

**ConAccount 2006**  
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# **Modelling environmental, economic and employment effects of resource savings in Austria**

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## 1. Introduction

**challenges / motivation**

## 2. Is increasing efficiency the solution?

Reducing **resource use** in Austria  
(results from the "RESA" project)

## 3. Beyond efficiency

**socio-ecological reform**

**redistribution of work** and **income**

## 4. Conclusion

**Towards integrated policies**

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## Challenges

- **High unemployment**

Austria: 4,9 %; EU25: 8,3 % (April 2006)

- **Financing of governmental expenditures**

Social expenditures: 35,67 Mrd. (1990)      66,86 Mrd. (2003)

% of GDP      26,20 %      (1990)      29,50 %      (2003)

- **Negative human impact on environment**

increasing resource use

decreasing carrying capacity

climate change

biodiversity change





## Core Aims of Sustainability

- **Dematerialisation / reducing resource use**
- **Increasing employment**  
(number of employed)
- **Increasing economic competitiveness**  
(Lisbon Strategy)



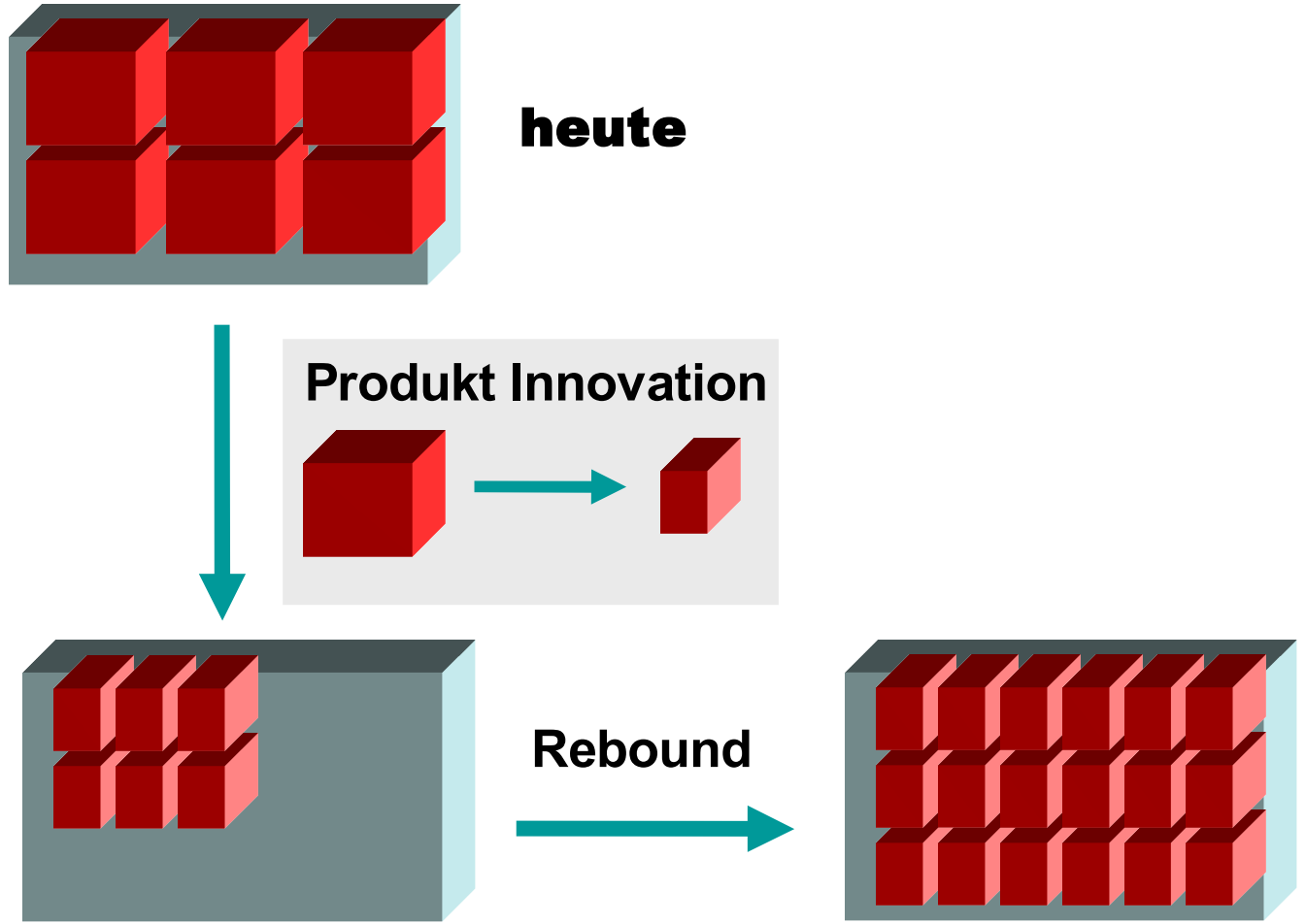
# Is Increasing Efficiency the solution?

