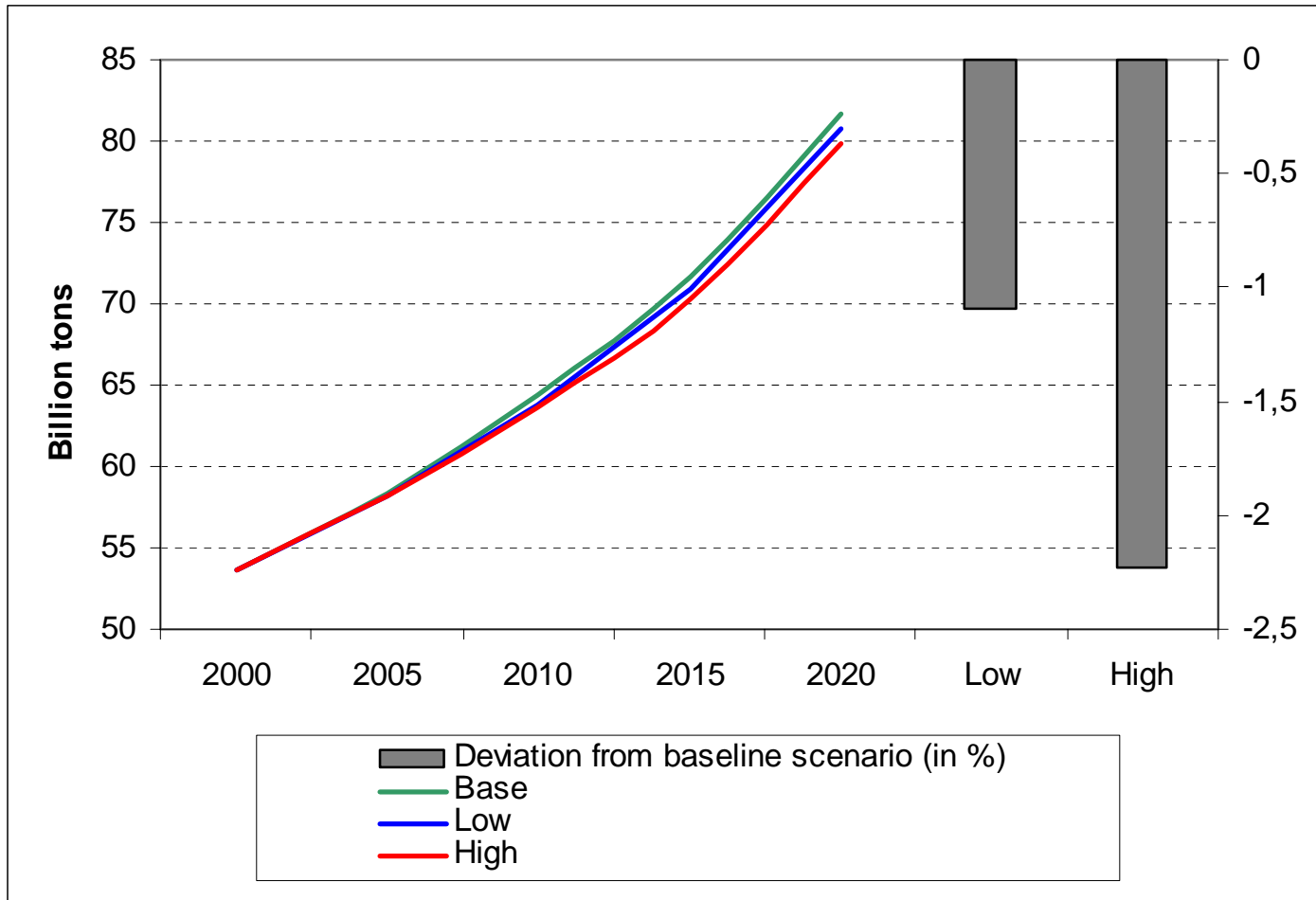
Worldwide used extraction (BASE)



