

# **Built Environment and the Use of Resources A Vision of Sustainability**

**FORESCENE Project Thematic Workshop on Infrastructures  
and Landuse**

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**THE REGIONAL ENVIRONMENTAL CENTER**  
*for Central and Eastern Europe*

# OVERVIEW

- \* **Sustainability and built environments**
- \* **What resources?                      What about built systems?**  
**Various aspects of analysis**
- \* **Why do we need to manage resources?**  
**Economics, social development, life support systems**
- \* **How to approach this complex field?**  
**Managing needs and economic processes effectively -  
incl. sound waste management**
- \* **Multidisciplinarity, multidimensionality: policy,  
methodology, management practices, resource  
economics, environmental and public health risks**
- \* **Vision or utopia?**



# Sustainable urban settlements

10 day training in VIU, organized by REC and CEU:

Economic and social trends in cities; The future of cities: ex-urban sprawl or integrated communities; Good governance; Urban planning: problems, solutions and consequences; Tools for sustainable planning; Implementing Local Agenda 21: lessons learned; Eco-management in urban areas; Sustainable architecture: principles and policies; Trends and initiatives of eco-building; Sustainable housing in Europe; Energy efficiency and renewable energy in sustainable urban development; Urban air quality, industry and health; Waste management in Europe: policies and trends; General aspects of water and wastewater treatment; Waste and water management in urban areas - *site visits*; The role of culture and heritage in urban renewal: successes and threats; Sustainable tourism: the case of Venice; The Venice Lagoon: alternative tourist routes – *site visit*; Sustainable urban mobility in Europe: trends, policies and tools; Case study: sustainable transportation in Milan; Changing system thinking: toward a new approach of urban sustainable mobility; Can the social and health systems be part of the development agenda of European countries: examples and challenges; Sustainable urban community development: jobs, justice, and civic engagement.



# Basic resources: life

- **Hosting environmental conditions: heat, pressure, chemical composition for sustenance of life**
- **Feed and drink (water) for metabolism**
- **Space and time for existence and multiplication**
- **Safety and security for survival – concept of longer term**



# Basic resources: humans

- **Environmental conditions: shelter, dressing**
- **Food and drink: hunting, fishing, gathering, then agriculture**
- **Space and time: forest, arable land, waters**
- **Safety and security: sophistication of shelter and infrastructure systems**

**Plus come specific needs for health, comfort, satisfaction, self-fulfilment and beyond reasonability**



# Basic resources: socio-economic system

- Energy
- Materia
- Land, water(s) and ecosystems
- Human capabilities
- Time
- Information
- Finances



# Basic resources: why to manage?

- **Energy:** fossils run out +CO<sub>2</sub>, nuclear long term safety (?), slow renewables development
- **Materia:** enormous transformations by mining, raws production, manufacturing and consumption – pollution, emission, waste
- **Land:** alternative use potential decreasing, biodiversity (planetary genetic info variety) in trouble  
...
- **Human capabilities:** sustenance of individual and species, growth of economy, (coping) strategies for competition and success (?)
- **Time:** how much do we have?
- **Information:** exploding – difficult to manage
- **Finances:** never enough for developers, while not enough good projects for financiers to invest in



# Resource policies (EU)

- 6th EAP (2002-2012)
- IPP, SCP (coming), ETAP and Performance Targets (under development)
- Eco-design (EuP, RoHS)
- Energy Performance of Buildings Directive
- IPPC/BAT and other pollution/emission control directives
- Lisbon Strategy for competitiveness and employment
- Thematic strategies on the Sustainable Use of Resources, on the Prevention and Recycling of Waste, on Urban Environment, on Soil, etc.



# Resource assessment methodologies

- Life cycle analysis (LCA) – cradle to grave or cradle to cradle
- Material flow analysis (MFA) - economy/EU-wide MFA, relevance to EU statistics, relevance to policy, challenges/uncertainties
- Substance flow analysis (SFA) – for specific chemicals/agents
- Environmental Accounting
- Etc.



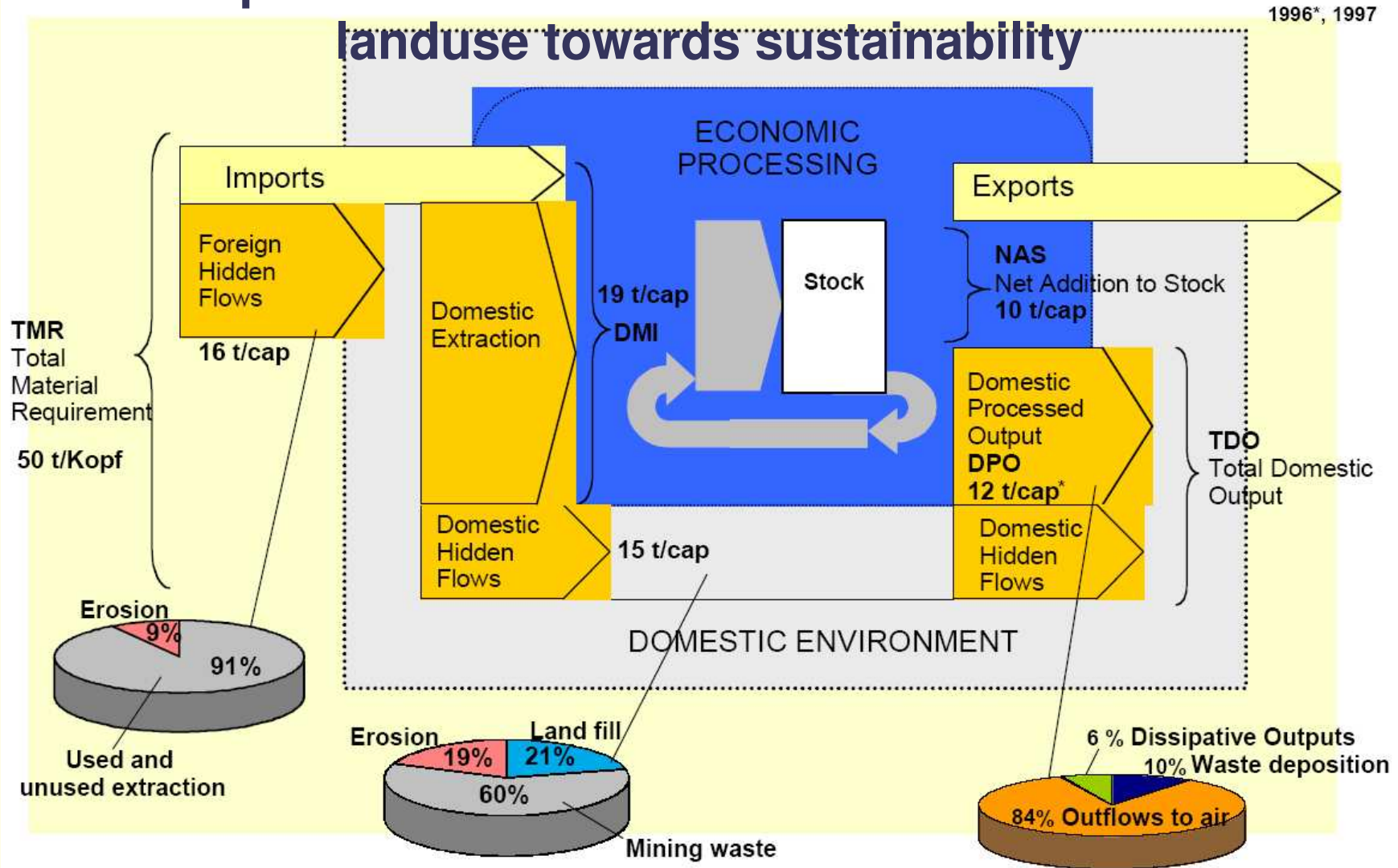
# Variety of complementary MFA approaches

Specific environmental problems related to certain impacts per unit of flow of			Problems of environmental concern related to the throughput of		
<b>Substances</b>	<b>Materials</b>	<b>Products</b>	<b>Firms</b>	<b>Sectors</b>	<b>Regions</b>
e.g.	e.g.	e.g.	e.g.	e.g.	e.g.
Cd, Cl, Pb, Zn, Hg, N, P, C, CO <sub>2</sub> , CFC	wooden products, energy carriers, excavation, biomass, plastics	diapers, batteries, cars	single plants, medium and big companies	production sectors, chemical Industry, construction	total or main throughput, mass flow balance, total material requirement
within certain firms, sectors, regions			associated with substances, materials, products		