- **Reductions of material costs**
  - ✓ increase in **material efficiency**
  - ✓ increase in **competitiveness**
  - ✓ increase in **labour productivity** (⇒ risk of unemployment)
- Risk of **rebound effects**
  - ✓ savings at company level do not always lead to overall reductions of resource use

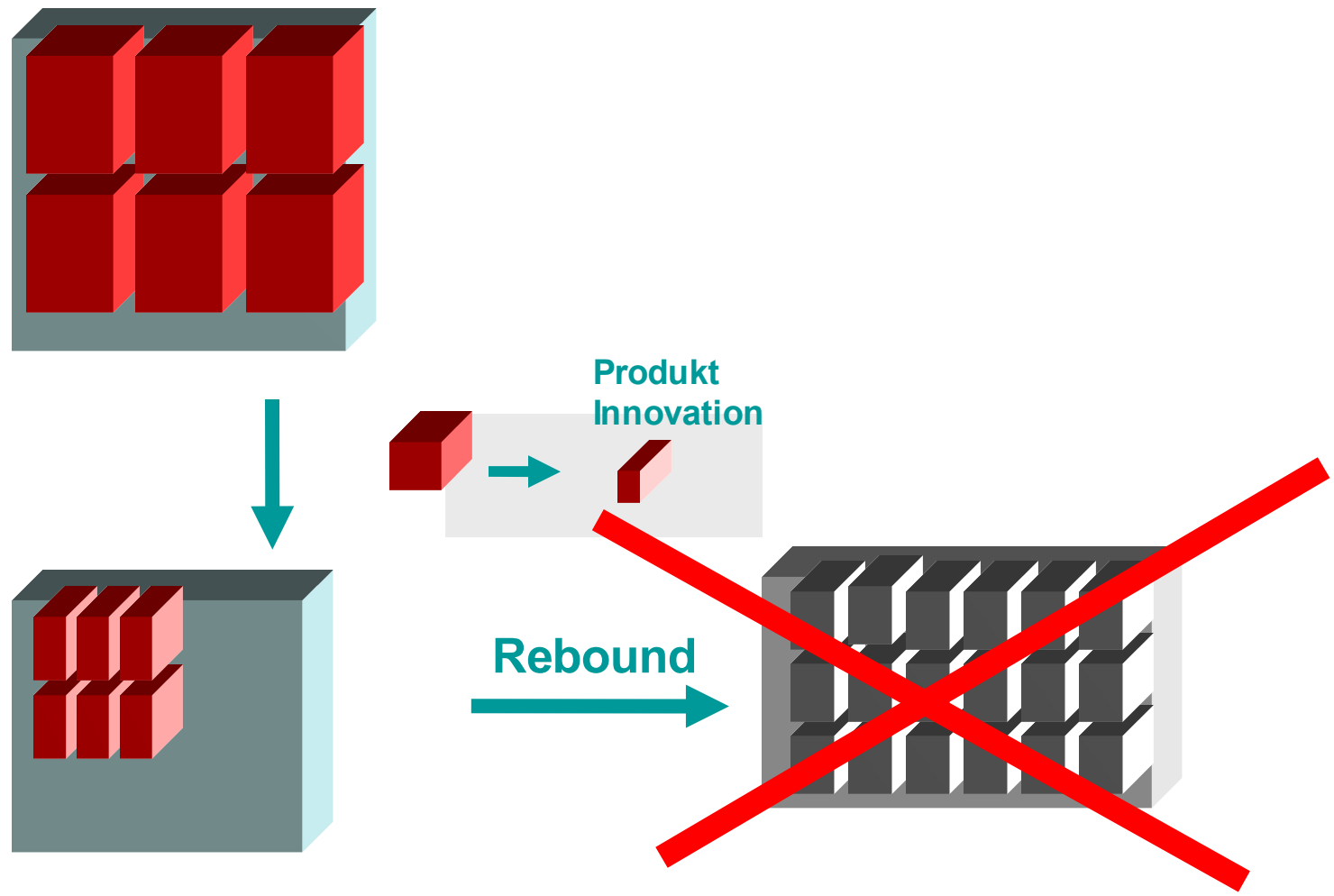


# Rebound effect

we are getting more and more productive...



# Solution



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## Project question

Which **environmental, economic, and employment effects** would it have on the Austrian society if **companies reduce their material and energy costs** from now until the year 2020?



## Project description

- **Sponsor:**

Austrian Federal Ministry of Agriculture, Forestry  
Environment and Water Management