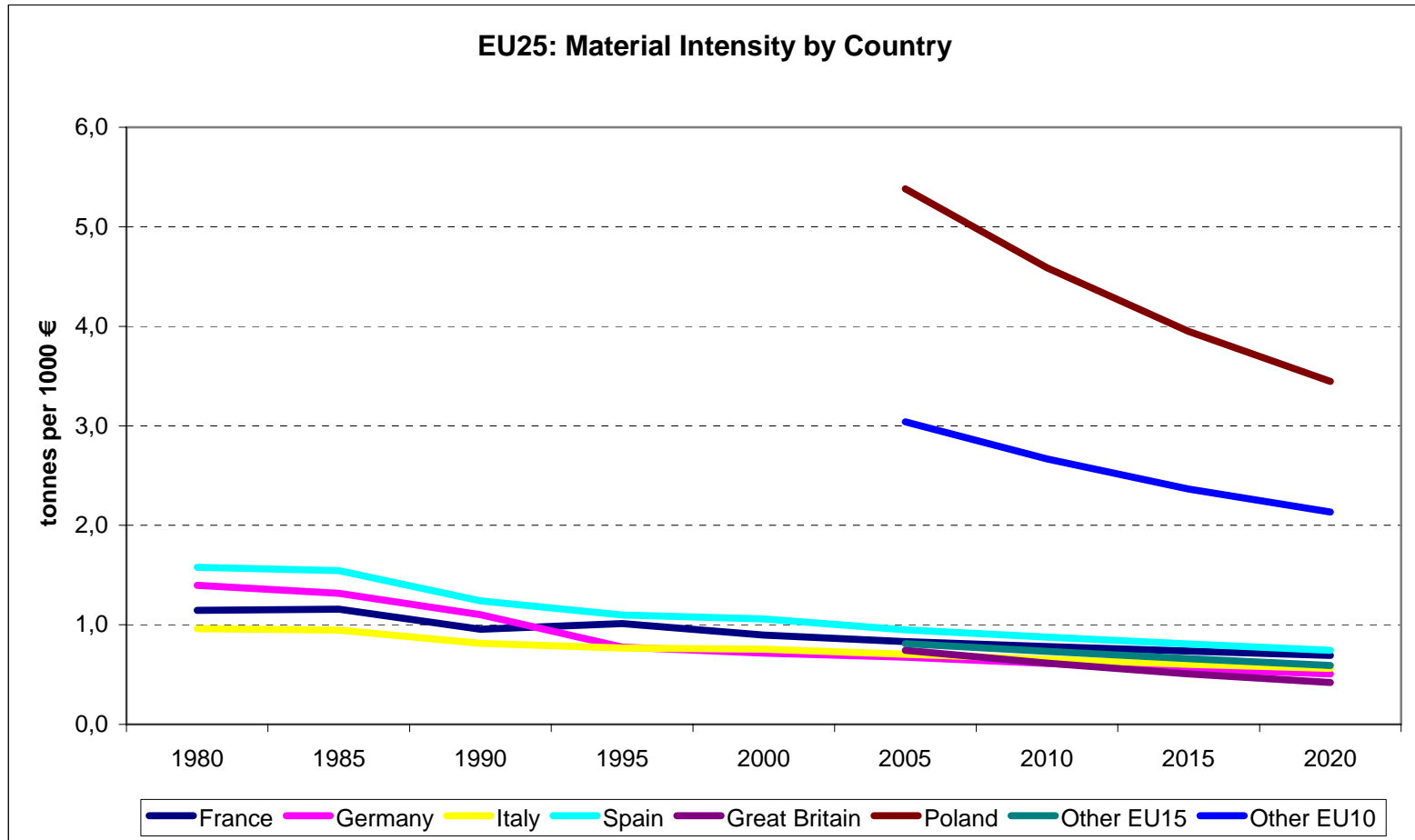
Shares of country groups in used extraction (BASE)