# The challenge

## Development of societal metabolism and associated land use towards sustainability



# Uncertainties

- **Structure and volume of industrial and societal metabolism**
- **Disparity of resource use in regions and economic sectors**
- **Implications of physical growth – population and supporting economies and land and built systems**
- **Shift to renewables – is it happening effectively to support development and growth?**
- **Progress on decoupling – per unit: yes (eco-efficiency)! Micro level: yes. But in absolute terms on macro level?**

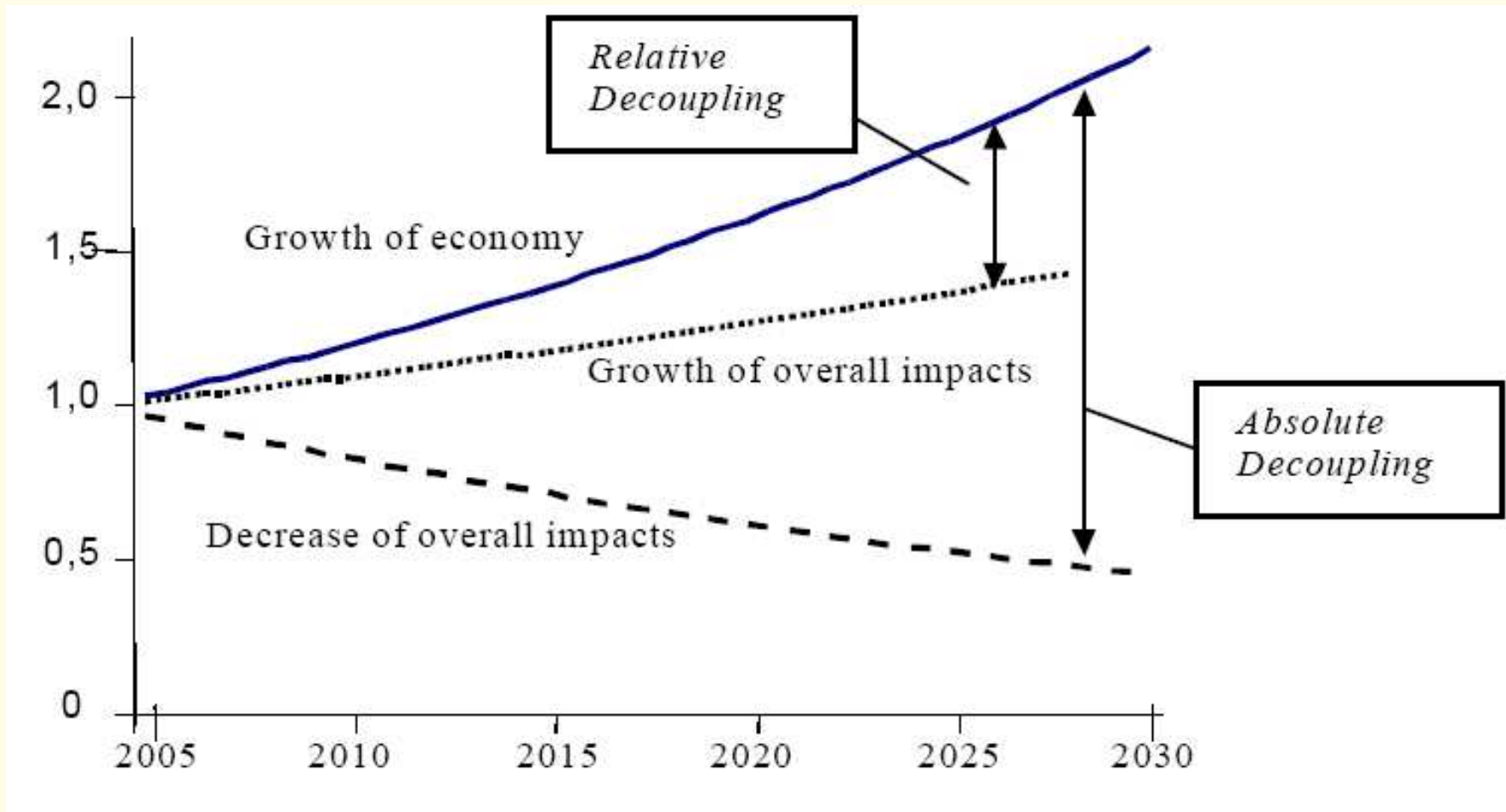


# Resource management practices

- **Resource/economic/environmental/landuse - planning**
- **Eco-efficiency**
- **Factor 4 and 10**
- **Innovation/R&D/cleaner (higher) technologies**
- **IPP, SCP**
- **Zero emission**
- **Etc.**



# Absolute and relative decoupling of environmental impact from economic growth

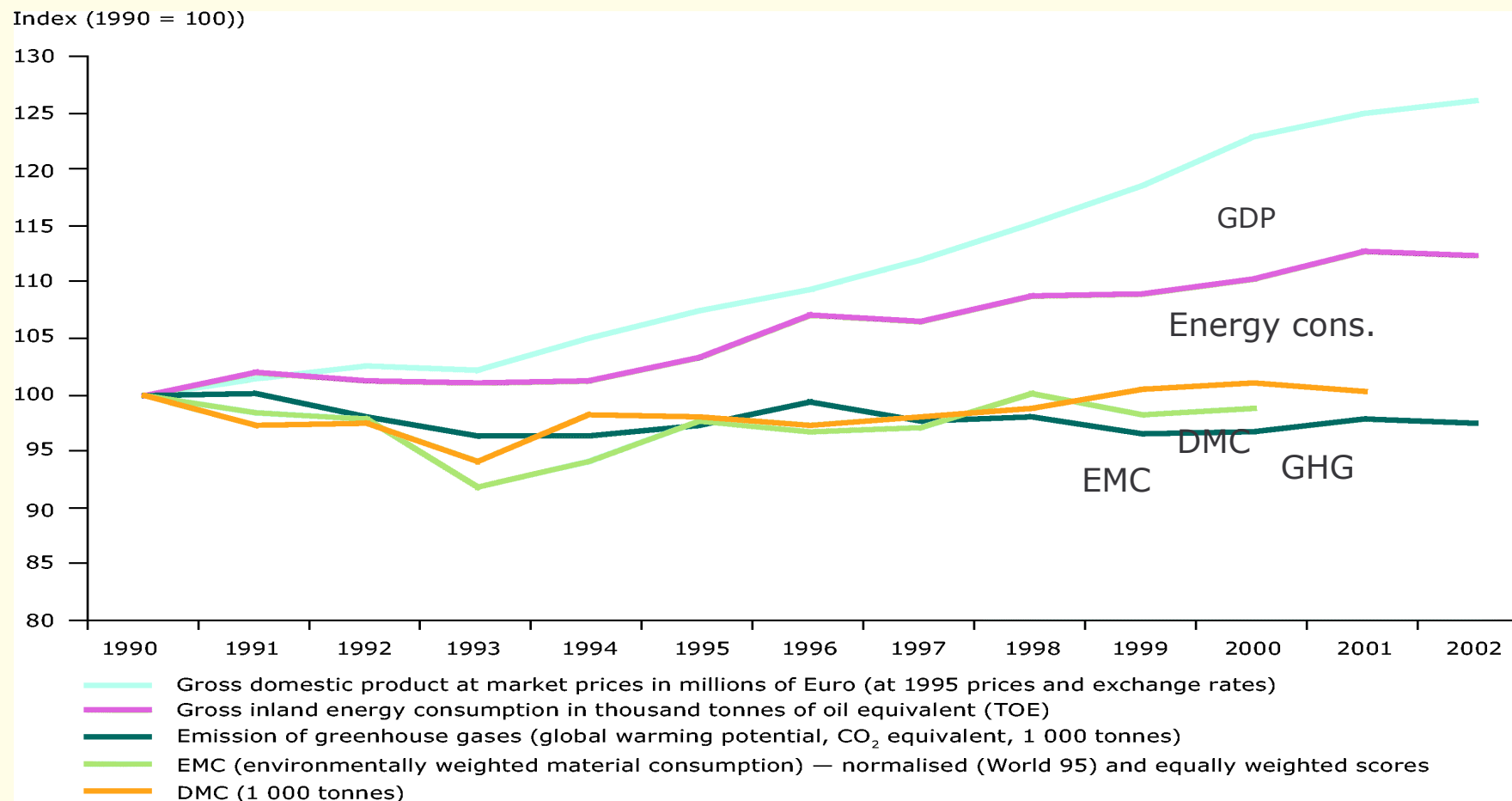


Source: Thematic Strategy on the Sustainable Use of Natural Resources - IMPACT ASSESSMENT, COM (2005) 670 final [www.rec.org](http://www.rec.org)