lebensministerium.at

- **Project team:**

Sustainable Europe Research Institute

Gesellschaft für Wirtschaftliche Strukturforschung



- **Project duration:**

December 2005 – January 2007



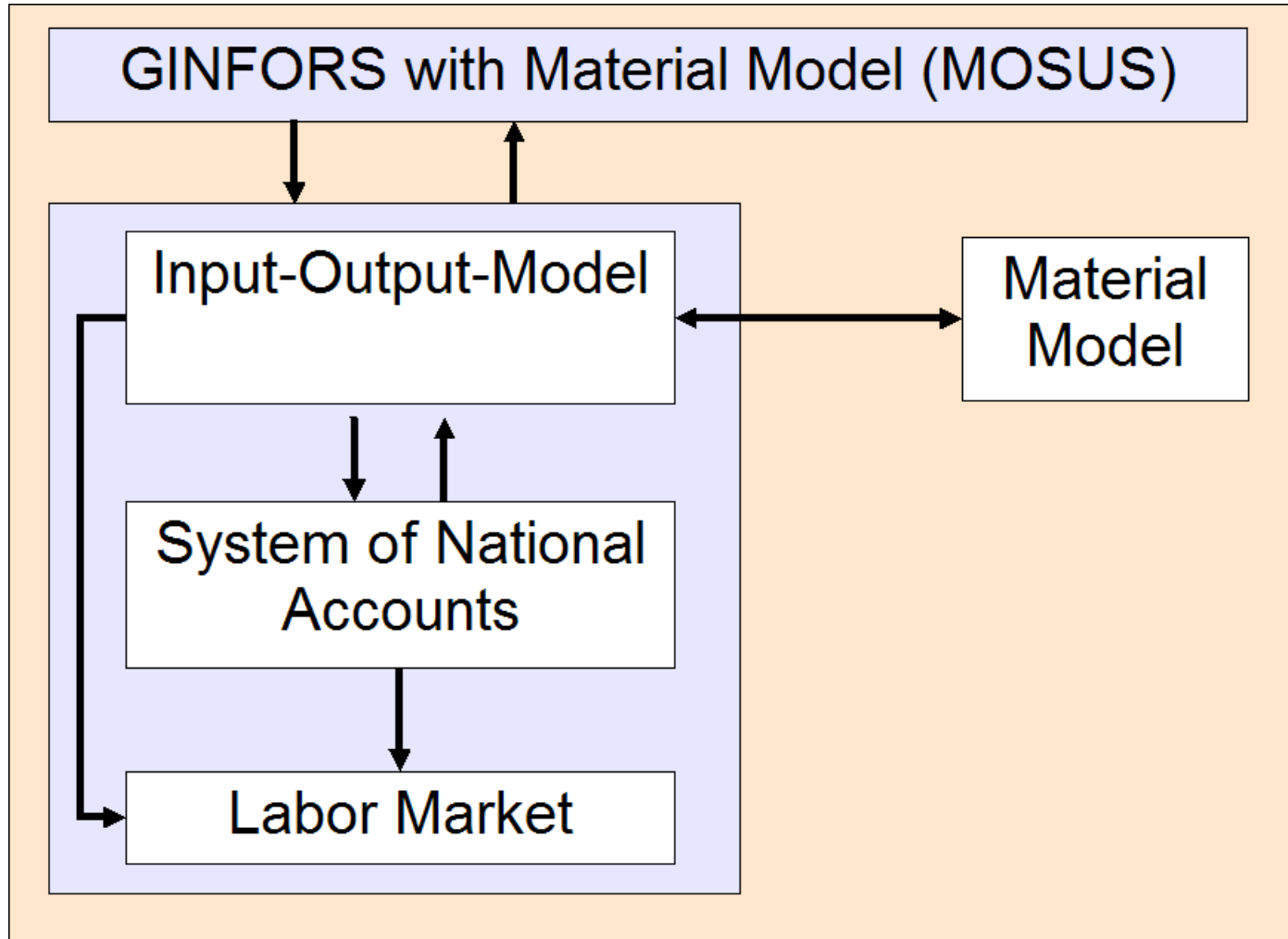
## Project focal points

- **Development of scenarios**, which show the potential of resource use reductions in Austria
  - ✓ German investigations show huge material inefficiencies at company level
  - ✓ Potential of 20 % material cost savings (based on A.D. Little) for Germany
  - ✓ Determining the potential for Austria
  - ✓ Discussing the saving potentials with experts (workshop) to develop realistic scenarios for Austria