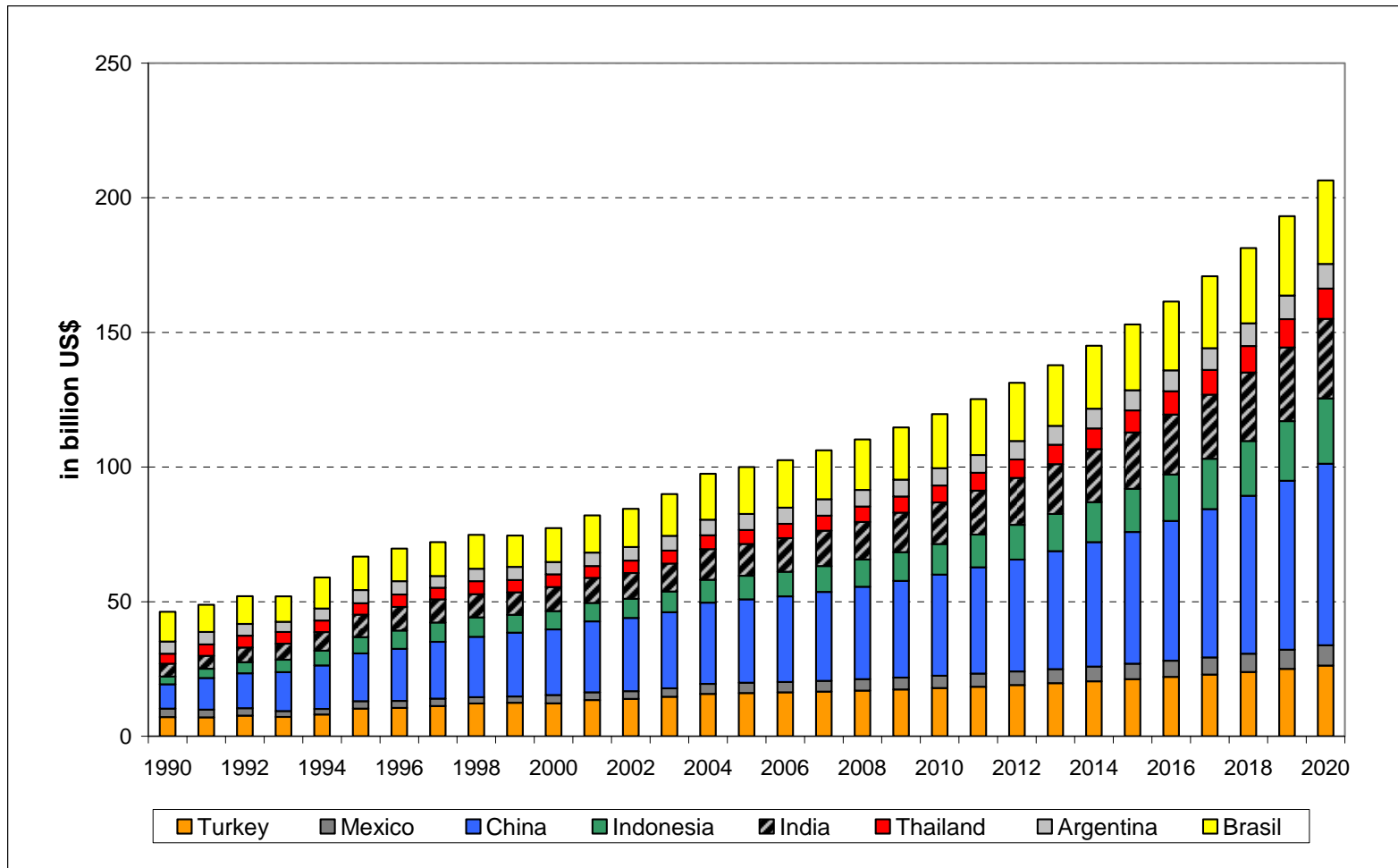
Worldwide used extraction, three scenarios



EU-25: Material Intensity by Country (BASE)



EU-25: Resource intensive imports from “Anchor countries”



- Win-win situation for economy & environment
- Clear winning and losing sectors
- Rebound effects – resource prices
- More ambitious dematerialisation policies required (beyond win-win)
- Action on the global level needed (e.g. ETR also in developing countries)

The end.....thank you !

More information:

www.mosus.net

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