



Constructing a Sustainably
Competitive Europe

MANUFUTURE'2007 CONFERENCE

Sustainable Manufacturing

**Engelbert Westkämper
Fraunhofer-IPA
Germany**



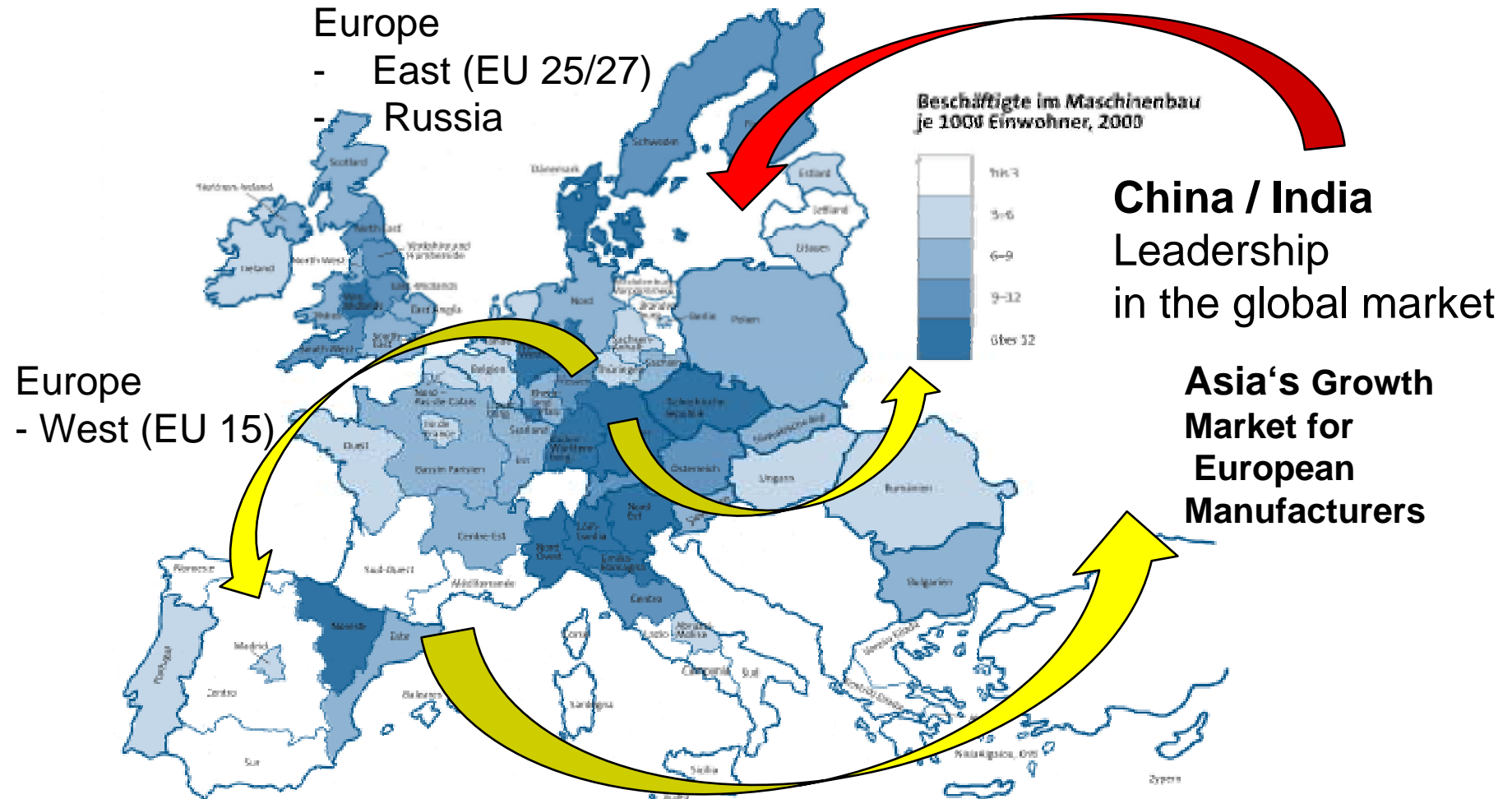
Content

New Dimensions of Sustainability

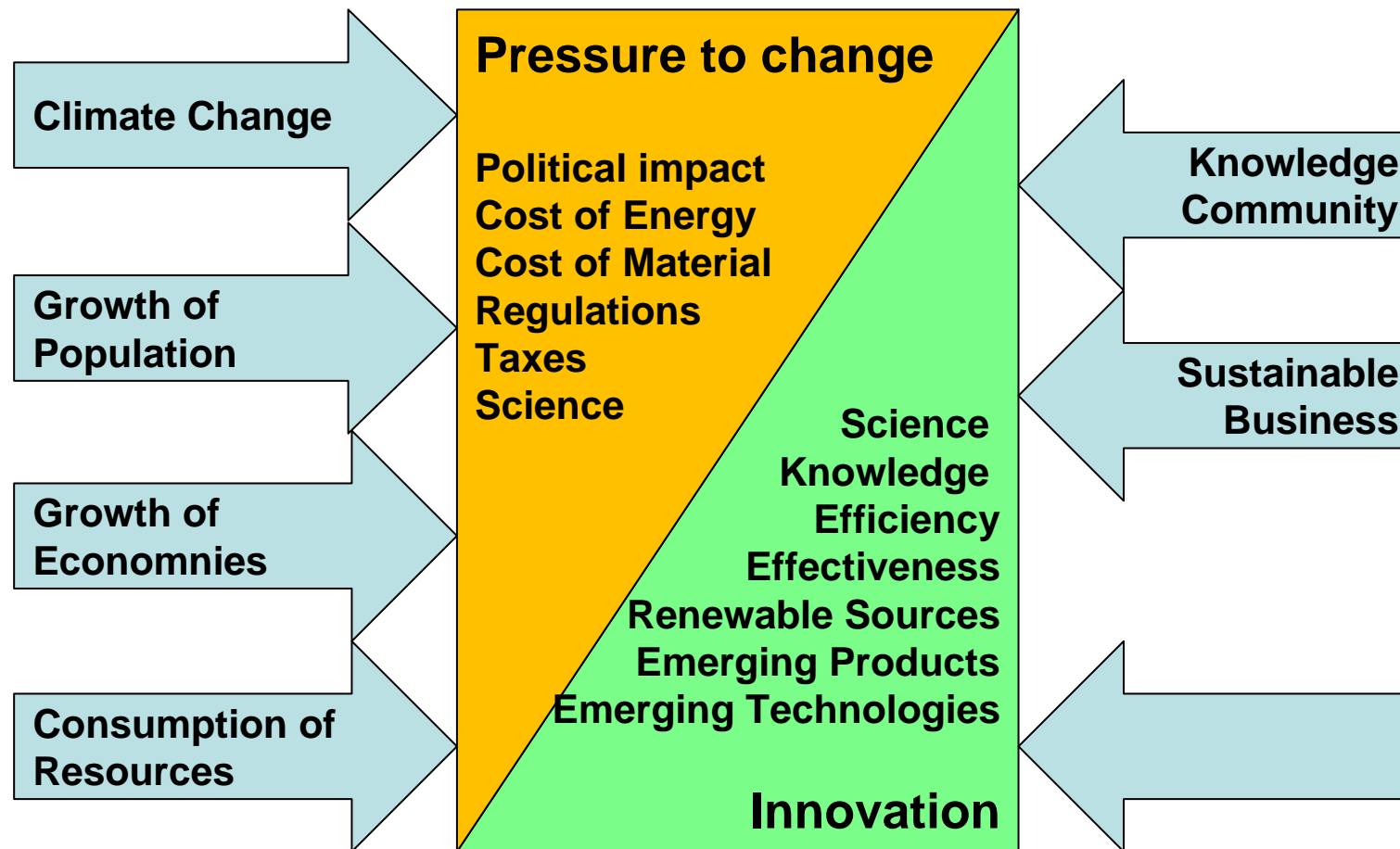
- Pressure and Opportunities
- Priorities
- Manufacturing Conflict of Aims
- Manufuture SRA and Sustainability
- Strategic Orientation
 - Life Cycle
 - Technologies
 - Business
- Manufuture RoadMap

Migration of Production

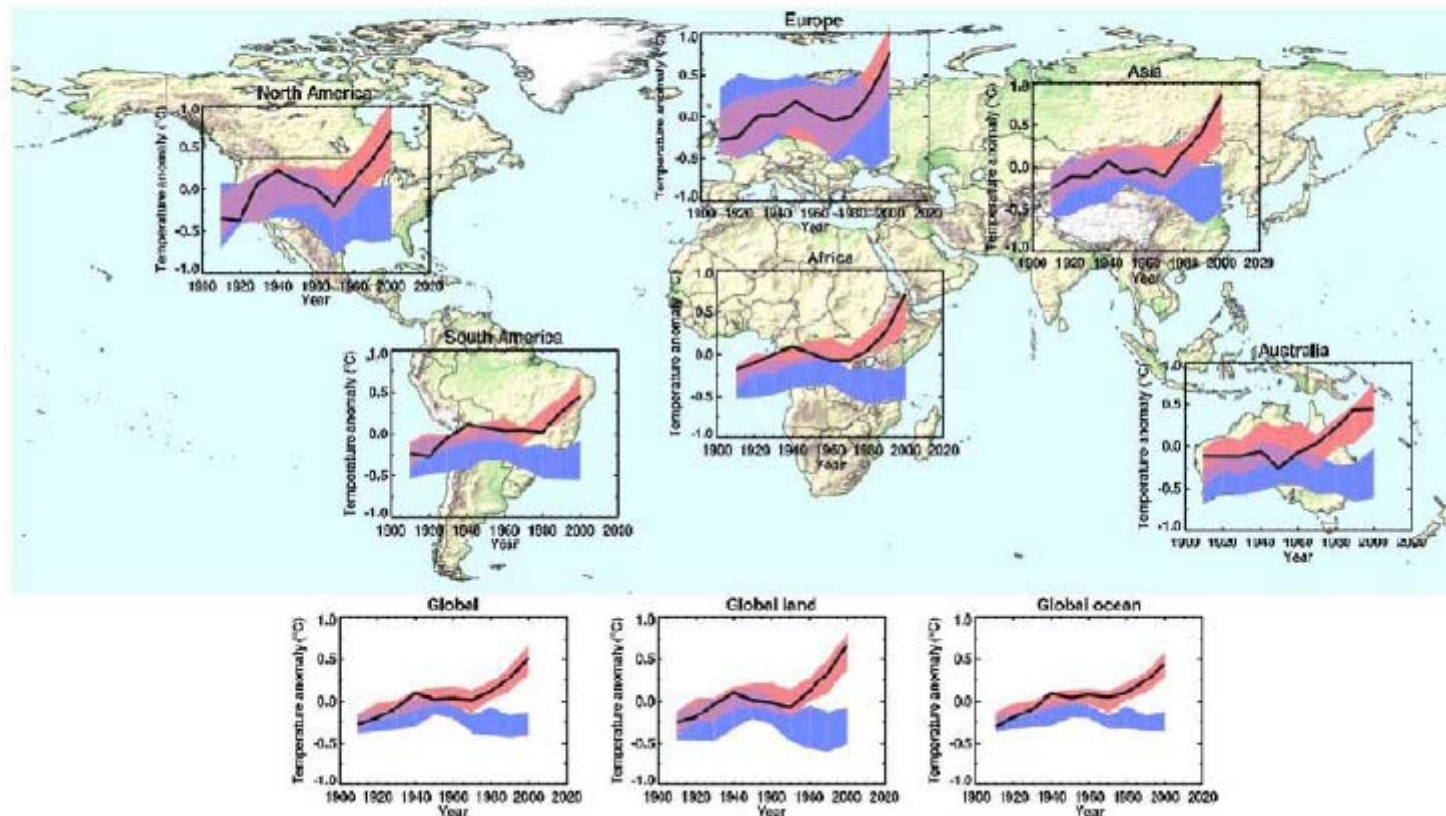
Consumption of Energy and Material out of Balance ?