  - ✓ Showing Effects of material cost reductions on environment, employment and economy
- Modelling of the scenarios with an **integrated ecological-economic model**

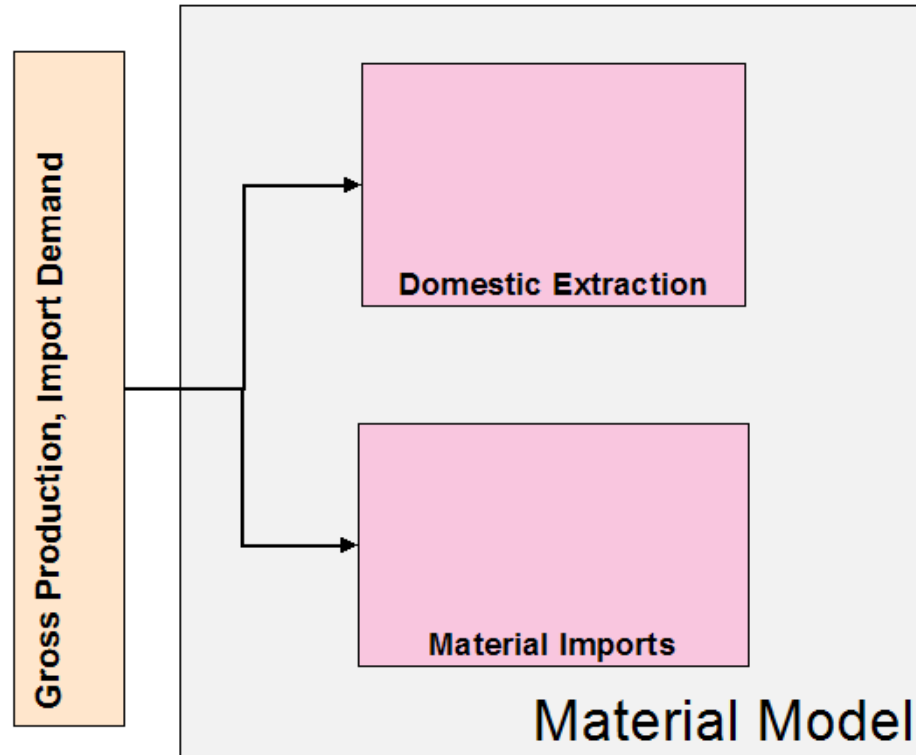
## The Model

- New **integrated ecological-economic model for Austria**
- **Disaggregated (production) structure** to show the linkage between the economy and the environment requires.
- **Macro-econometric model**  
Agents behave under conditions of bounded rationality, econometrically estimated parameters
- **Empirical** foundation
- Soft link to GINFORS (multi-country ecological-economic modeling system) to model foreign trade.

