TECHNOLOGY TOWARDS SUSTAINABILITY

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Technological progress and environmental protection are not mutually exclusive. In recent years, research and business have increasingly been focusing on emerging technological, procedural, organisational, institutional and political innovations leading towards sustainability. Moreover, the last decade has signalled a shift in environmental policy away from regulatory and end-of-pipe approaches and towards the principle of pollution prevention. Industry voluntarily adopts the concepts of clean technology and cleaner production. A basic factor in bringing about this change in policy is the growing demand by consumers for continuous improvements in the environmental performance of products.

However, progress achieved so far has been limited for the following reasons:

- Scientific and technological barriers need to be tackled before alternative clean techniques and cleaner production routes can be developed.
- There has been no adequate overall framework to drive scientific and technological innovation and to accelerate its integration with environmental and consumer policies.

Concerning the latter, after the problem was recognised, several international activities and policies were launched to fill the gap. Examples are the National Cleaner Production Centres under the UNEP umbrella and the new European approach of Integrated Product Policy (IPP), which aims to facilitate the production of environmentally friendly products and, at the same time, contribute to setting-up a market for such products.

Integrated Product Policy

The objective of IPP is to reduce the environmental impact of products during their entire life cycle, ranging from the extraction of raw materials, production, packaging, distribution and use to the management of waste (Figure 1). The basic factor in this approach is that environmental impacts should be considered during each stage of a product's life cycle and that these impacts should influence the decision-making process of the parties involved. IPP attempts to integrate environmental parameters in the design of products, the ultimate goal being that the protection of the environment evolves into a "business value," just like profit, and product quality and safety.

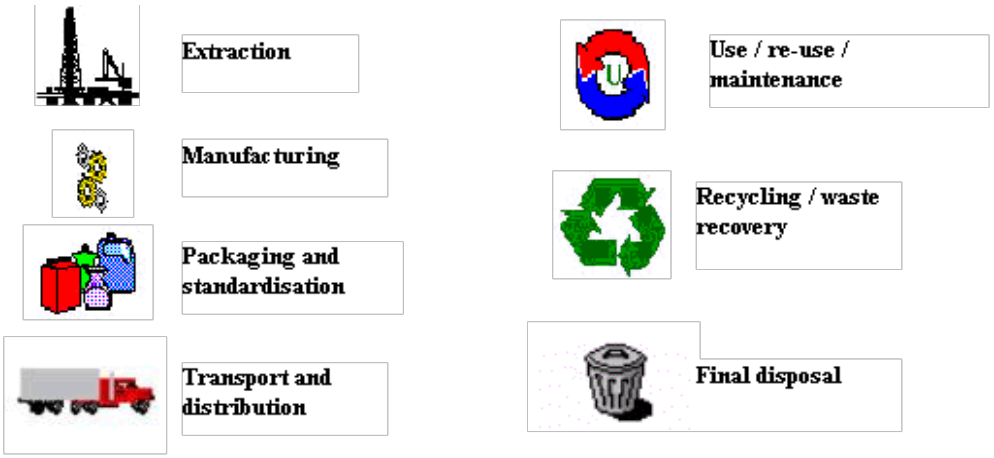

Figure 1. Life cycle stages

IPP is supported by directives, regulations, procedures and certification requirements. Some of these are already being implemented, such as Directive 94/62 EC concerning packaging and packaging waste, EMAS, Eco-labelling etc., while others are being reviewed with the prospect of applying them to a number of industrial processes. In February 2001, the European Commission adopted the Green Bible concerning IPP, which will form a discussion forum on the role and measures that should be taken at the European level.

Combined with the close co-operation of all relevant stakeholders aimed at finding effective measures for the protection of the environment and the development of businesses, the IPP approach will constitute the main innovative element of the 6th Environmental Action Programme. Similarly, the strategy for sustainable development, included in the agenda of the Göteborg Council Summit in June 2001, aims to utilise the synergies that

exist between environmental protection and the development of businesses.