Sustainability in the Focus of Globalisation



IPCC 4AR: Temperature Anomalies



L2L Conference 2007

From Leipzig to Lisbon

Potocnic:

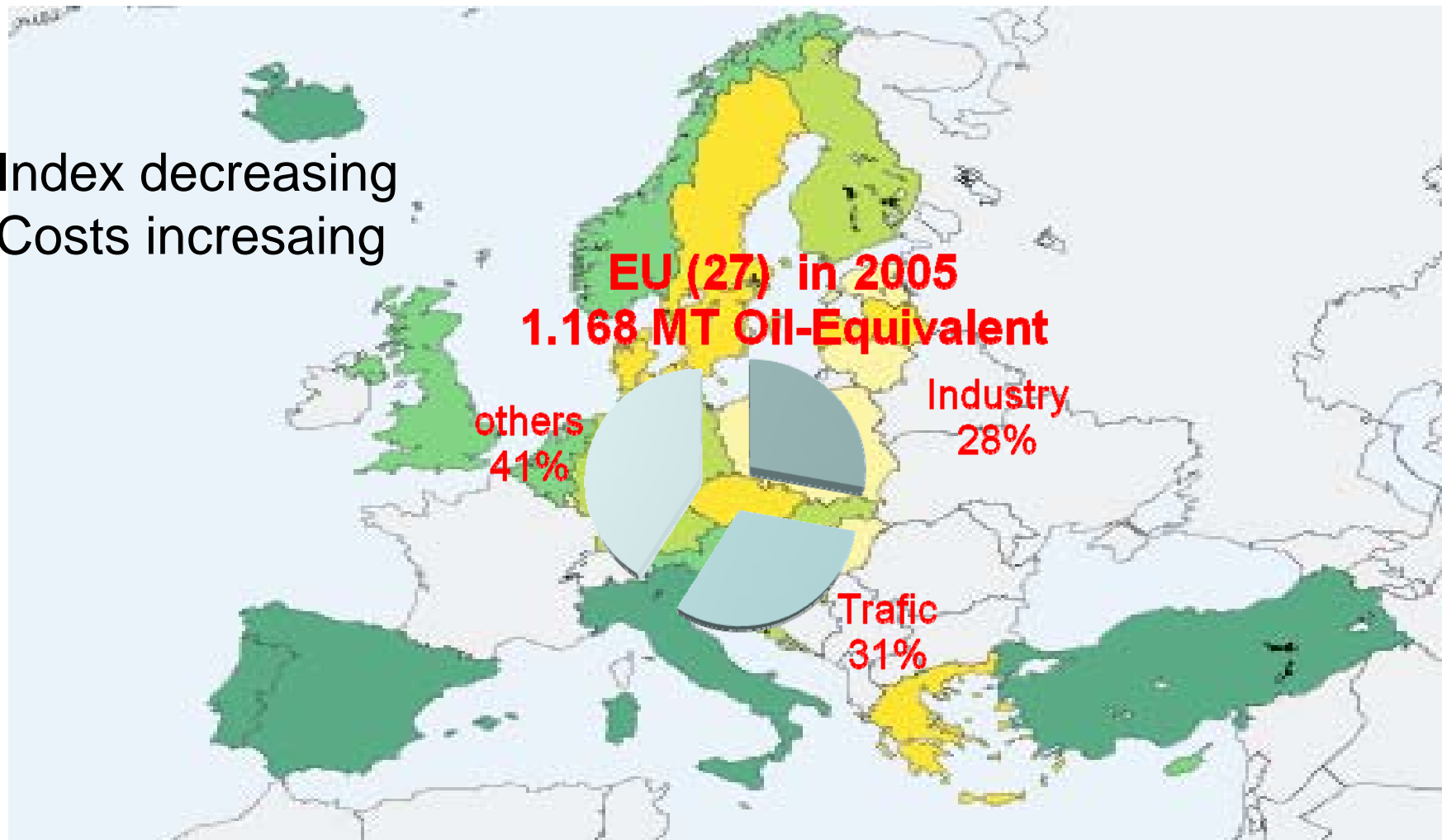
Sustainability is all about connections. For example:

- We cannot talk about environmental sustainability without considering energy.
- We cannot reform energy without looking at transport and industry.
- We cannot make changes to transport and industry without considering the effects on jobs and growth.

If the issues and challenges for sustainability are interconnected, our response must be too. We can no longer pretend that it is more important which institution, which discipline, which sector, or even which country finds solutions. Research is internationalised and so must be its answers.