# Overview of the Model Structure



# Material Model



⇒ **Assumption**: no material efficiency gains in extracting sectors, but between the demanding sector and the extracting sector

# Categories of material inputs

	<b>Domestic Extraction</b>	<b>Material Imports</b>
<b>Biomass</b>	food feed animals forestry non edible biomass	food feed animals forestry non edible biomass
<b>Minerals</b>	construction minerals industrial minerals ores	construction minerals industrial minerals ores
<b>Fossil Fuels</b>	coal crude oil natural gas other fossils	coal crude oil natural gas other fossils

## Scenarios

- **Scenario 1:** „Aachen Potential“  
(minus 20% material costs in **all sectors**)
- **Scenario 2:** Resource efficiency in the **construction sector** (minus 10% material costs in construction sector)
- **Scenario 3:** material substitution in **construction sector** (wood instead construction minerals)

## Scenario 1: Aachen Potential

### Assumptions

- Linear reduction of material costs of each production units
  - ✓ in all manufacturing sectors, construction and public administration (not in service sectors)
  - ✓ minus 20% for 2005 until 2020.
- Permanent reduction of material costs is achieved by additional inputs in the magnitude of the material savings of one year (**consulting efforts**)
- not realistic, but provides insight in the relationships between the model components

## Scenario 1: Aachen Potential

### Results Relative changes to BAU scenario

<b>Economy:</b>			
GDP (price adjusted)	in %	7,2	24,4
Private Consumption Expenditures (price adjusted)	in %	6,4	20,9
Exports (price adjusted)	in %	2,0	7,2
Imports (price adjusted)	in %	-2,6	-6,2
Price Index GDP	in %	-3,90	-12,50
<b>Employees</b>			
	in %	0,9	2,8
<b>Disposable Income (Private Households)</b>			
	in %	3,4	10,6
<b>Environment:</b>			
Material Inputs (Total)	in %	-0,8	0,6
Material Imports	in %	-1,6	-1,0
Domestic Extraction	in %	-0,2	2,2
Material Productivity (Total; GDP/DMI)	in %	8,1	23,7
Domestic Extraction	in %	7,5	21,8
Material Imports	in %	9,0	25,8
Construction	in %	6,8	20,9

## Scenario 1: Aachen Potential

### Conclusions:

- Reduction of material costs leads to
    - ✓ **positive effects on economic development and competitiveness**
    - ✓ **increase in employment** (but: development of labour market is dependent on the wage increases compared to productivity increases)
    - ✓ huge **increases in material efficiency**, but also **increase in absolute material use**
  - Results depend on **design of scenarios**
  - Results show the **important role of the construction sector**
    - ✓ huge amounts of construction minerals (60% of domestic extraction)
    - ✓ important economic role
- ⇒ **Scenario 2 and 3 refer to construction sector**

## Scenario 2

# Resource efficiency in the construction sector

### Assumptions:

- minus 10% of intermediate inputs from „Mining and Quarrying“ in the sector “Construction” between 2006 und 2020
  - ✓ Savings of material inputs result in additional consulting costs of the same magnitude for one year (Consulting efforts enable resource savings)
- Consequence: intermediate inputs of construction sector decrease

## Scenario 3

# Material substitution in the construction sector

### Assumptions:

- Decrease in intermediate inputs like in scenario 2.
- Substitution of construction materials by wood:
  - ✓ Intermediate inputs of „Be- und Verarbeitung von Holz“ increase by 10 % from 2006 to 2020
  - ✓ change of construction materials from anorganic to organic (renewable)
- Consequence: **intermediate inputs of construction sector remain constant.**

