

Environment and Innovation

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Objectives of the Study (1)

- Describe and assess in detail six emerging environmental concepts in terms of their proponents, their potential for further use and the differences between responses in the EU and in other countries, including developing countries;
- Describe and assess in detail six emerging environmental technologies in terms of their scope, private and public uptake, potential for future development, potential future benefits and the differences in use between the EU and in other countries, including developing countries;

Objectives of the Study (2)

- Discuss the implications of the above concepts and technologies for future EU environmental policy, for the Lisbon and EU Sustainable Development Strategy (SDS) objectives and for relationships with non-EU countries, including developing countries;
- Describe at a general level other important environmental concepts and technologies (illustrated in the annex of the final report).

Environmental Concepts

Six environmental policy concepts were selected during the scoping process and in particular at a meeting at the European Parliament in January 2006

- ecological footprint
- cradle-to-cradle
- dematerialization
- eco-sufficiency
- transition management
- vulnerability

Ecological Footprint

- measures the environment's **biological capacity required to support human activities** on the global, regional or national scale
- a **highly aggregated indicator**
- widely used by municipal governments and companies to measure their environmental impacts and determine strategies to reduce the use of environmental space
- widely praised as an effective heuristic **communication and awareness raising tool**

Cradle-to-Cradle/Cradle-to-Grave

- Aims to improve the environmental performance of products and to minimize environmental degradation throughout the **product life cycle**
- The quantification of life-cycle wide environmental impacts of products is the domain of “**life cycle assessment (LCA)**” methods
- The most comprehensive study on the EU level was carried out in the “**Environmental Impacts of Products (EIPRO)**” project
- DG Environment is currently developing a tool-box of possible policy instruments to implement the **Integrated Product Policy** objectives, including voluntary agreements, environmental management systems (e.g. EMAS), green technologies (supported through the Environmental Technologies Action Plan) and eco-design (e.g. the directive on eco-design on energy using products (EuP)).

Dematerialisation

- Aims at **reducing (raw) materials and energy** used by the economy for the production of goods and services
- The European Commission has recently adopted the indicator of “Total Material Consumption (TMC)” as a target **headline indicator** for the theme ‘production and consumption patterns’ in the European Sustainable Development Strategy
- The concept of dematerialisation holds strong potential for raising not only the resource productivity of the European economies, thus improving the state of the environment, but also to significantly stimulate economic growth and improve the international competitiveness of European industries through savings of (material and energy) costs

Eco-sufficiency

- Substantial reductions in resource use will require the reduction of unsustainable consumption through changes in **consumption *patterns*** and reductions in **consumption *levels*** in industrialized countries, in addition to eco-efficiency strategies
- Eco-sufficiency is closely related to issues of quality-of-life and life-work-balance
- It also requires a change in social frameworks, provided on the national or European level, including measures such as **environmental taxes, environmental planning, education for sustainability and new concepts of labour**

Transition Management

- aims to facilitate transitions towards sustainable development. It is a new governance concept oriented towards achieving system changes in energy, transport, agriculture through innovation-oriented policies
- Experiences mainly come from the Netherlands, where transition management is used for the following 4 transitions: energy, biodiversity, agriculture and mobility

Vulnerability

- Vulnerability is a result of both **exposure** to risk factors such as drought, conflict or extreme price fluctuations, and of underlying socio-economic and institutional conditions that reduce people's and/or the environment's ability to cope with the negative impacts of exposure
- These impacts not only depend on the exposure but also on the **sensitivity** of the unit (such as a watershed, island, household, village, city or country) that is exposed
- Vulnerability analysis focuses on the perspectives and experiences of **vulnerable and marginalised groups** to understand in particular the role of poverty, institutional weaknesses, globalisation, environmental factors and marginality in creating vulnerability
- Vulnerability assessments can be a way to focus on pre-emptive measures towards disasters (natural or man-made) rather than wait for the victims to become just that.

Six Selected Environmental Technologies

- white biotechnology
- hydrogen-based transportation fuels
- small-scale wastewater treatment systems
- energy-producing greenhouses
- solar panels combined with heat pumps
- CO₂ sequestration

White Biotechnology

- White (industrial) biotechnology or biocatalysis is used to produce all kinds of products used in daily life – ranging from cheese to biodiesel fuel.
- It involves fermentation and enzymatic processes that are highly interesting financial and ecological alternatives to chemical-physical and mechanical processes.
- Biocatalysts reduce waste and resource use.
- The principal industries benefiting from the use of biocatalysts are the pharmaceutical and chemical industries.
- The international market for bioproducts and processes is rapidly increasing.