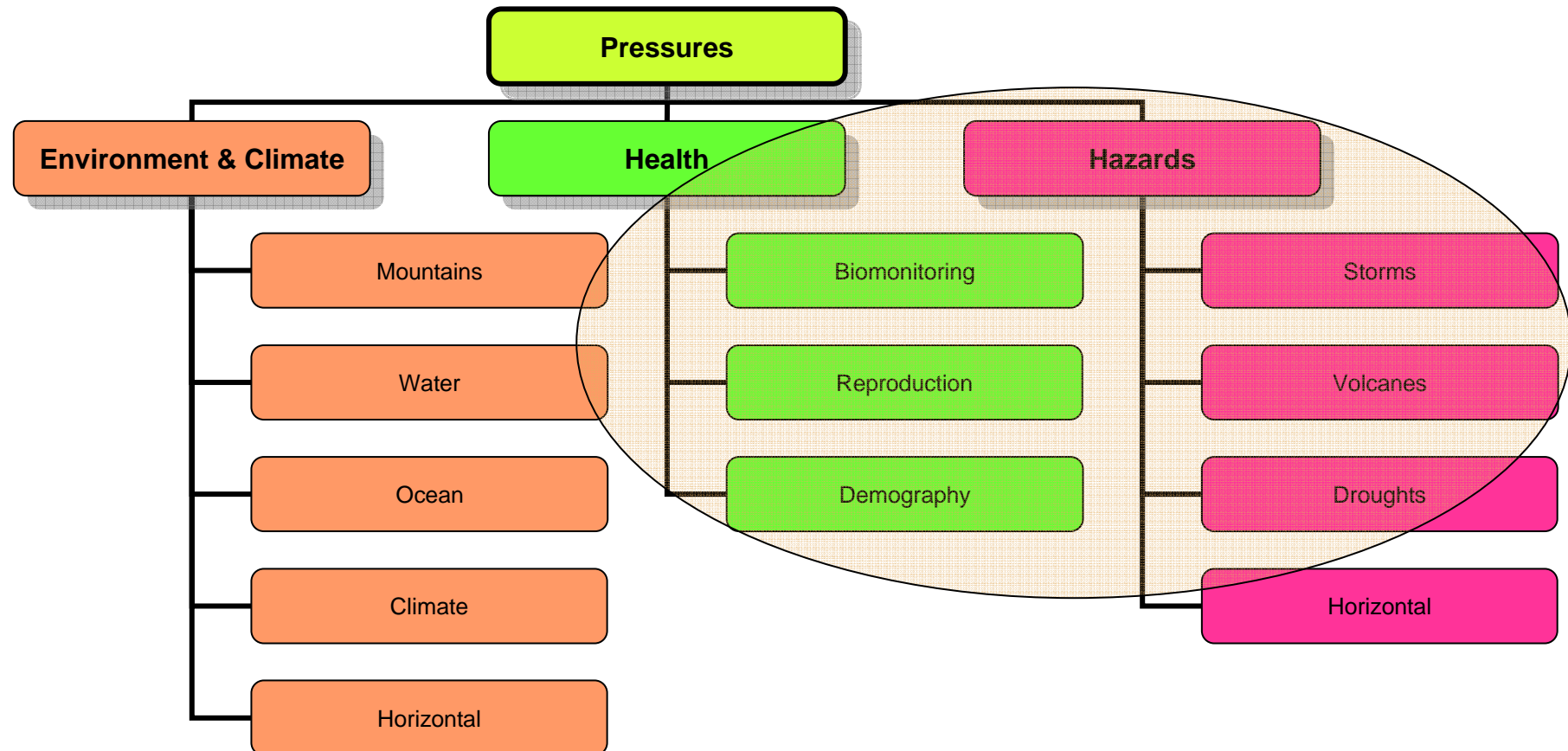
Energy Consumption in Europe

- Index decreasing
- Costs increasing

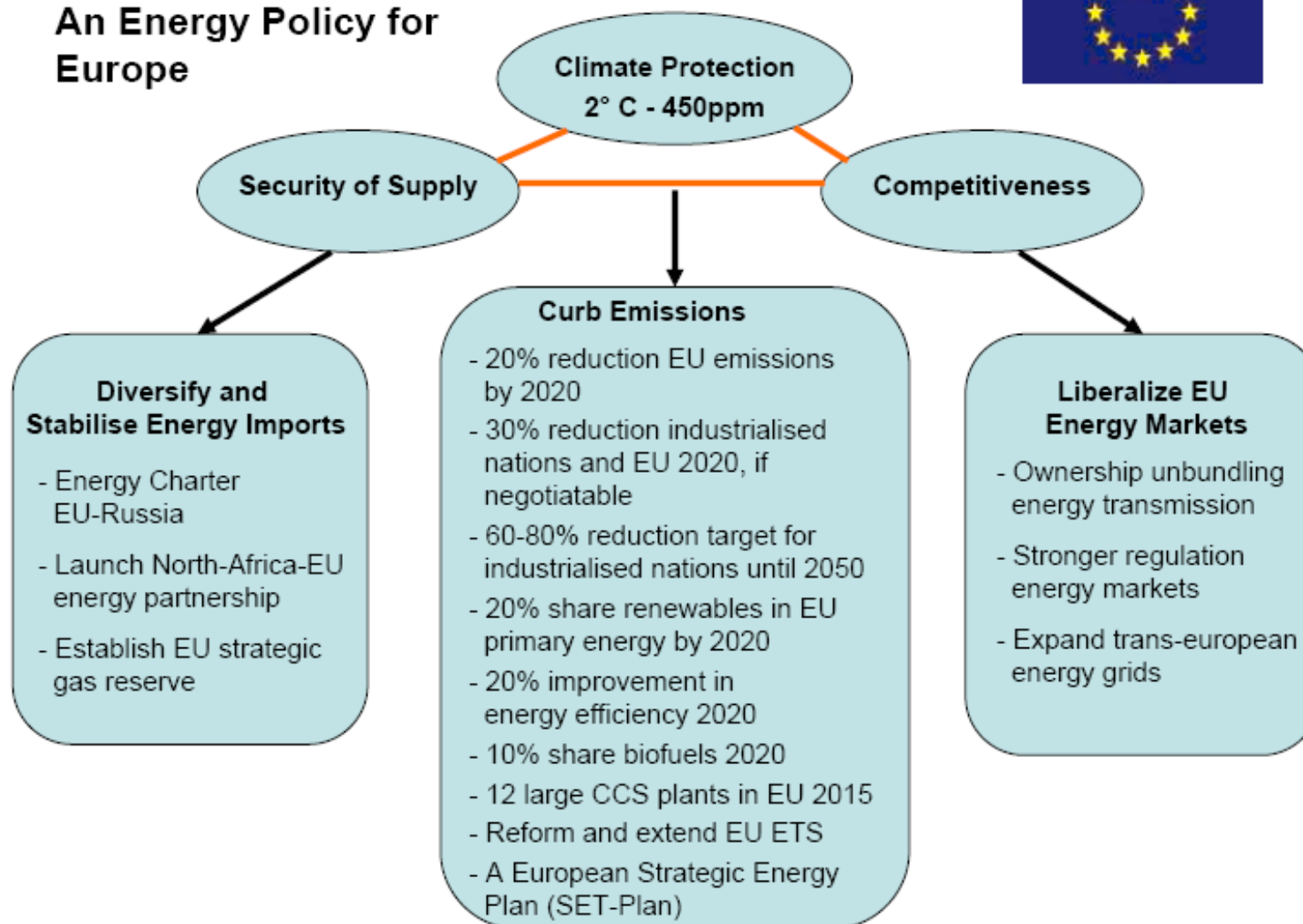




Priority 1: Climate Change, Pollution and Risks



EU Commission: An Energy Policy for Europe



FP 7 THEME 6: ENVIRONMENT

To promote **sustainable management of the natural and human environment and its resources** by advancing our knowledge on the interactions between the biosphere, ecosystems and human activities, and developing **new technologies, tools and services**, in order to address in an integrated way global environmental issues. Emphasis will be put on prediction of climate, ecological, earth and ocean systems changes, on tools and on **technologies, for monitoring, prevention and mitigation of environmental pressures and risks including on health and for the sustainability of the natural and man-made environment.**



Definition of Sustainability

The Commission defined sustainable development as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs."

Sustainability relates to the continuity of economic, social, institutional and environmental aspects of human society, as well as the non-human environment.

Go Harlem Brundtland



ManuFuture Model

Changing Paradigms of Manufacturing

From....

- Reducing costs
- Cheap Labor
- Optimised Quality
- Taylorism

Enterprises
Management

to...

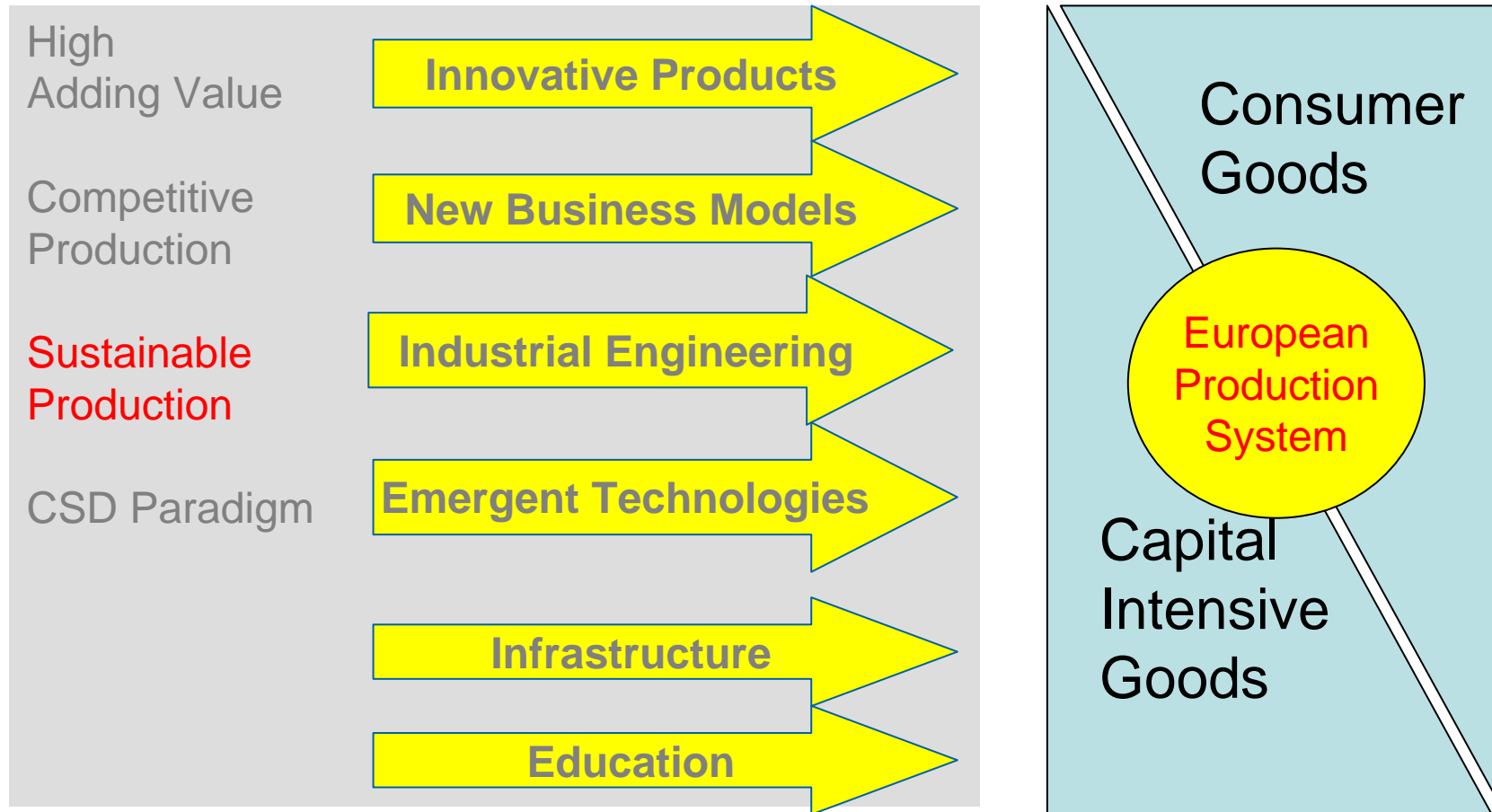
- High Adding Value
 - Competition
 - **Sustainability**
 - Innovation
- in the Knowledge
Economy and Society