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# Decoupling resource use from GDP in EU15



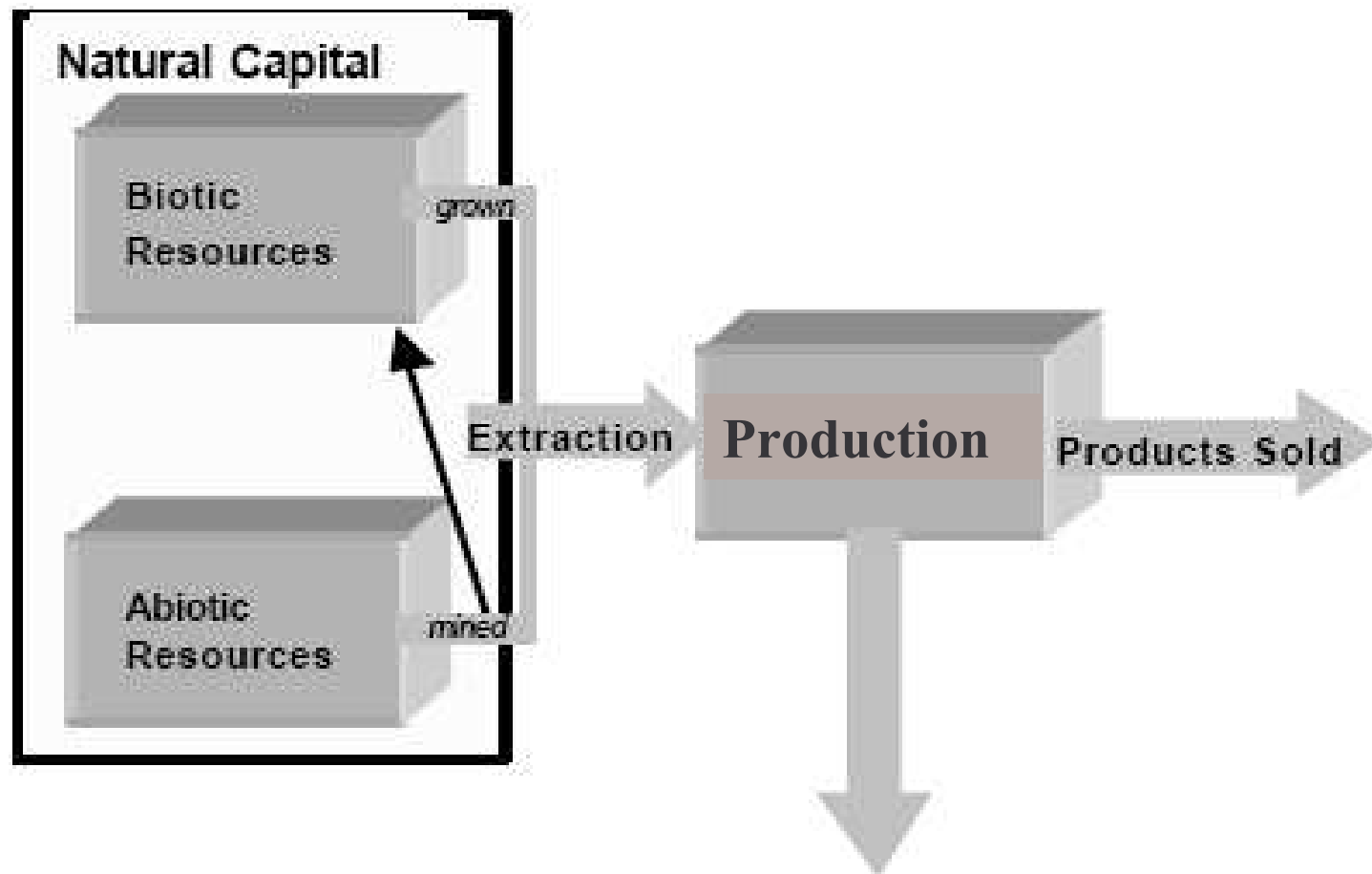
Source: EEA Eionet WS, 2006