# Results of scenario 2 and 3

## GDP

	Relative deviations from the base scenario (in percent)							
	"Resource efficiency"				"Changing materials"			
	2005	2010	2015	2020	2005	2010	2015	2020
	<i>nominal</i>							
GDP	0,00	-0,00	-0,01	-0,02	0,00	-0,00	-0,00	-0,00
Household Final Consumption Expenditure	0,00	0,00	0,00	0,00	0,00	-0,00	-0,00	-0,00
Final Consumption Expenditure of NPISHs	0,00	-0,00	-0,01	-0,01	0,00	-0,00	-0,00	-0,00
Final Consumption Expenditure by Government	0,00	0,00	0,00	0,01	0,00	-0,00	-0,00	-0,00
Gross Capital Formation	0,00	-0,02	-0,06	-0,10	0,00	-0,00	-0,00	-0,00
Exports	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Imports	0,00	-0,00	-0,00	-0,00	0,00	-0,00	0,00	0,00
	<i>price adjusted</i>							
GDP	0,00	0,01	0,03	0,06	0,00	0,00	0,00	0,00
Household Final Consumption Expenditure	0,00	0,01	0,03	0,06	0,00	0,00	-0,00	-0,00
Final Consumption Expenditure of NPISHs	0,00	0,01	0,02	0,04	0,00	0,00	0,00	0,00
Final Consumption Expenditure by Government	0,00	0,01	0,04	0,06	0,00	0,00	0,00	0,00
Gross Capital Formation	0,00	0,00	0,01	0,02	0,00	0,00	0,00	0,00
Exports	0,00	0,00	0,01	0,01	0,00	0,00	0,00	0,00
Imports	0,00	-0,00	-0,00	-0,00	0,00	0,00	0,00	0,00
	<i>Labor Market</i>							
Employees	0,00	0,00	0,01	0,02	0,00	-0,00	-0,00	-0,01
	<i>Price Index (2000=100)</i>							
GDP	0,00	-0,01	-0,04	-0,07	0,00	-0,00	-0,00	-0,01