Holistic
Production
System

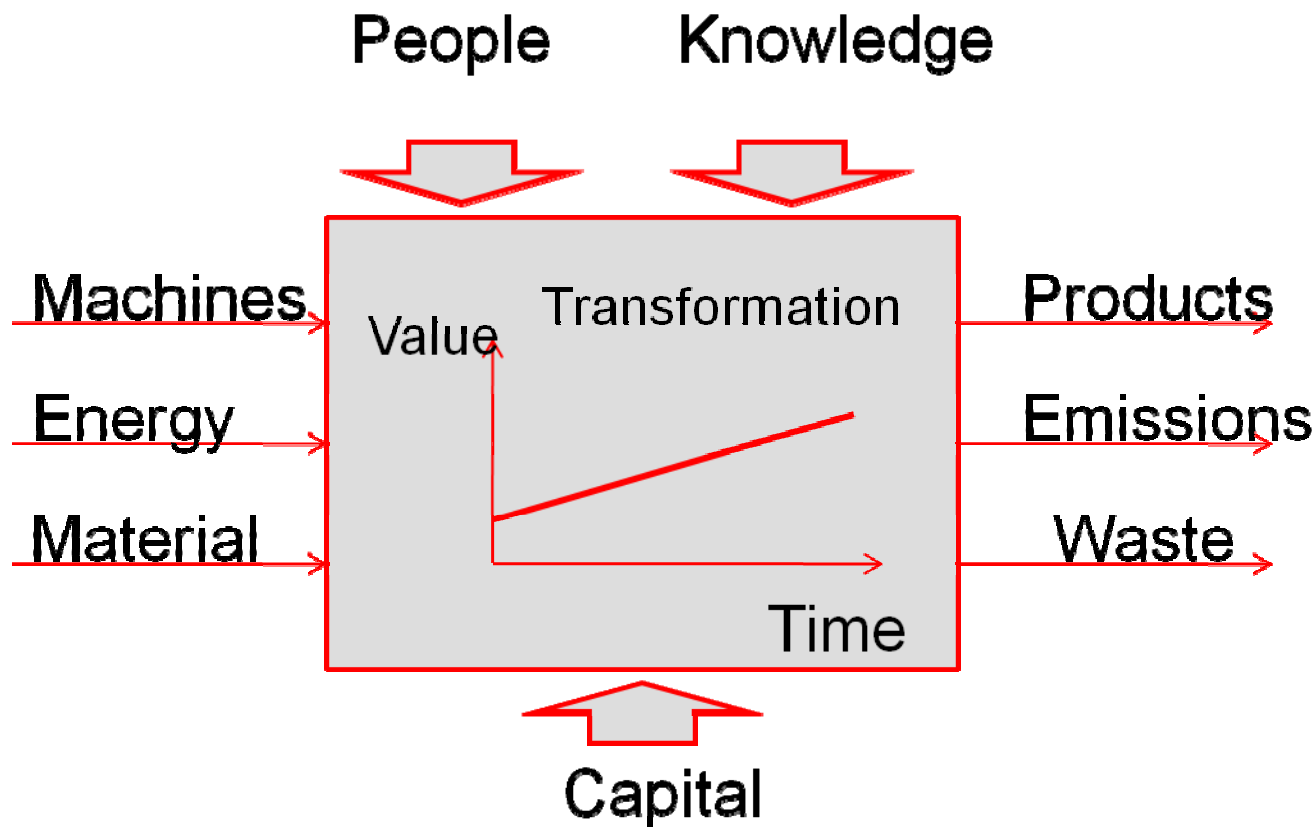
Products

Processes

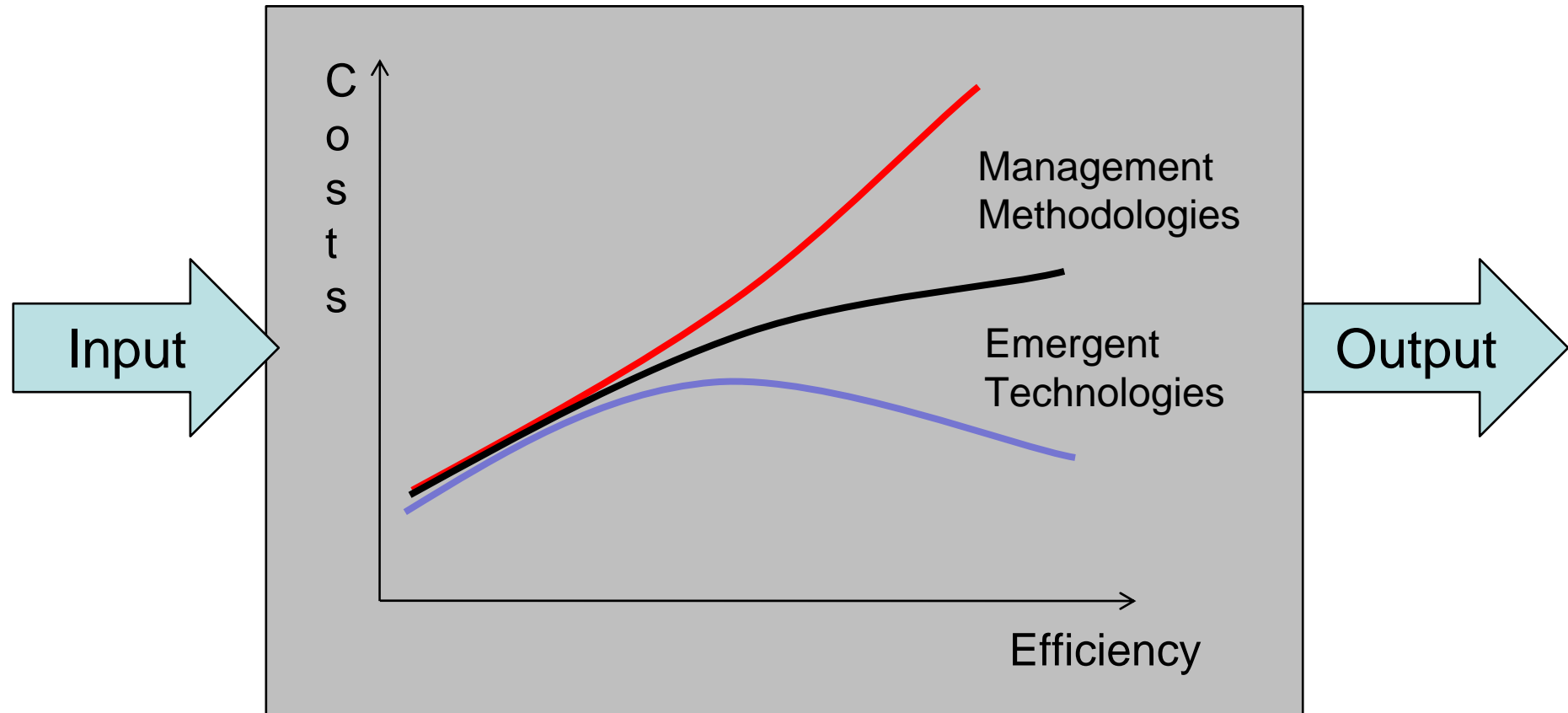
MANUFUTURE Research Agenda



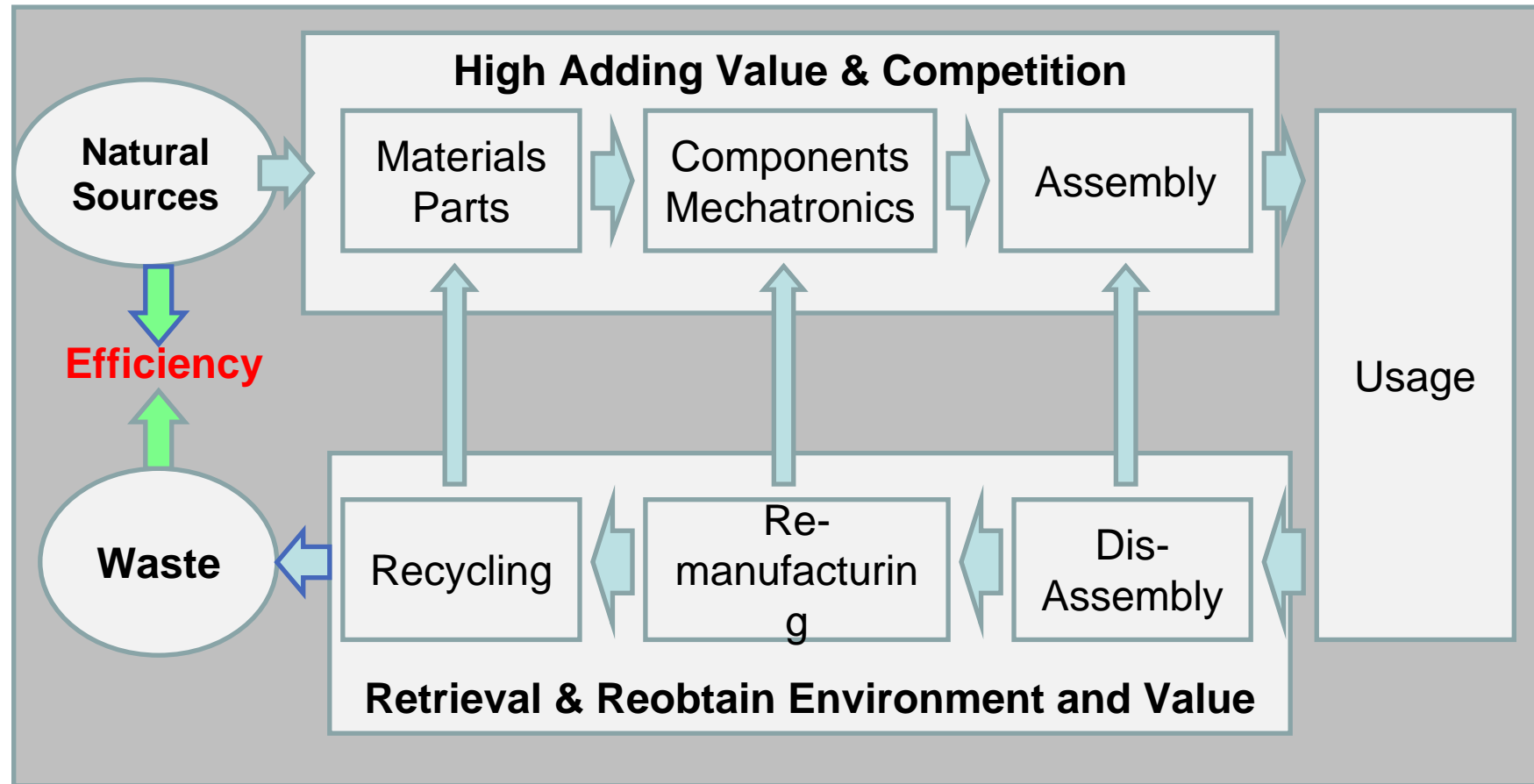
Sustainable Manufacturing Manufacturing Transformation Process



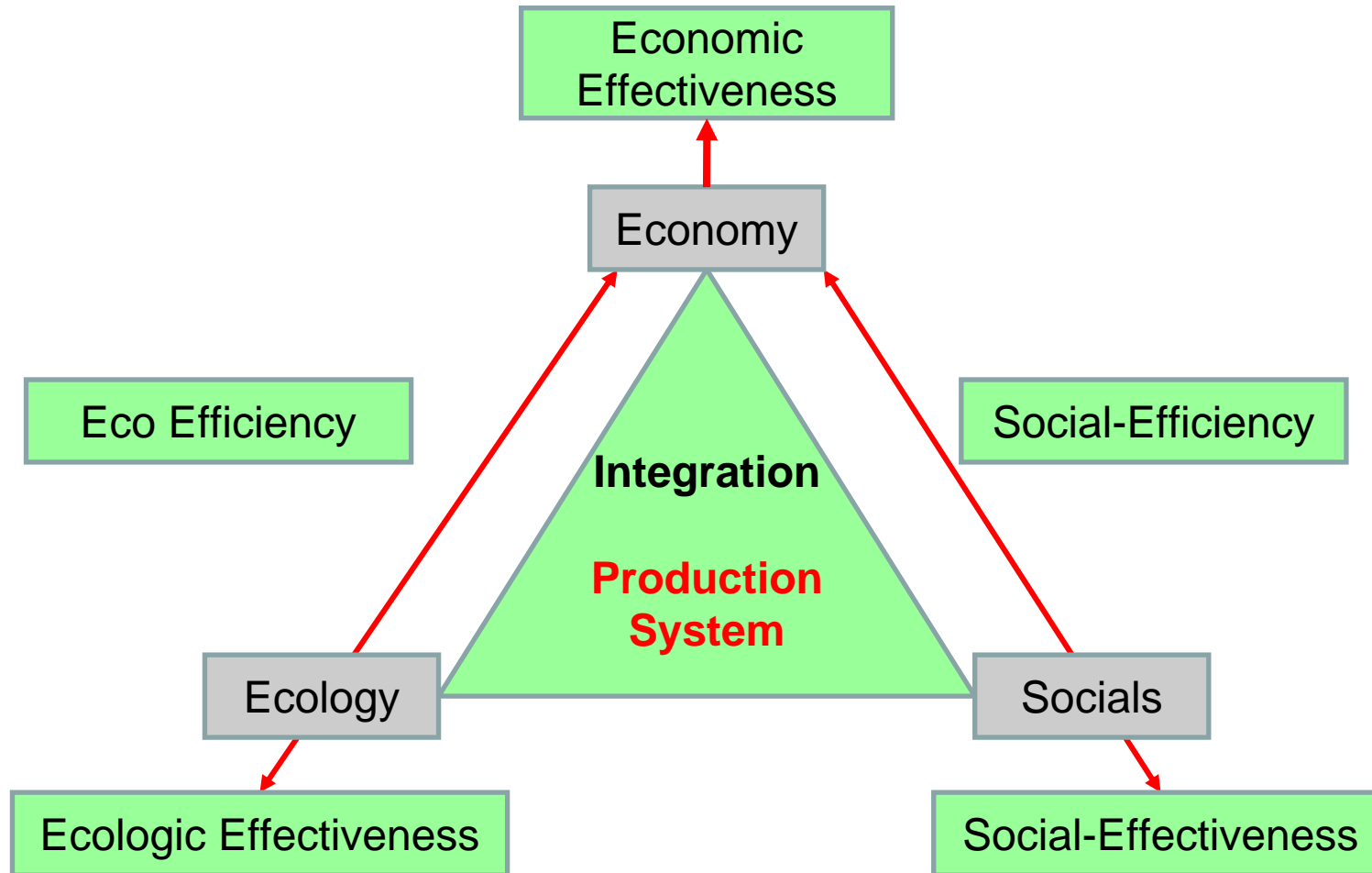
Efficiency of Resources in the Transformation Process