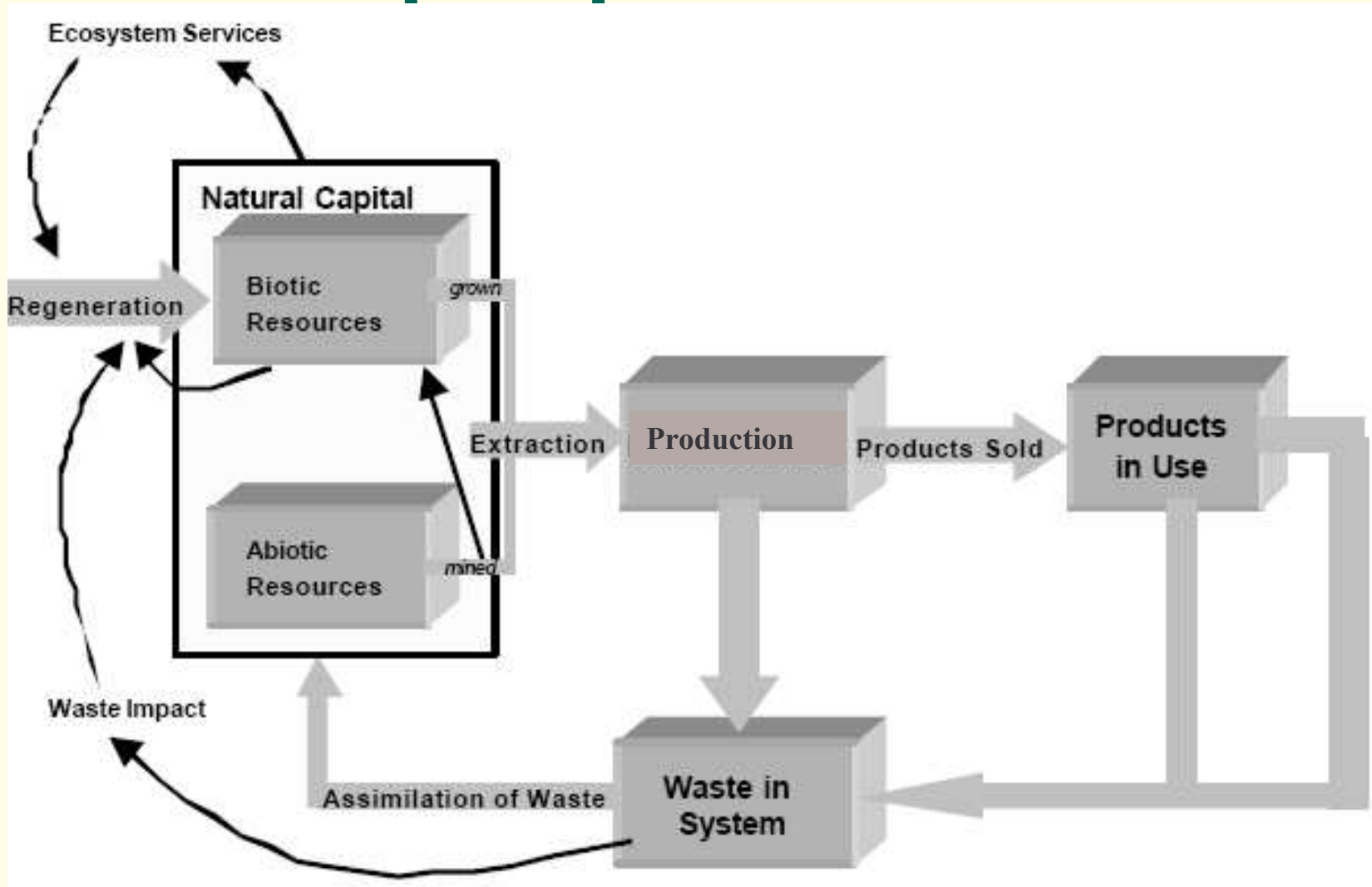
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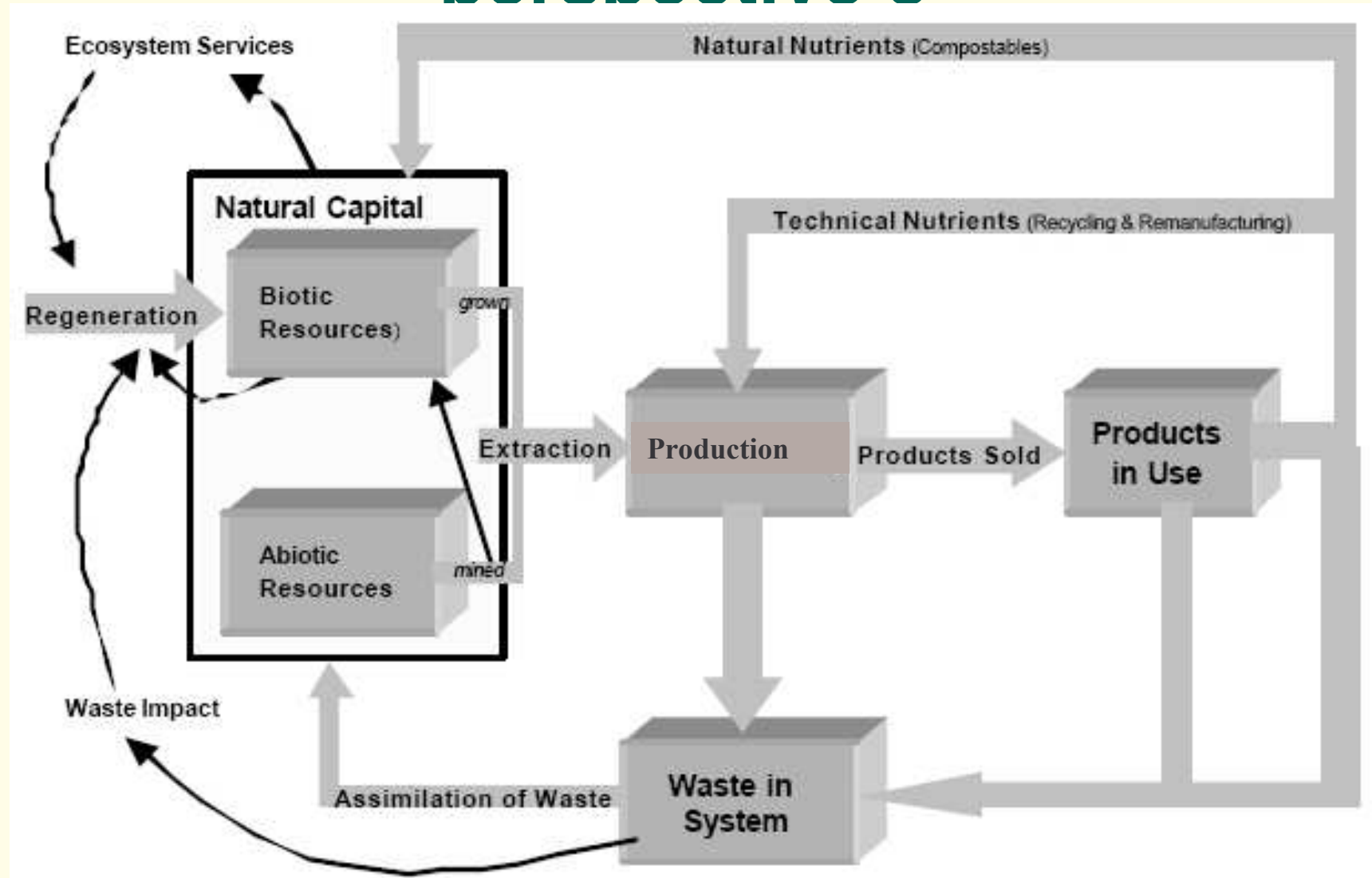
# The resource cycle: systems perspective