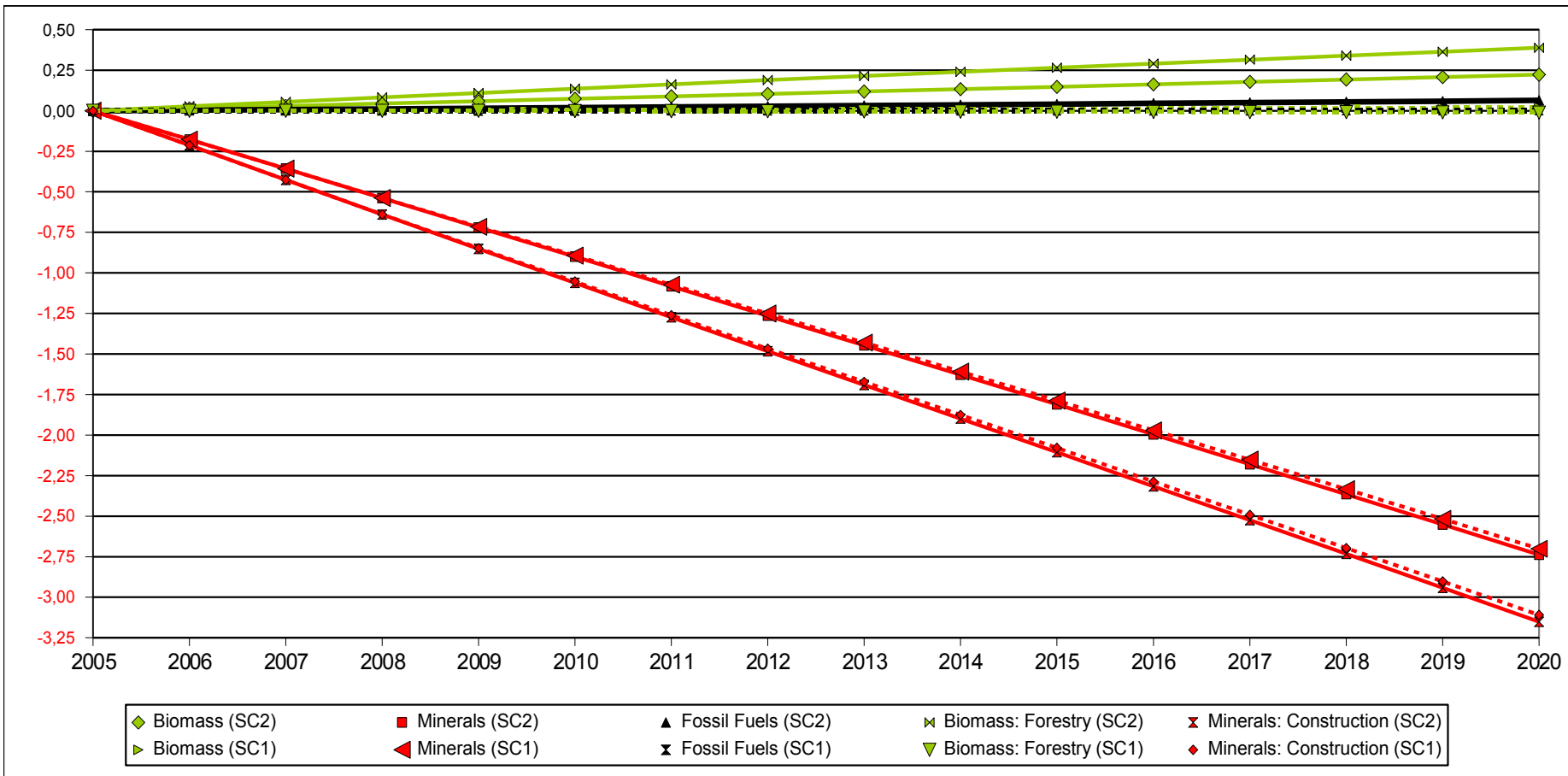
# Results of scenario 2 and 3

## Material use

	Relative deviations from the base scenario (in percent)							
	"Resource efficiency"				"Changing materials"			
	2005	2010	2015	2020	2005	2010	2015	2020
Biomass (Total)	0,00	0,00	0,01	0,02	0,00	0,07	0,15	0,22
Biomass: Forestry	0,00	0,00	0,01	0,01	0,00	0,14	0,26	0,39
Fossil Fuels (Total)	0,00	-0,00	-0,00	0,00	0,00	0,02	0,04	0,06
Minerals (Total)	0,00	-0,89	-1,79	-2,70	0,00	-0,90	-1,81	-2,74
Minerals: Construction	0,00	-1,05	-2,08	-3,11	0,00	-1,06	-2,11	-3,15
<b>Material (Total)</b>	0,00	-0,47	-0,95	-1,45	0,00	-0,45	-0,92	-1,40

# Results of scenario 2 and 3

Relative deviation of scenarios 2 and 3 compared to the BAU scenario



## Results of scenario 2 and 3

Changes of scenarios 2 and 3 compared to the BAU scenario for employment and production value for selected sectors

	"Resource efficiency"				"Changing materials"			
	2005	2010	2015	2020	2005	2010	2015	2020
Employees, Relative deviations from the base scenario (in percent)								
Mining and Quarrying	0,00	-1,06	-2,08	-3,11	0,00	-1,07	-2,11	-3,15
Forestry	0,00	0,00	0,01	0,02	0,00	0,09	0,21	0,37
Business Services	0,00	0,02	0,02	0,02	0,00	0,00	0,00	0,00
Construction	0,00	0,03	0,09	0,16	0,00	0,00	0,00	0,00
Output, Relative deviations from the base scenario (in percent)								
Mining and Quarrying	0,00	-1,07	-2,11	-3,14	0,00	-1,08	-2,13	-3,18
Forestry	0,00	0,00	0,01	0,02	0,00	0,13	0,25	0,36
Business Services	0,00	0,02	0,02	0,03	0,00	0,00	0,00	0,00
Construction	0,00	0,03	0,09	0,15	0,00	0,00	0,00	0,00

## Conclusions:

### Limitations

- Only data for Direct Material Input (no imported materials)
- cost savings could lead to additional economic growth
- Aachen scenario not realistic