Life Cycle and Sustainability



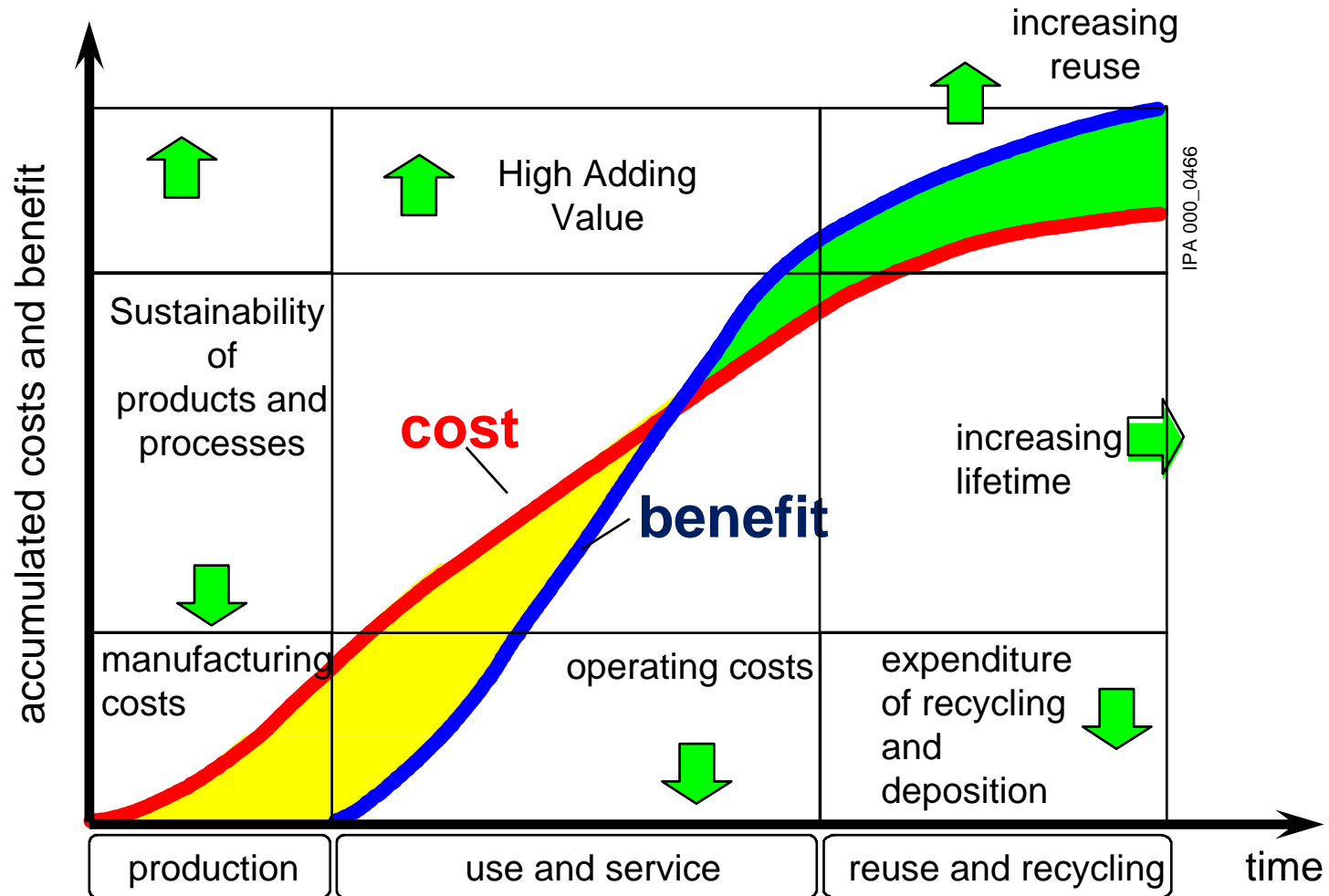
Challenges of Sustainable Enterprises



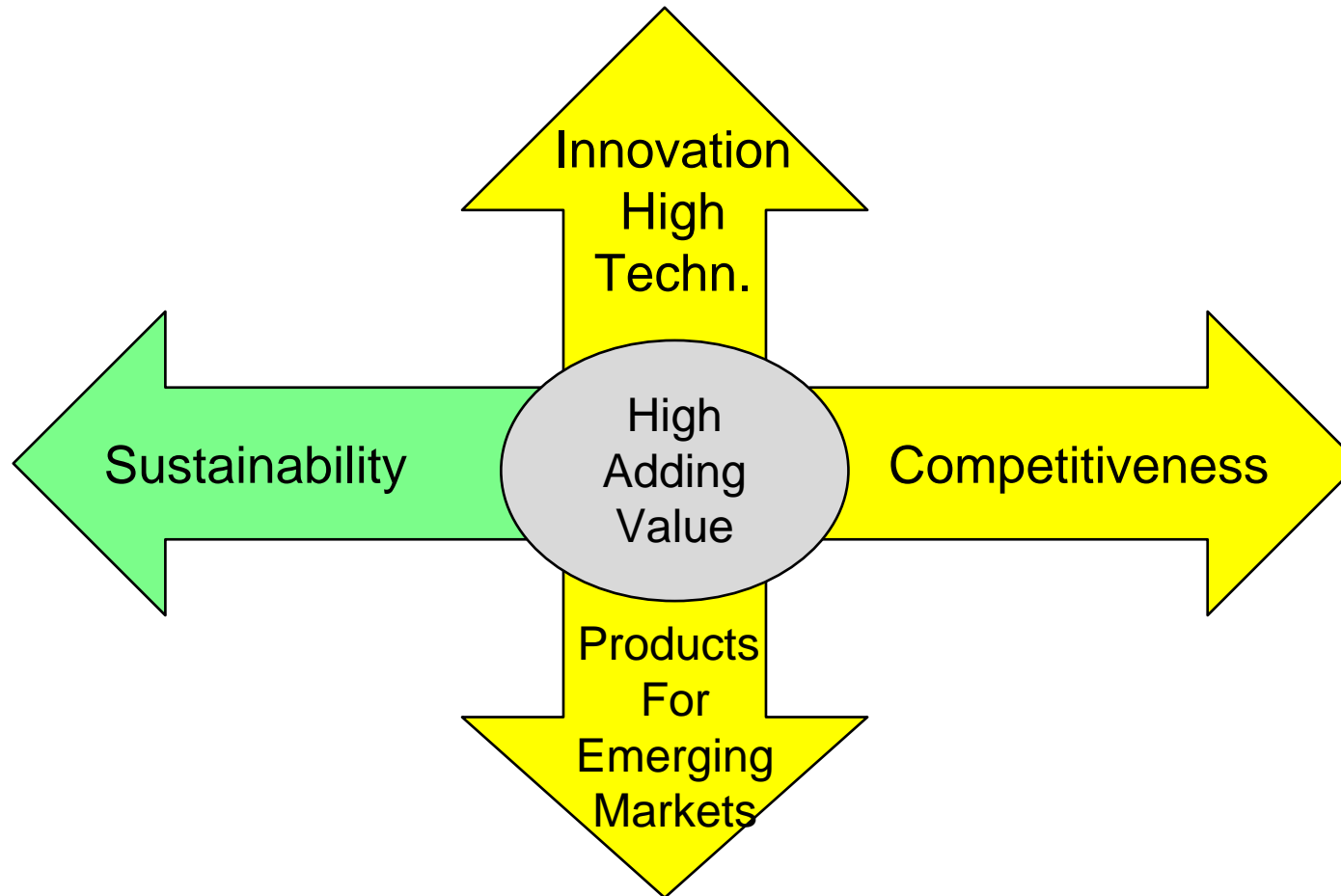
Source: BMU econsense



Strategies in the Life Cycle



Manufacturing Conflicts

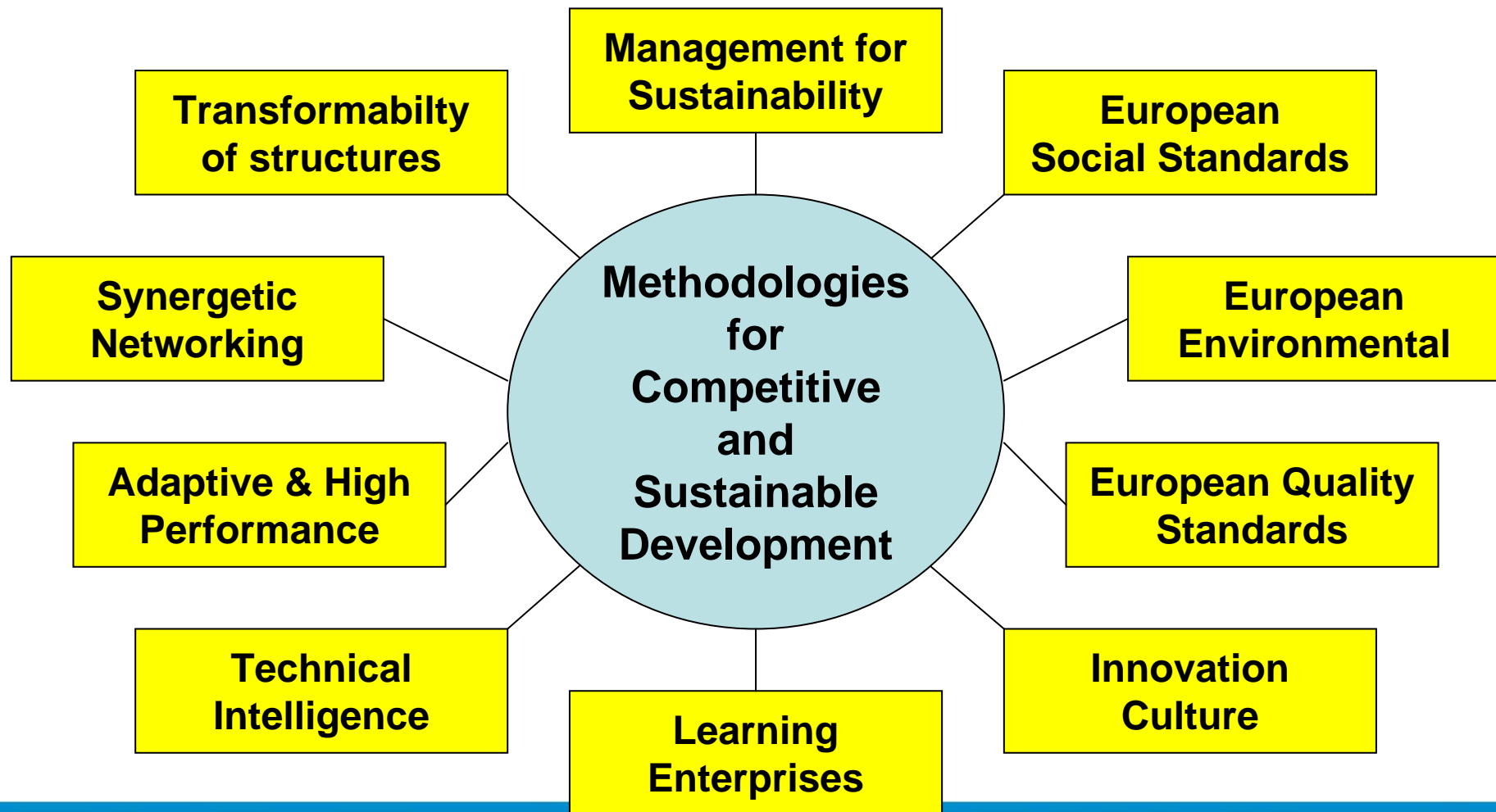


Sustainable Manufacturing

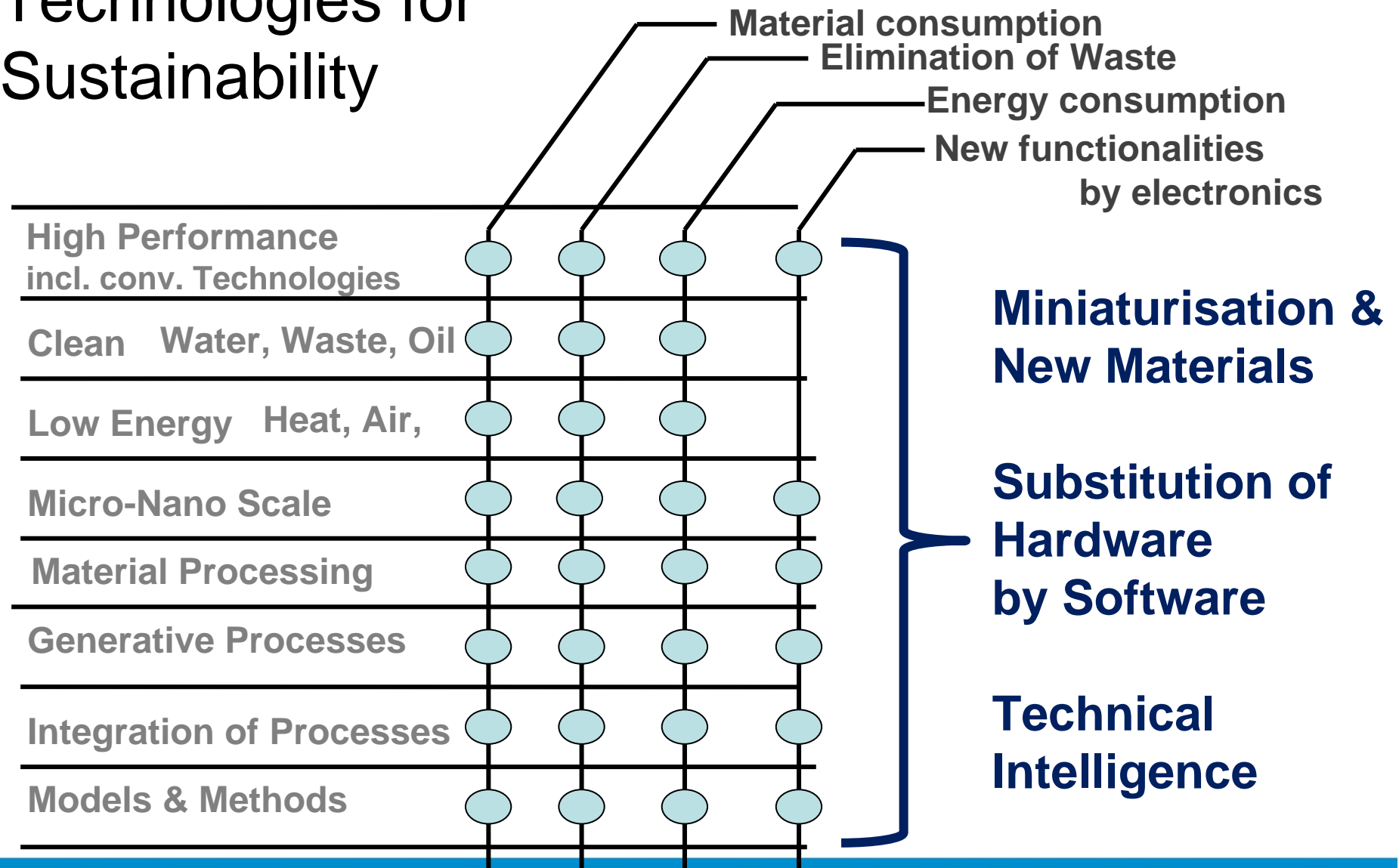
“... strong need for further research in the interplay between technology, social, economic and ecological systems...”