# The resource cycle: systems perspective 2

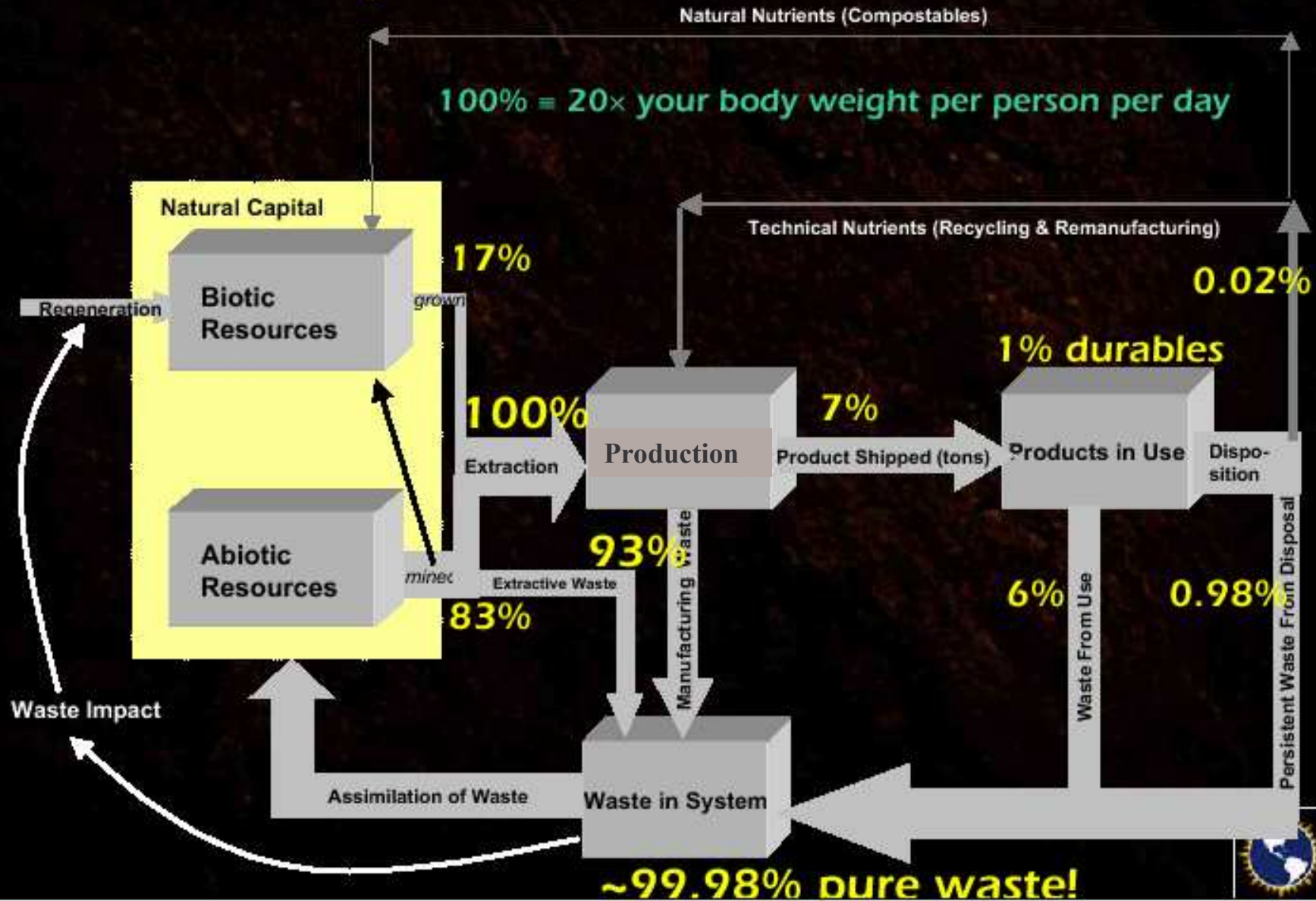


# The resource cycle: systems perspective 3



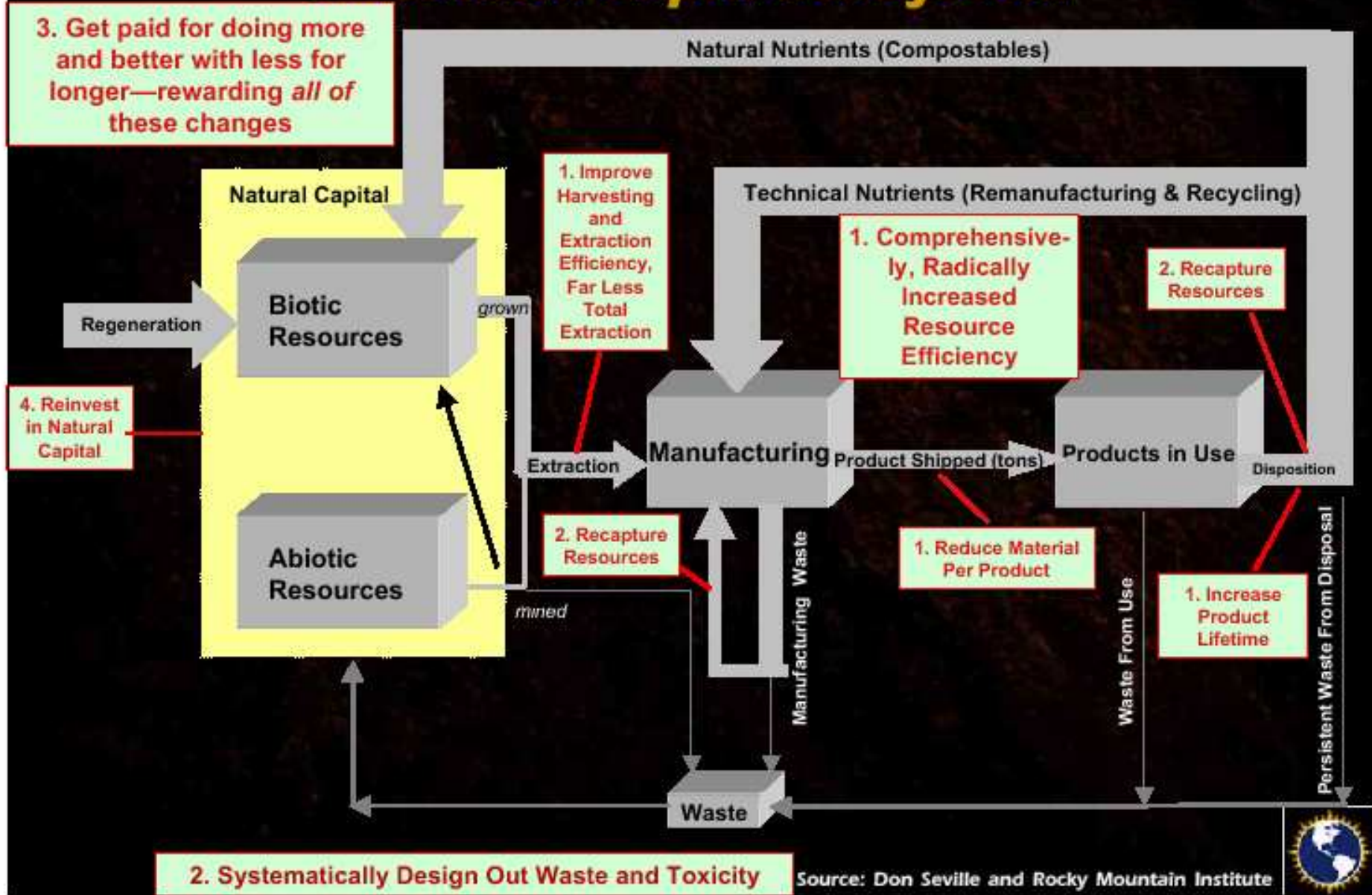
# The Rich Resource Cycle: Many Countries' Goal?