Hydrogen-based Transport Fuels

- Current interest in hydrogen stems from environmental and energy policy concerns including global climate change, local air quality, noise and security of energy supply, together with breakthroughs in fuel cell technology.
- While hydrogen has minimal environmental effects where it is used, there may be impacts associated with its production.
- The European Union is engaged in fuel cells bus trials in several cities and foresees that 20% of transport fuel will come from hydrogen by 2020.

Small-scale Wastewater Treatment Systems

- Small-scale wastewater treatment systems may be a more sustainable solution for developing countries and for dwellings in Europe not connected to centralised systems.
- World demand for water treatment products is forecast to increase over six percent per year through 2009 (including price increases) to over \$35 billion.

Energy-producing Greenhouse

- The ‘energy-producing greenhouse’ is part of a concept which involves the closing of several cycles: heat, nutrients, water and waste with excess heat being used by houses that also become partly independent from utility services.
- In 2005 a pilot project with the energy-producing greenhouse started in Bergerden in the Netherlands. The pilot is one of the projects of the Dutch energy transition.

Solar Panels in Combination with Heat Pumps

- During operation, photovoltaic (PV) and solar thermal technologies produce no air pollution, little or no noise, and require no transportable fuels. This makes solar power one of the cleanest energy technologies.
- European manufacturers of solar thermal panels are leading in advanced systems together with Japan.

CO₂ Sequestration

- CO₂ capture and storage (CCS) is separation of CO₂ from anthropogenic sources, transport to a storage location, and isolation from the atmosphere.
- CCS would be an option in the portfolio of actions for stabilization of greenhouse gas concentrations, while allowing for the continued use of fossil fuels.
- Components of CCS are in various stages of development. Complete CCS systems can be put together from existing technologies that are mature or economically feasible under specific conditions.
- CCS is an end-of-pipe solution, and should therefore be considered only once a maximum efficiency improvement has been achieved on the power production process.
- From a regulatory standpoint, many issues concerning CO₂ sequestration remain unresolved.
- Due to its large and increasing fossil-fuel-based power production systems, China represents a great potential market for capture technologies.

Implications for EU Policy Making

- EU Environmental Policy
- EU Sustainable Development Strategy
- Lisbon Strategy
- The EU's future economic and policy relationships with other countries.

Environmental Policy

- Widespread implementation of the environmental concepts and technologies discussed in the report will require environmental mainstreaming/policy integration.
- Sustainability requires control and adaptation. It is not a matter of just promoting sustainable technologies. The model of transition management in the Netherlands offers a useful model for considering transition issues of system change offering sustainability benefits.
- Given the extent of environmental changes already observed and those predicted, mitigation **and** adaptation policies will be required. The technologies described in this report can contribute significantly to mitigation, while vulnerability assessment can guide adaptation policies.

EU Sustainable Development Strategy

- The concepts and technologies discussed in the report can contribute substantially to meeting the targets of the renewed strategy, as indicated in Table 2.

The Lisbon Strategy

- The implications for the **Lisbon Strategy** can broadly be related to the implications for public investment in research, innovation and education, as well as on jobs and economic growth.
- It is almost impossible to provide good estimates of employment effects of the selected technologies.
- Through eco-efficiency policies economic benefits may be achieved together with environmental benefits.

Trade Policy

- According to WTO experts global trade in environmental technologies can be valued at approximately US\$250 billion.
- Increased market access for environmental goods, such as the 6 examples discussed in this report, promises a “win-win-win” outcome, as it translates into greater access - for lower cost - to technologies and products that support governments’ environment and development goals (e.g., improved sanitation, pollution prevention, renewable energy).

Use of the Concepts in Other Countries

- Small study (Questionnaire) of expert perceptions of the importance of the new concepts at present and in the future in the Old and New EU Member States, China and India in the fields of research, policy and industry.
- An analysis of scientific articles in the Web of Science database concerning the use of the concepts and their use in USA, Japan, China and India as reflected in scientific publications.

Research Publications

- Absence of focus on dematerialisation in all four countries,
- Eco-sufficiency and cradle-to-cradle and cradle-to-grave concepts are worked on (Europe has a strong lead in this research field).
- High number of articles on ecological footprint
- Neither eco-sufficiency nor transition management has reached any of the mainstream journals indicating their truly emerging nature even in research.

Implications for Future Policy Relations with Other Countries

- All of the concepts we have discussed relate to the broader sustainable development agenda in Agenda 21, the World Summit on Sustainable Development (WSSD) and the follow-up process in the annual sessions of the Commission on Sustainable Development (CSD).
- Another key global process where some of these concepts can have a role is the United Nations Decade on Education for Sustainable Development (UNDESD), 2005-2014

The report also provides:

- A reference list, with web-links to further sources of information
- A glossary with definitions of 36 concepts and 17 technologies
- Annexes with summary tables on technologies
- Results from the questionnaire

Thank You for Your Attention!

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