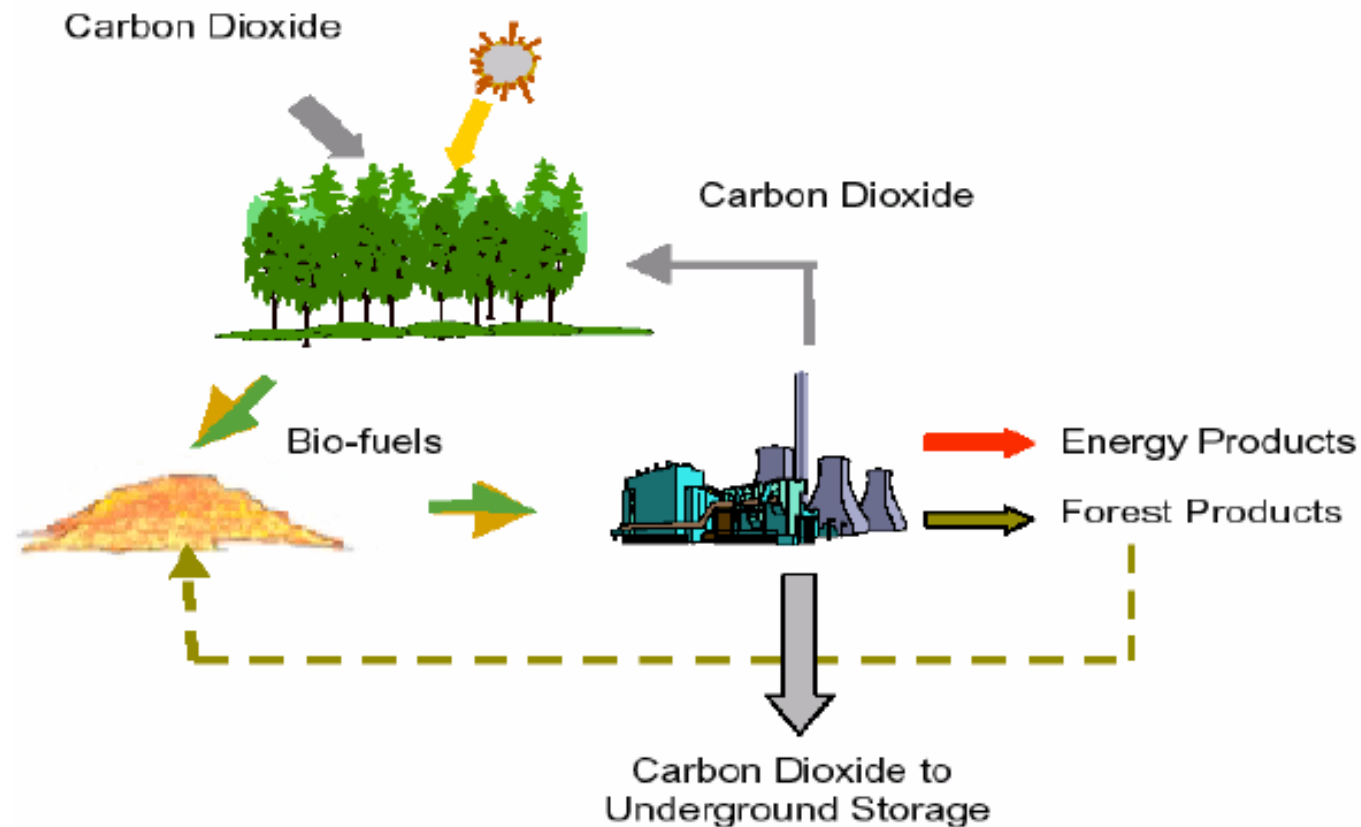
Lead Project: European Production System



Technologies for Sustainability



The carbon cycle of bioenergy with carbon capture and sequestration



Source: Obersteiner, M., Azar, C., Möllersten, K., Riahi, K. (2002): Biomass Energy, Carbon Removal and Permanent Sequestration – A 'Real Option' for Managing Climate Risk, IIASA Interim Report IR-02-042