## The Current System (US numbers to illustrate)



# The Resource Cycle for Sustainable Development

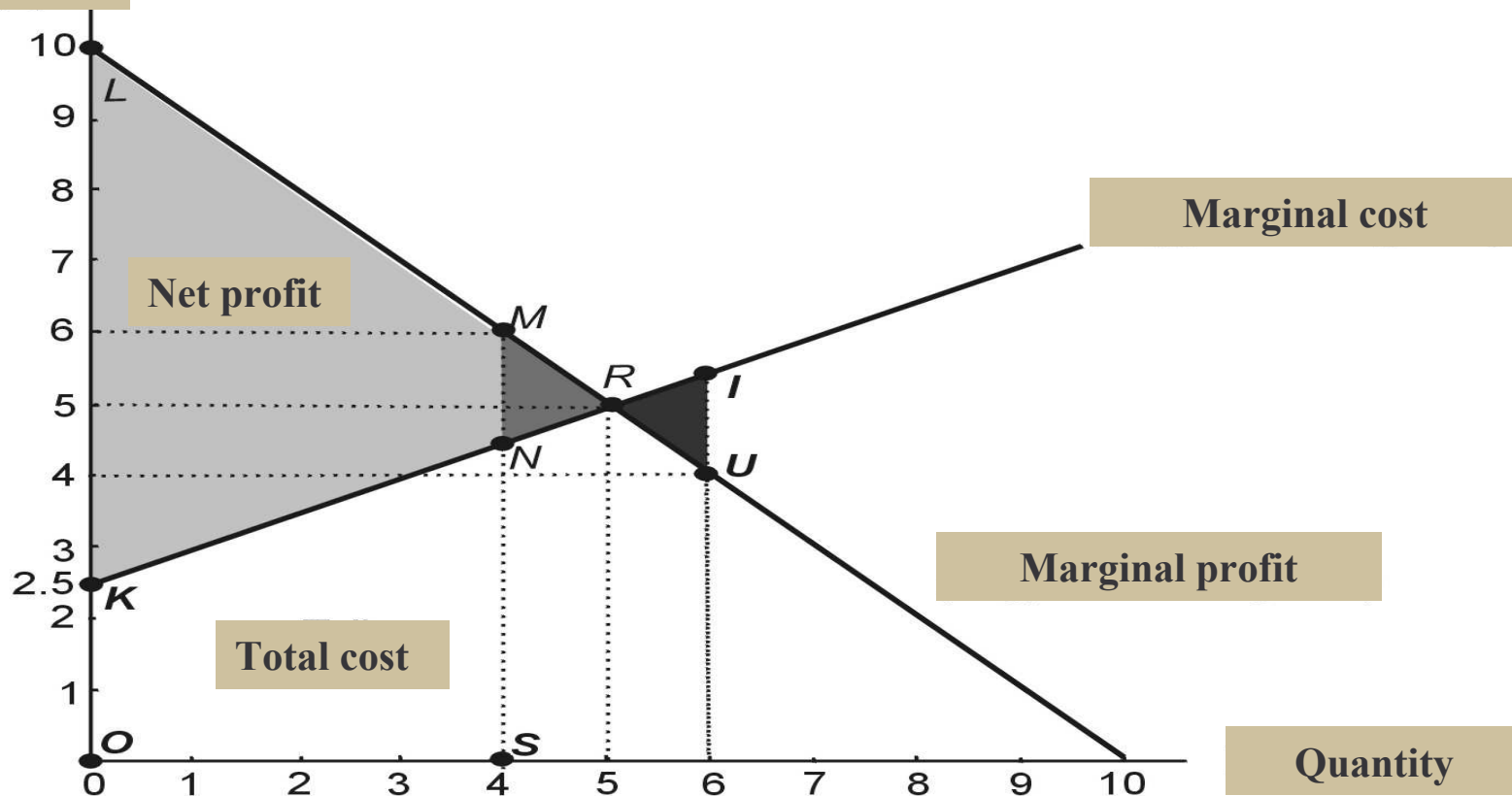
## A Natural Capitalist System



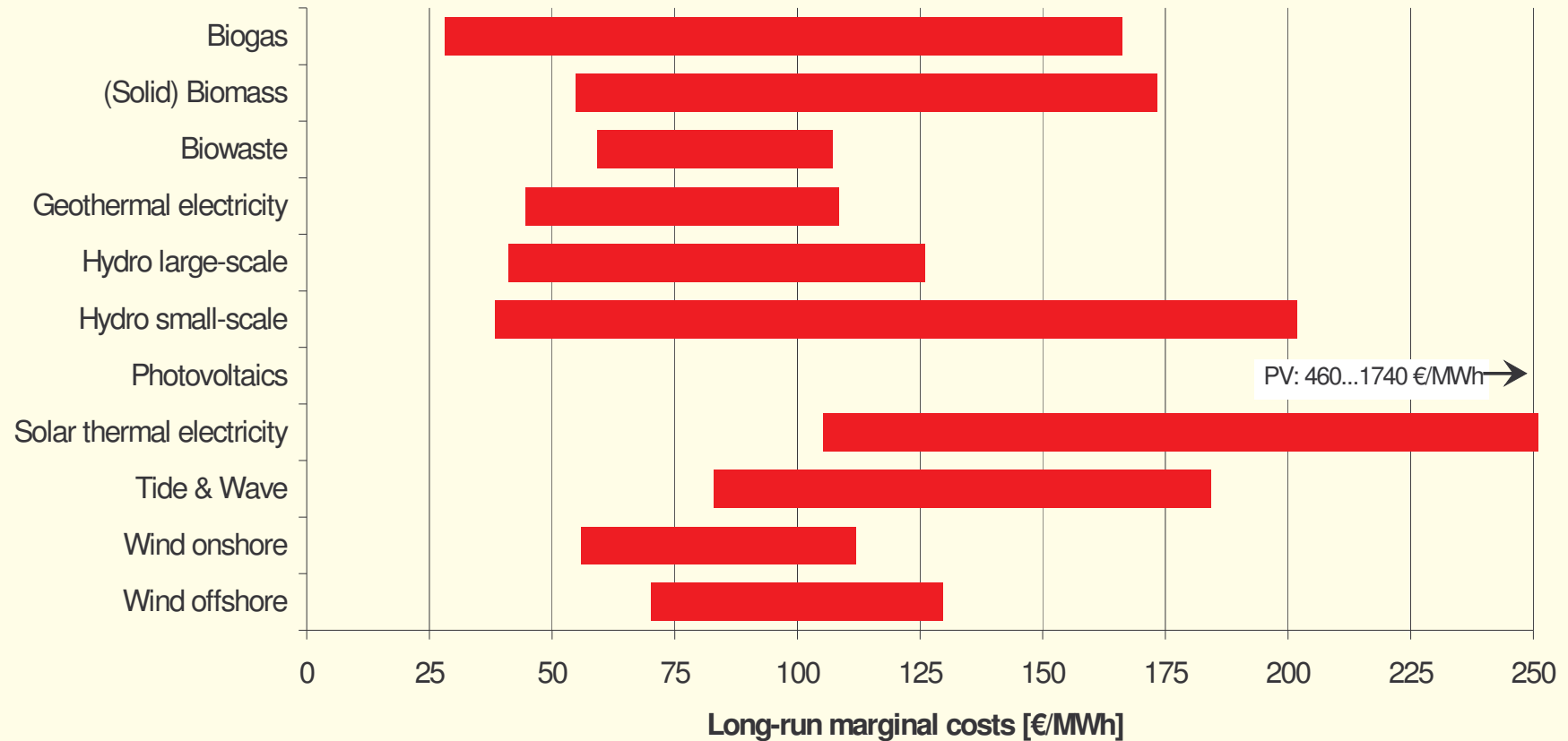
# Resource economics

Internalization of externalities and maximization of benefits by optimum resource allocation

Per unit cost



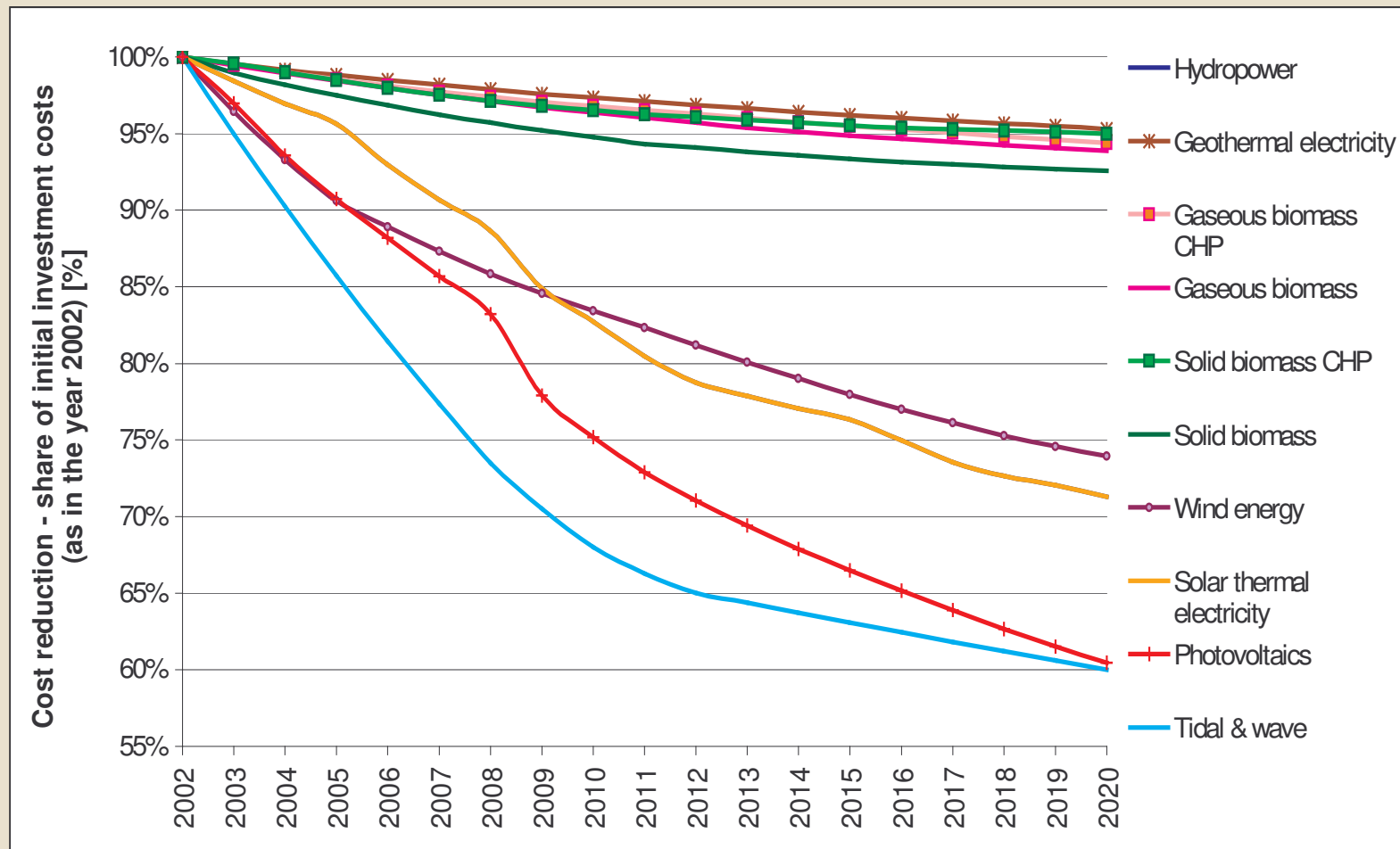
# Example: technology - cost (1)