### Next steps

- **Design of more realistic scenarios**
- **Modelling of these scenarios**

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Towards integrated policies

## How to **avoid** rebound effects?

- **Absolute limits (tradable permits)** for material extraction, energy use, land use, emissions ...
- **Work, earn and consume less ??**

**= more leisure and unpaid work**

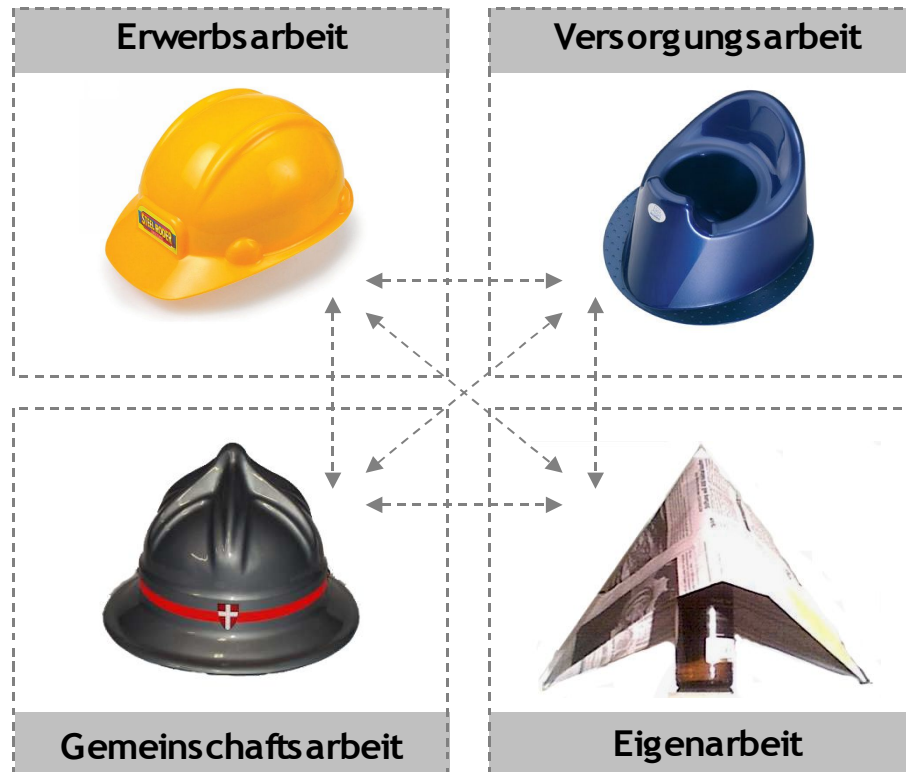
**50.000 h lifelong employment**

## Full employment?

- **„normal work“:**
  - ✓ 40 hours / week
  - ✓ 40 weeks / year
  - ✓ 40 years / life

## Redistribution of work

- Re-value **immaterial results**
- Concept of **mixed work**



# Sustainability for individual happiness?

- **European SDS**

„Europeans value quality of life“

-> **well-being** as a core concept

**a good life for every person on earth** – now and in the future  
([www.gosd.net/Pignans.pdf](http://www.gosd.net/Pignans.pdf))

## **Role of the economy?**

**The economy is the system to  
produce collectively what  
everybody wants.**

**... not to „create jobs“**

## An example



# All in one





**Is this what we „want“?**

**Is this what we (need to) work for?**

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## Integrated policy

### **social dimension**

new type of full employment  
social security  
fairness

### **environmental dimension**

reduce material, energy and land use  
reduce risks and harmful substances

### **economic dimension**

innovation and competitiveness  
production for well-being

### **institutional dimension**

participation  
democracy

## Integrated policies for integrated problems/challenges

- **Examples:**



[www.mosus.net](http://www.mosus.net)



[www.a-und-oe.de](http://www.a-und-oe.de)

- **Conclusion:**

- ✓ **WIN-WIN** is possible
- ✓ **Material efficiency** is crucial but needs accompanying policy
- ✓ ***Redistribution of labour and income plays a decisive role***

**Integrated policy framework**

**Civil society pressure**

**Communication and education**

**Individual Responsibility**

**Cultural Creativity and Social Learning**

**Thank you!**

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