Factories for Emerging Products and Technologies



Factories of Emotions

- Customers
- Humans

Clean Factories

- Environmental

Transformable Factories

- Adaptive / Modular
- Configurable

Factories for Sustainability

- Renewable Energy (Solar, Fuel Cells, Hybrids...)
- Emerging products
- Emerging Technologies

Low Cost Factories

- Lean, efficient

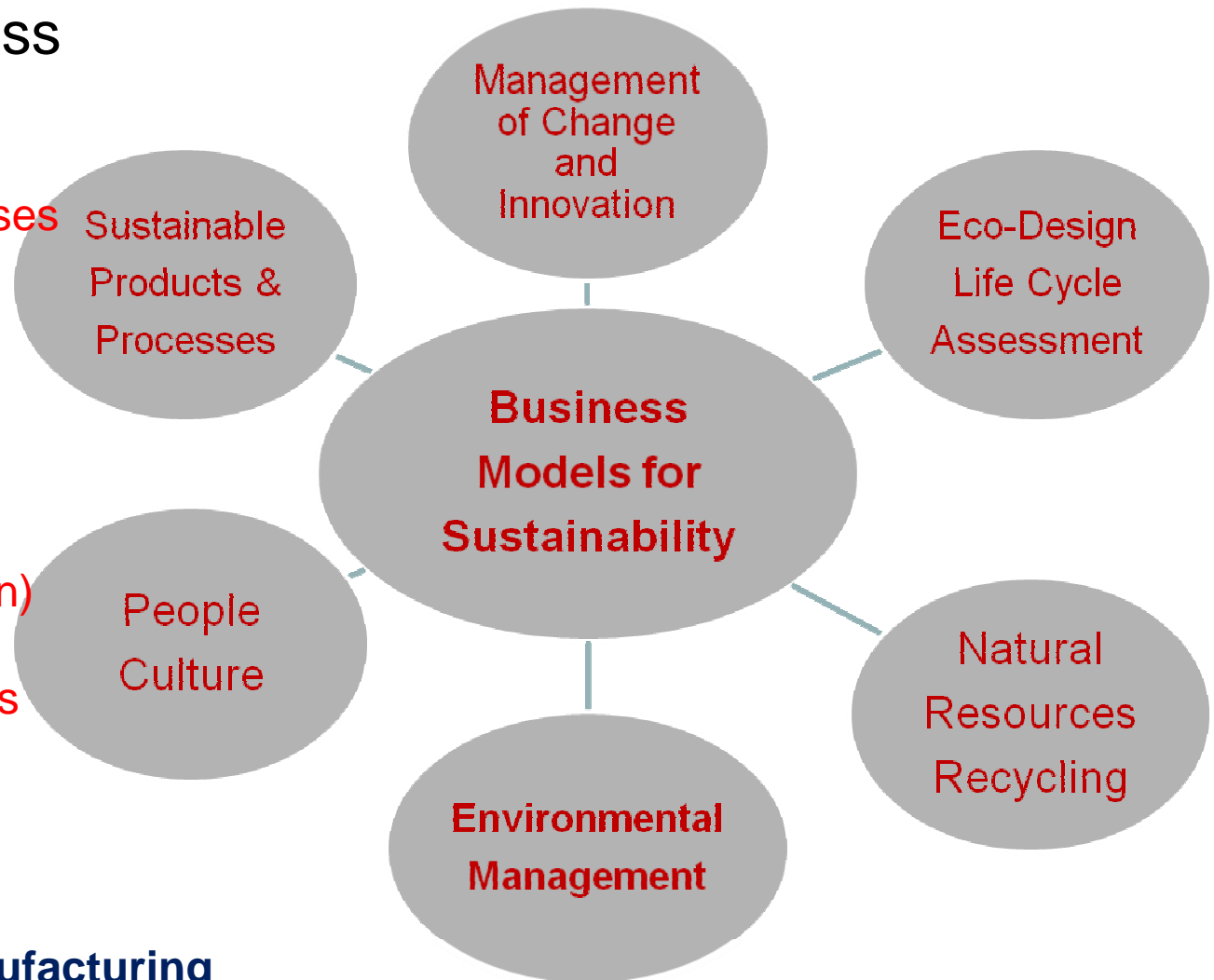
Sustainable Business

Long term Business

- Sustainability of Enterprises
- Efficient Production
- Total Energy Mgt.

Investment in

- R&D for Sustainability
- Human capital (Education)
- Zero Emissions
- Sustainable Technologies



World Standards of Manufacturing

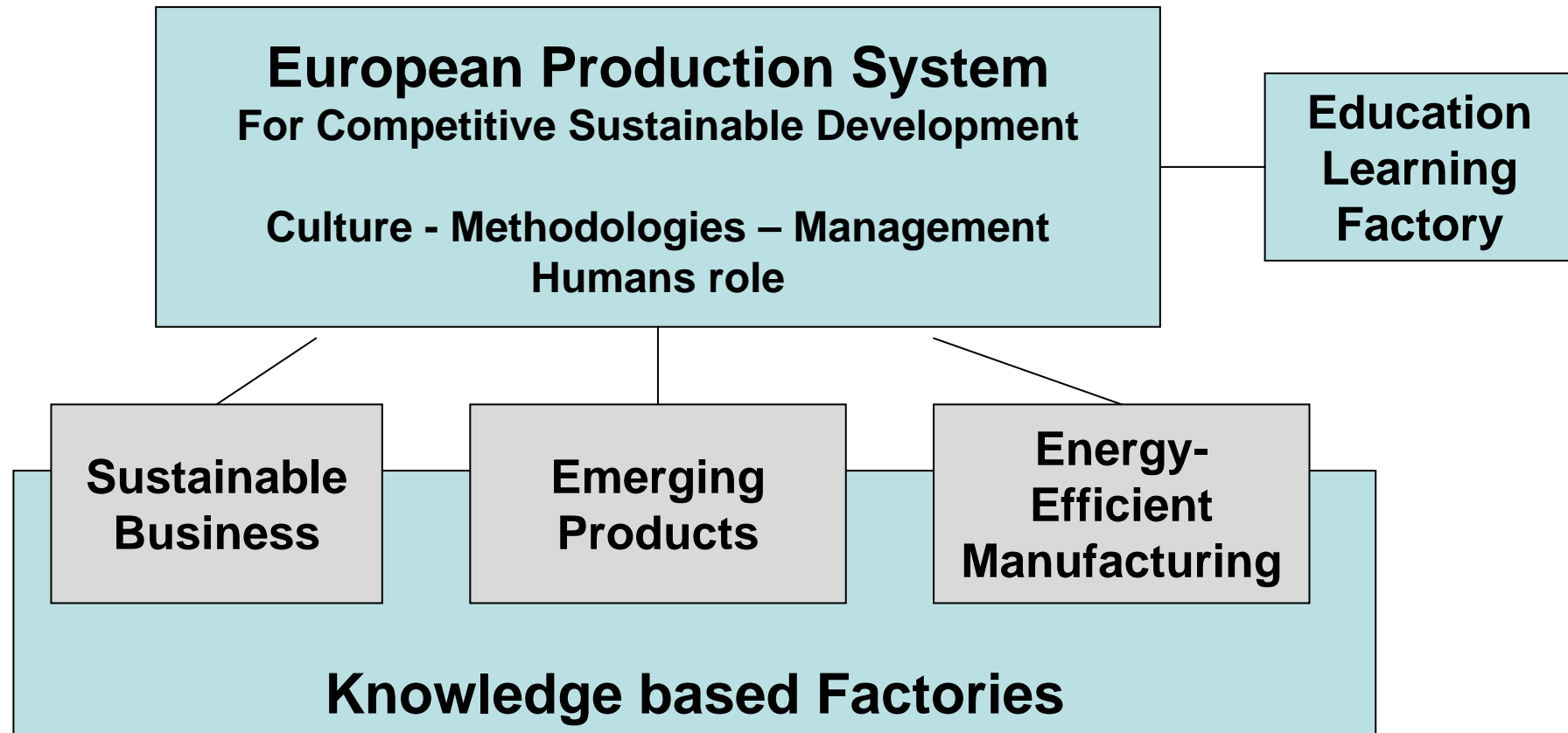
- social, environmental, business, management, technical, IP

Actions proposed in the Manufuture Roadmap

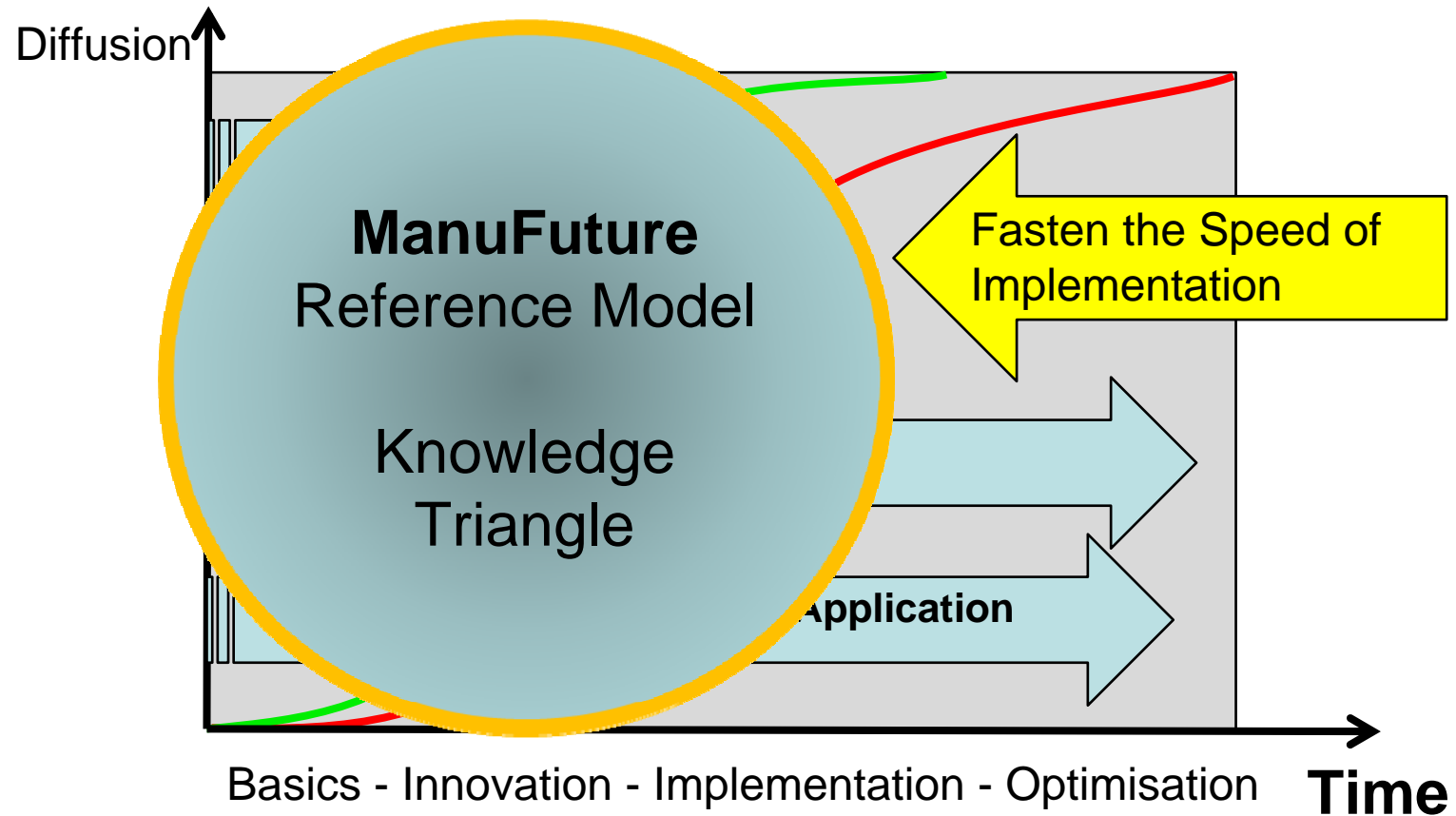
Integration of Sustainability in the European Production System