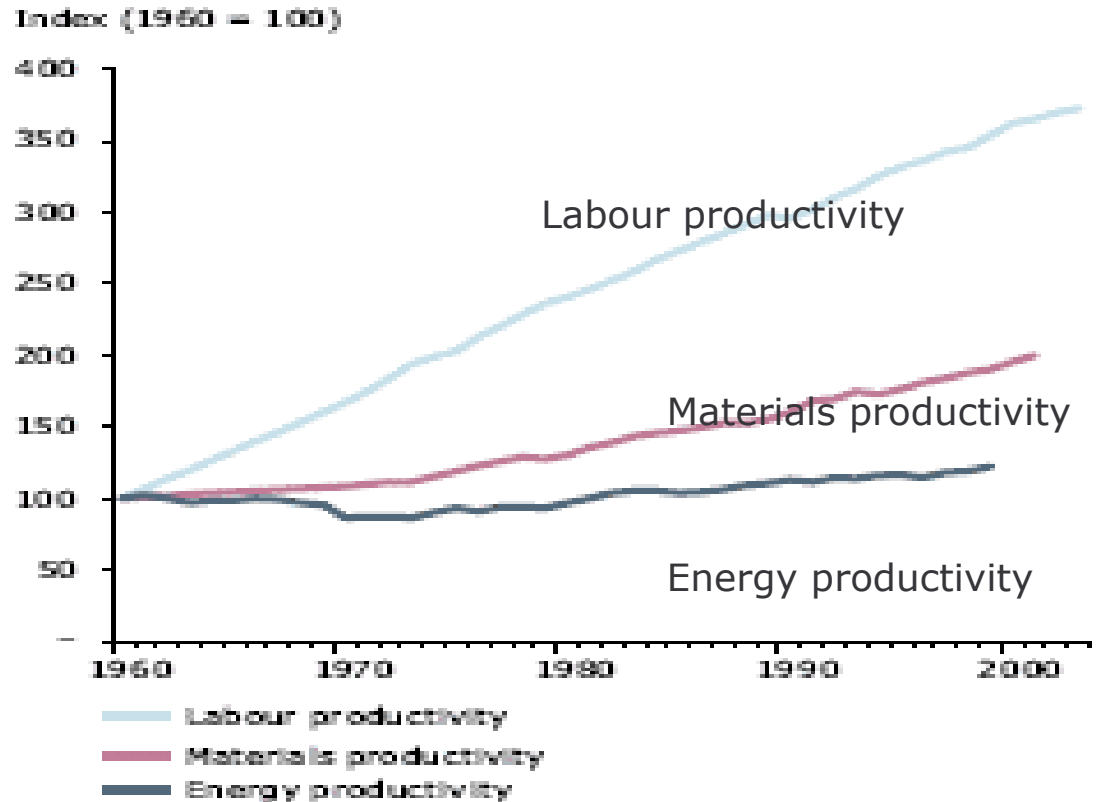
**Long-term marginal generation costs (for the year 2002) of different RES to Electricity technologies**



# Example: technology - cost (2)



# Resource productivity



**Note:** Labour productivity: GDP per annual working hours (1999 USD (converted at EKS PPPs) per hour); material productivity: GDP per domestic material consumption (DMC) (EUR per kg); energy productivity: GDP per total primary energy supply (TPES) (thousand 1995 USD per toe).

**Sources:** Groningen Growth and Development Centre and The Conference Board, Total Economy Database, 2004; EUROSTAT/IPF, 2004; IEA, 2001; Federal Statistical Office, 2003.

- Labour costs constitute about 20% of total costs in manufacturing in EU-25. Material and energy costs can be up to 50%



# **(Urban) infrastructure**

**Vital utility services include:**

- **Safe drinking water**
- **(Sewage and WWT)**
- **Energy: electricity (heat, gas)**
- **Road system (and public transport)**
- **Education and healthcare**
- **(Shopping)**
- **Waste services**



# Waste management (infrastructure)

- Communal
  - Industrial
  - Hazardous
- plus liquid phase  
plus final residues

- Landfilling
  - Incineration
- plus
- Waste minimization
  - Recycling and reuse
  - Composting
  - Bio-mechanical  
treatment  
and energy generation

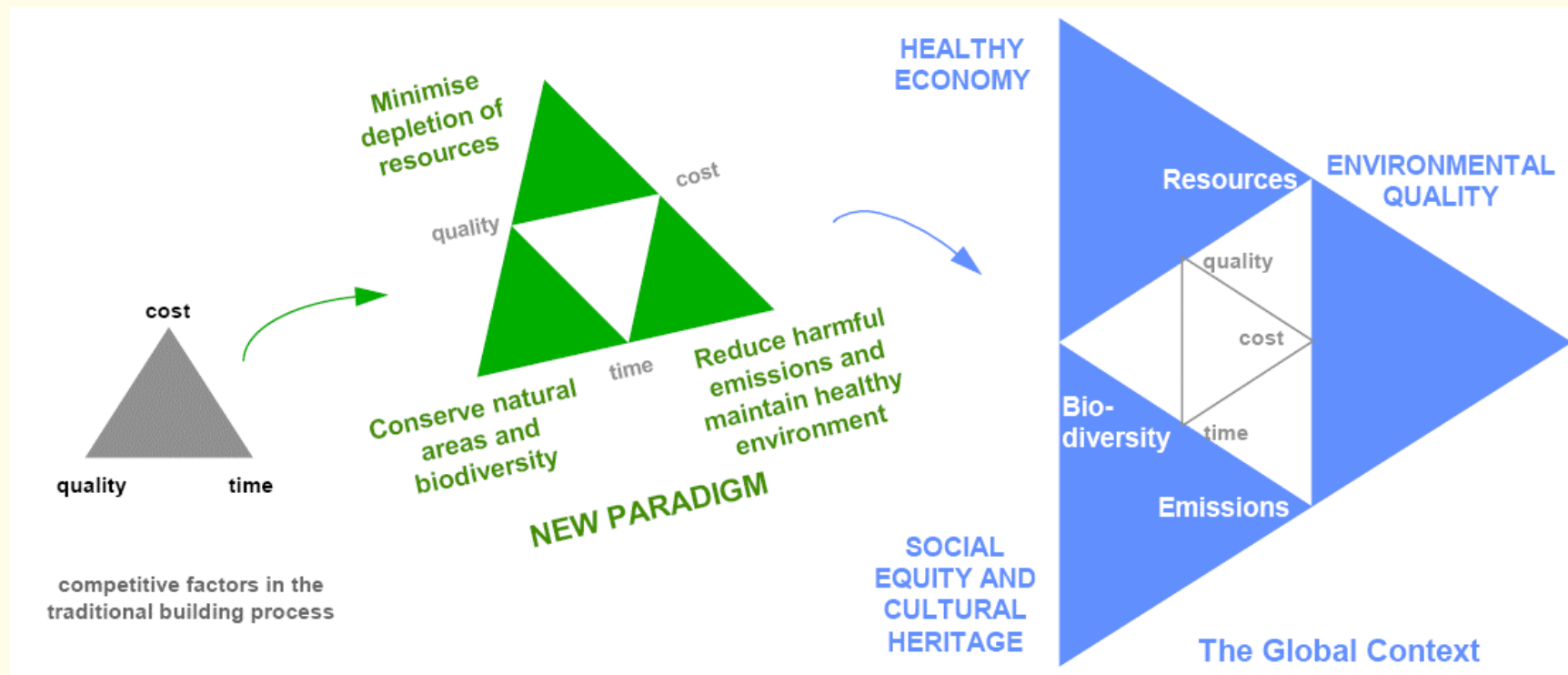


# WM relevant risks to consider

- **Environmental risks:** air, water, soil, noise, vibrations, plant and animal health
- **Public health (and comfort) risks:** respiratory track, dermatological system, foodchain, auditory and olfactory nuances, etc.
- **Financial and economic risks:** high service costs, decreased property values, return on investment ...
- ... what else?