EURO-SUSTAIN

Substantial progress with regard to the implementation of IPP is expected from the EURO-SUSTAIN action. Recently launched on the occasion of the Hellenic chairmanship of Eureka (the European network for industrial research and development), EURO-SUSTAIN primarily aims to strengthen the economic competitiveness of European industry by promoting technologies that will lead towards a more rational use of energy and a reduction in raw material needs. For this reason EURO-SUSTAIN is divided into the following four thematic units:

Clean technology and cleaner production

The concepts of clean technology and cleaner production are fundamental to IPP. It should be noted that the effectiveness of the tools and approaches presented below depend on the ability to develop and implement clean technologies and clean production processes. For this reason EURO-SUSTAIN will examine new opportunities and potential pathways to sustainability based on the combination of the clean technology/clean production and IPP concepts. Experiences from demonstration projects and case studies will be presented, and strategies for promoting the concepts of clean technology and cleaner production through IPP will be developed.

Eco-Design

Eco-Design provides strategies and techniques for designing and producing environmentally responsible products, which can compete in the international marketplace. An IPP priority in this area is the development and implementation of guidelines aimed at effectively promoting Eco-Design to businesses. Hence, EURO-SUSTAIN will focus on the following points:

- choosing and designing materials for recycling/reuse
- designing products for recycling/reuse
- recovery of materials
- monitoring and sensing technology – tracking of materials and wastes

Immaterialisation

According to IPP, services will play a crucial role in partially or fully replacing products. Immaterialisation is a way of replacing the use of a product by information and telecommunication services. Examples include the substitution of physical products, such as technical devices or even paper, by virtual information devices. EURO-SUSTAIN will review the experiences of business and research centres and examine the potential for applying immaterialisation in:

- the replacement of products by information intensive services
- new ways of working, e.g. how to replace physical work settings by virtual information spaces
- new ways of engineering that eliminates requests for physical products

Tools for sustainability

This thematic unit focuses mainly on Life Cycle Analysis (LCA), which is a fundamental tool of IPP. LCA is a methodology for the systematic evaluation of environmental parameters during each stage of a product's life cycle (Figure 1). Originally LCA was adopted as a decision-making tool only by large industries, while being implemented differently by different countries. This is due to the fact that a detailed LCA usually requires specific analyses for solving problems that arise from applying the methodology, finding the data and evaluating its quality, and creating databases specifically for the product that is being examined.

In order to cover this gap, IPP promotes the development of tools that will facilitate the rapid examination of the environmental impacts of products, particularly for small and medium sized companies that do not have the knowledge or resources to carry out LCAs alone. For this reason the e-LCA project started at the beginning of 2001 with funding from the European Community. The aim of the project is to provide innovative services through the Internet in order to facilitate the adoption of environmental management tools, and particularly LCA, by SMEs. Greece is represented in this project by the Laboratory for Heat Transfer and Environmental Engineering (LHTEE), Aristotle University of Thessaloniki (see http://aix.meng.auth.gr). LHTEE also co-ordinates HELCANET, the Greek Network for Life Cycle Analysis whose aim is to research, develop and promote the application of LCA in Greece.

EURO-SUSTAIN represents a framework in which enterprises, business associations, research centres, academic institutions and public administrations will get together to:

- exchange information and points of view in order to launch collaborative projects in the framework of Eureka and the Sixth Framework

Programme

- promote sustainable economic development at the European level with minimum environmental impacts
- promote new and advanced technologies for a sustainable society

Ultimately, EURO-SUSTAIN will support IPP through the promotion of innovative research and development leading to environmentally friendly products and services and an increased understanding of the procedures that lead to sustainability.

Professor Nicholas Moussiopoulos is the Director of the Laboratory of Heat Transfer and Environmental Engineering at Aristotle University, in Thessaloniki, Greece, as well as a lecturer in Mechanical Engineering at the same university and Honorary Professor of Karlsruhe University in Germany. As head of a 30-strong member scientific team, Professor Moussiopoulos has conducted countless research programmes, the majority of which have been funded by the EU. He has also acted as advisor to the Greek Minister for the Environment and Public Works and represents Greece at the International Scientific Committee of the EUROTRAC-2 programme, which co-ordinates European research into atmospheric pollution. He is actively involved in the European Environmental Organisation's Centre for Atmosphere and Climatic Change, as well as being a regular member of the National Experts' Research Committee. He is also Co-ordinator of the Environment Committee of the Aristotle University of Thessaloniki. Professor Moussiopoulos' research work centres on the protection and conservation of the environment, as well as on the correct and responsible use of energy.