<ul style="list-style-type: none"> • New Business Models <ul style="list-style-type: none"> – Survival Strategies – Beyond Lean – New Taylorism • Networking in Manufacturing <ul style="list-style-type: none"> – Supply chains – Real time Visability 		<ul style="list-style-type: none"> • Emerging Technologies <ul style="list-style-type: none"> – Environment – Energy, Material • Adaptive Manufacturing <ul style="list-style-type: none"> – Komponenten – Machines – Systems 	
Eco-Design LCC LCA	Digital Engineering Digital Products	Intelligent (Emerging) Products	ICT for Manufacturing Learning

Actions for Competitive and Sustainable Development (Lead Projects)



Life Cycle of Technologies

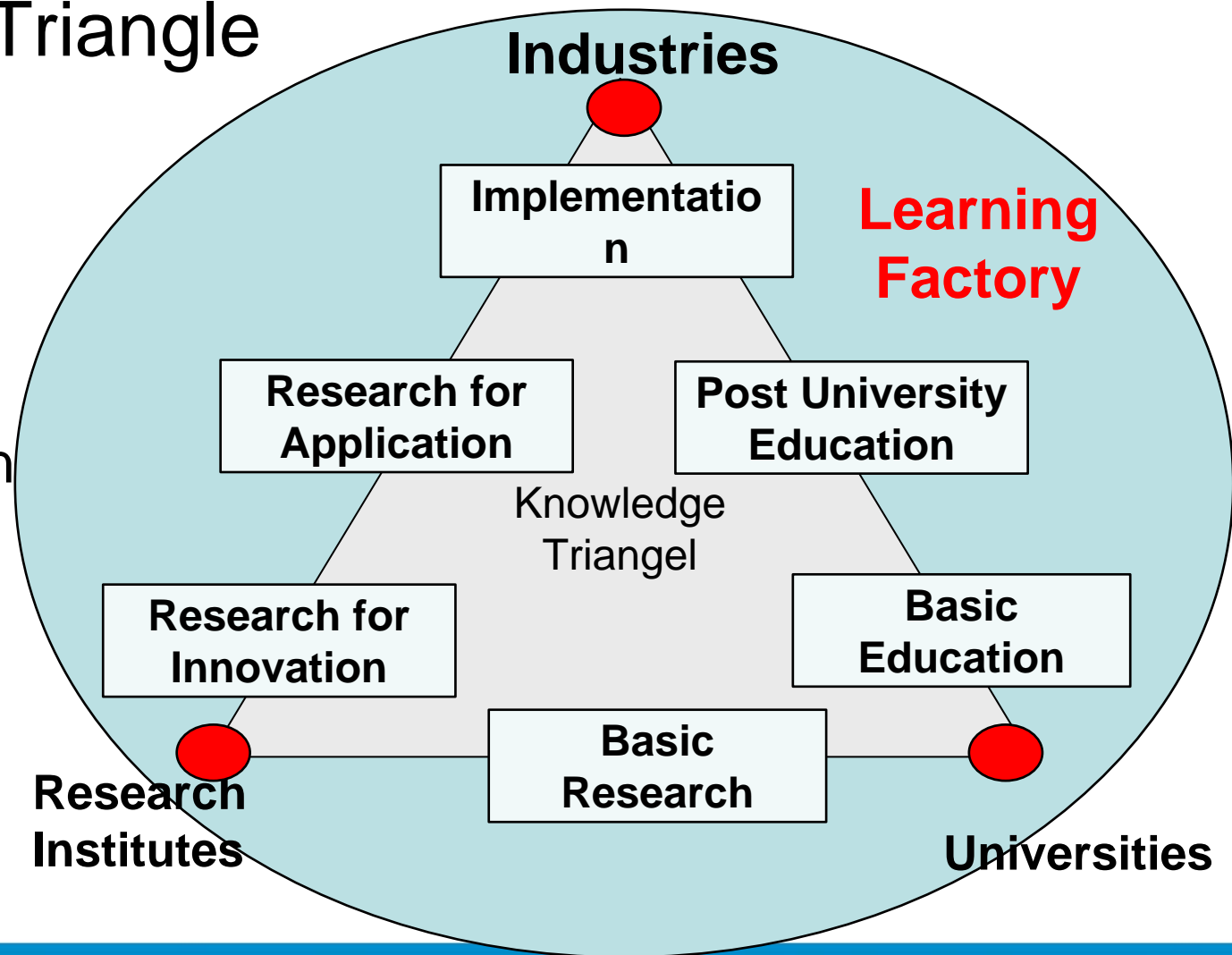


Manufuture Knowledge Triangle

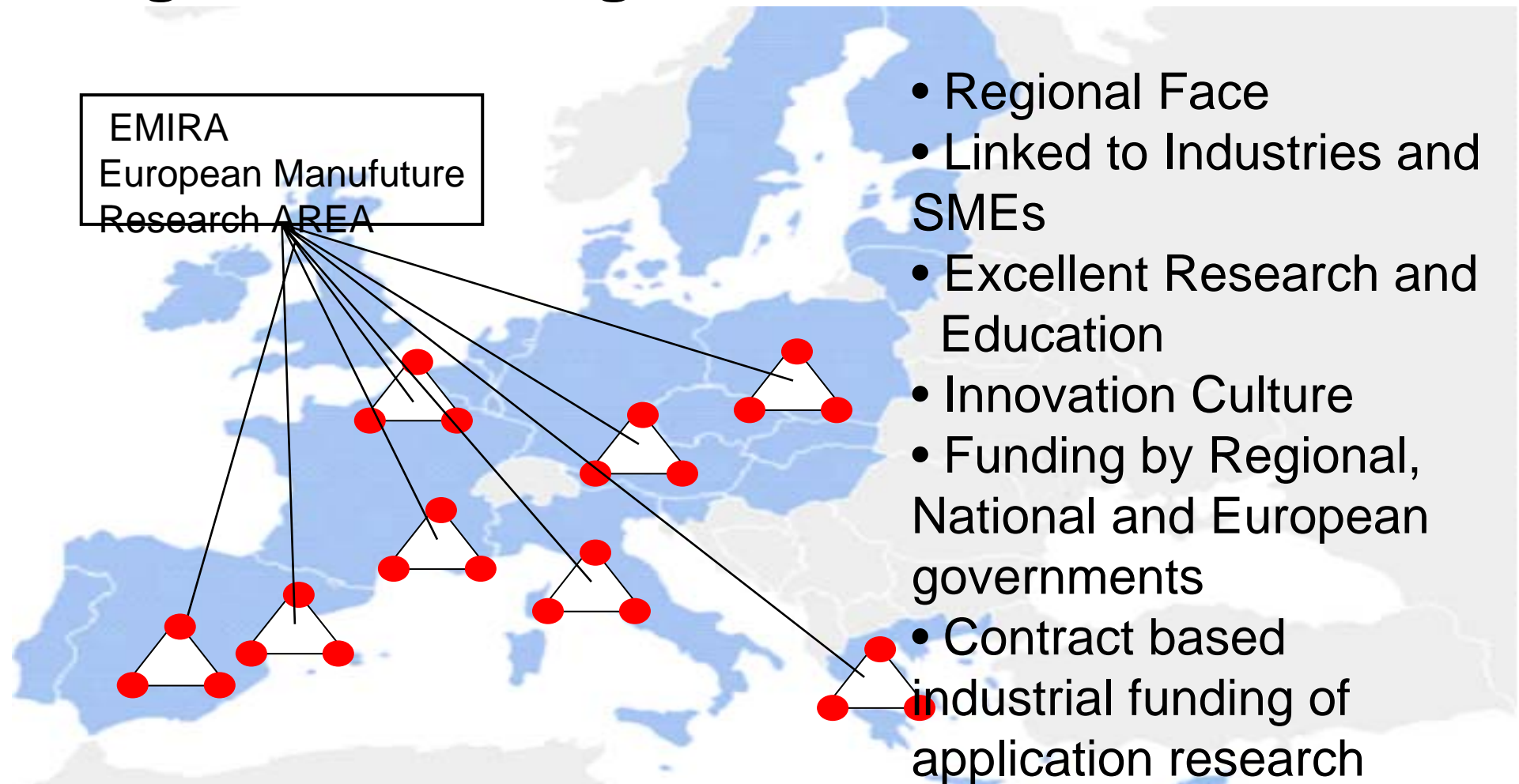
Synergetic
Research

Dual Education

Regional
Orientation



Regional K-Triangles



The European Way of Innovation in Manufacturing



Sustainable Manufacturing

- The Pressure to change Manufacturing towards Competition and Sustainability increases and opens new areas of Innovation
- Research for Manufacturing is essential to transform European Manufacturing
- The Manufuture Road defined proactive Actions:
 - European Production System
 - Sustainable Business
 - Intelligent (Emerging) products
 - Efficiency of Resources (Emergent Technologies)
- To Fasten the Speed of Diffusion:
 - Knowledge Triangle
 - Learning Factories



Manufuture Documentation

Vision

Strategic Research Agenda

Paradigm:
Competition, Sustainability and
High Adding Value

Leadership Roadmap

Proactive Actions