# Challenges of sustainable construction

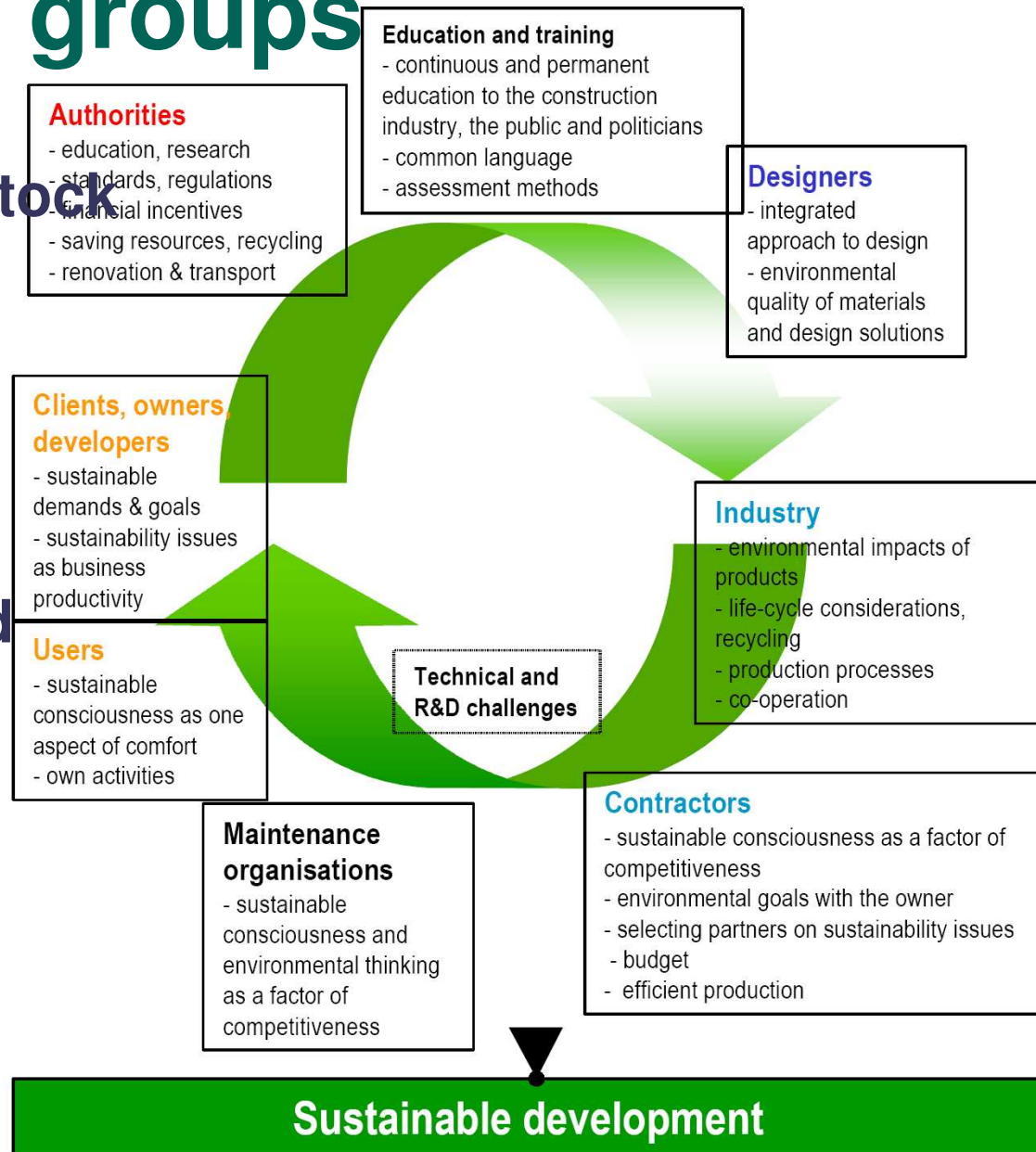


(Bourdeau et al.: Sustainable Development and the Future of Construction)

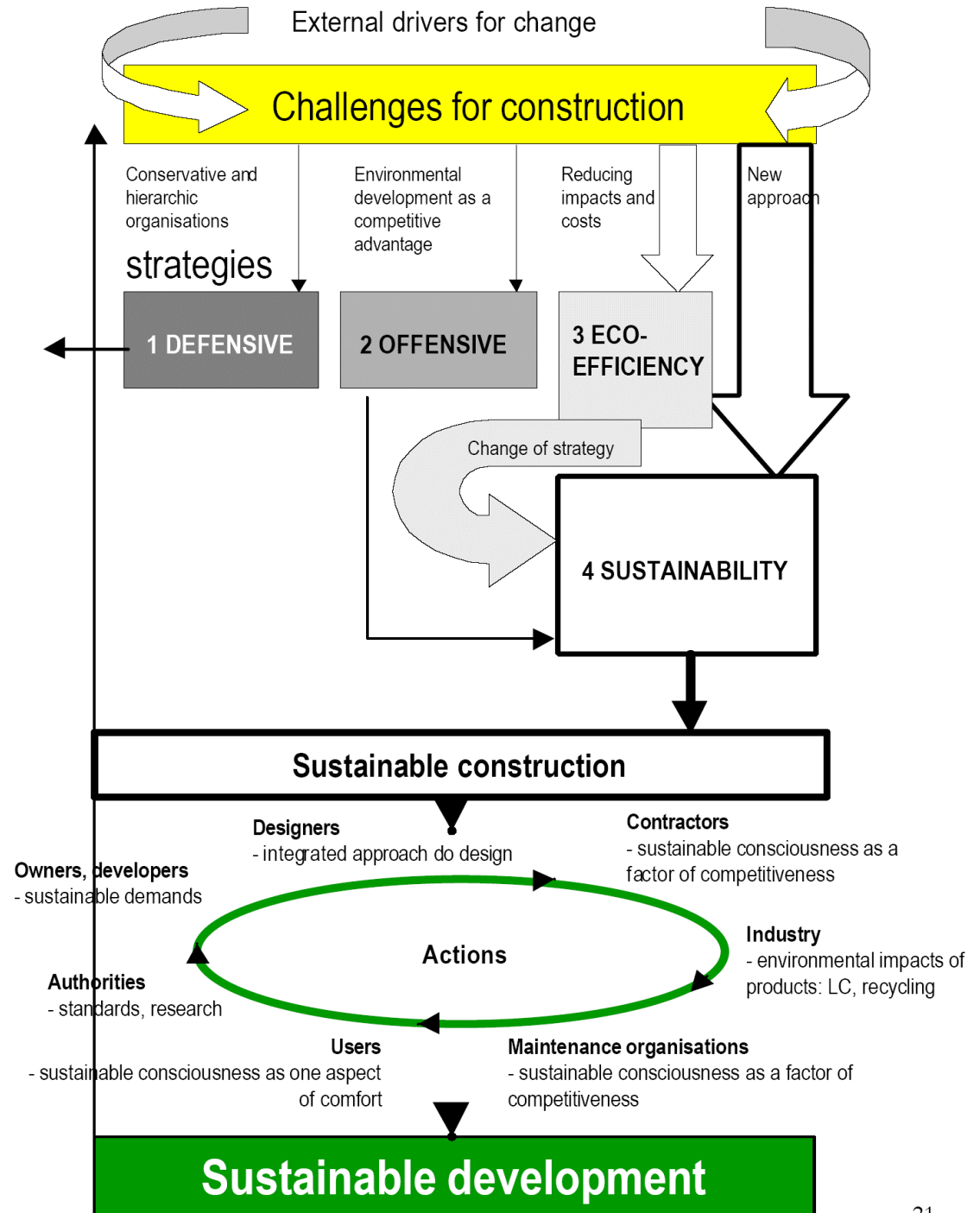


# Challenges of different stakeholder groups

Growing building stock requires increased resources for building, maintenance, reconstruction, and demolition



# Strategies and actions for sustainable construction



# Vision

- \* **Decoupling on absolute terms**
- \* **Challenging the rebound effects**
- \* **No problem shifting in space and time and in environmental pressures**
- \* **Improved criteria and method of measuring and experiencing wealth and well-being (progress) – satisfying valid needs/functions while educating against perverse behaviors (orientation)**
- \* **Optimized use of land to create livable space and communities, while maintaining biodiversity**
- \* **Lowering risks and hazards to populations to manageable levels**



# Vision cont'd

- \* **Optimized resource flows (see RMI's „Natural Capitalism”)**
- \* **Highly increased use of renewable resources**
- \* **Life cycle thinking prevailing (cradle to grave and cradle to cradle!)**
- \* **Ethical behaviour and decision-making**
- \* **Governance by precautionary, prevention, proximity, producer responsibility, polluter/beneficiary pays, etc. principles, plus public participation and access to justice!**



# Vision or utopia

**Is this realistic, taking past and current processes into account?**

**Can people, humankind, change substantially by smart planning, or does it follow cataclysmatic conditions with adaptive survival strategies and tactics only?**

**Is SD an utopia, similarly to ... ?**



**Thanks for the attention!**

