Integrated Product Policy and Innovation

Incremental Steps and their Limits

Integrierte Produktpolitik bietet einen Rahmen für die Verbesserung der Umweltleistung von Produkten. Sie ist geeignet, schrittweise Verbesserungsinnovationen bei Produkten zu fördern. Doch läuft sie Gefahr, sich zu sehr auf bestehende Produktsysteme zu konzentrieren und hierdurch die für weit reichendere Umweltentlastungen erforderlichen Systeminnovationen zu vernachlässigen. Deshalb muss sie um weitere Politikansätze, wie etwa „transition management", ergänzt werden.

Von René Kemp

Environmental management in business has shifted from emission control and waste management to products. The shift should be welcomed: product use is a source of environmental stress and there is much to be gained from environmentally improved products that are less environmentally harmful during their use and afteruse. Integrated product policy (IPP) – defined by Berkhout and Smith as „public policy which explicitly aims to modify and improve the environmental performance of product systems" (1) – offers a framework for achieving this. This article will argue that IPP may be less suited for achieving radical innovation and system innovations that involve structural change at the supply and demand side. For achieving system innovations that offer sustainability benefits, we need a wider framework and a different type of policy approach which may be labeled transition management. IPP is thus discussed from an innovation perspective, where innovation refers to a tangible and intangible output and the process to it.

▶ Types of innovation

The innovation literature says that there is little sense in talking about innovation as something homogenous. The term innovation must be used in a qualified way. A common analytical distinction is made between incremental innovation, radical innovation and system innovation (2). Incremental innovations are relatively minor changes of processes and products. They occur more or less continuously and are usually the result of experience and normal problem solving activities of engineers. Radical innovations on the other hand are typically the result of R&D in enterprises and research activities in university and government laboratories. Examples of radical innovations are: the pill, nylon, the steam engine and, in the area of environmental technology, anaerobic wastewater treatment. Radical innovations entail a departure from existing products, even though the departure is a partial one, as radical innovations often build on existing knowledge and designs, especially in the early period of their development.

At the third level we have new technology systems or system innovation: changes in technology systems that affect various branches of the economy and give rise to new sectors. System innovations involve a cluster of innovations, leading to new sociotechnical configurations. Examples of system innovation are: the electrification of manufacturing and private homes, the development of the centralised electric system, the cluster of synthetic materials innovations, and machinery in injection moulding and extrusion. A system innovation of our time is e-commerce.

A common distinction within the environmental literature on eco-products and design is made between product improvement, product redesign and change of systems or product chains. A similar distinction, from a systems perspective, is the distinction between system optimisation, system redesign and system (or function) innovation. An example of a system innovation is industrial symbiosis (industrial ecology): the closing of material streams, through the use of waste outputs from one company by another. System innovation involves new ties and rules. System optimisation on the other hand consists in the improvement of products and processes instead of the creation of a new system or the transformation of an existing one.

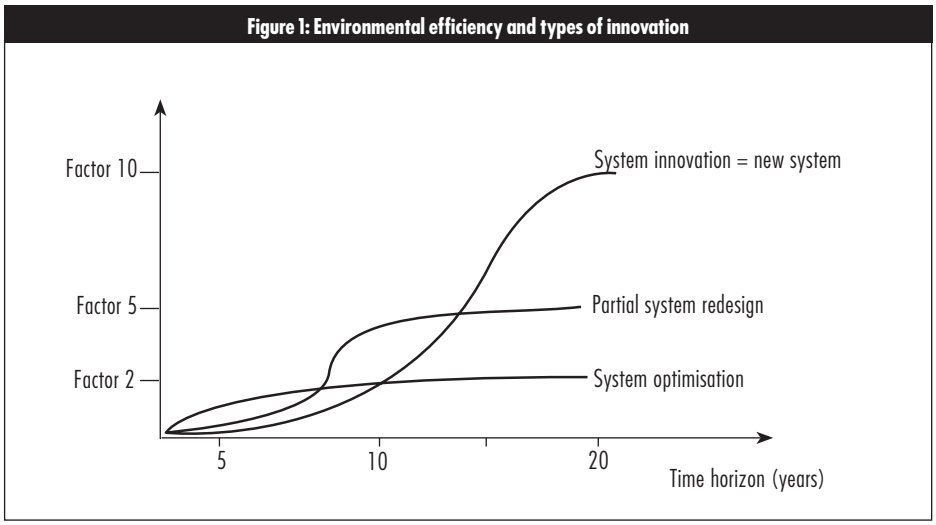
▶ Innovation and the environment

The distinction between different types of innovation is relevant for (the management of) environmental technology responses. Environmental protection benefits may be achieved through both types of changes. Some authors have argued that significant environmental benefits may be achieved through incremental change over an extended period (3). Although this is undoubtedly true, such changes will run into increasing marginal costs per unit of improvement. If we want to achieve 10- to 50-fold improvement of resource productivity – which some say are needed in the next 50 years – we need system innovation or technological regime shifts (involving structural change) in addition to the optimisation of existing systems or product chains (4).

The time path of improvement in environmental efficiency for different types of innovation is visualised in a highly stylised and simplified way in figure 1.

Most of the attention of business is focusing on eco-efficiency options: win-win solutions that combine environmental with economic benefits, leading to factor two improvement. Examples of

Figure 1: Environmental efficiency and types of innovation



Source: Weterings, R. et al: 81 Mogelijkheden: Technologie voor duurzame ontwikkeling. Final Report for VROM. Apeldoorn 1997

these are: energy-efficient processes, recycling systems, low-solvent paints and coatings. Far less attention has been given by business, but also by government, to system innovation as a way of achieving environmental benefits. The reason is easy to understand: system innovation (system renewal) involves wider change, beyond the level of components, involving the use of new technology, new markets and major organisational change. An example is the shift from car-based travel towards intermodal travel, i.e. people using different modes of transport. It will not only involve so-called transferia (transfer points) and special bus lanes and light rail in conurbations but also major social and organisational change: the collective ownership and use of cars (car-sharing and riding), the creation of so-called mobility agencies providing intermodal transport services, the integration of collective transport schemes by transport companies, and the introduction of employee incentive and information systems for intermodal travel in companies.

▶ The innovation impact of IPP ...

The increasing focus on products and system change as a way of moving towards sustainability implies that the distinction between environmental innovation and normal innovation starts to blur. Environmental benefits may be achieved through normal business innovation of improved products and processes. The literature on environmental management shows that there are many opportunities for this. All it takes is attention and some intelligence.

IPP is useful for dealing with situations in which the circumstances are not that fortunate, i.e. environmental benefits cannot be achieved at a net economic gain. IPP helps finding ways of co-optimising environmental goals with other goals: product performance for users and low cost manufacturing. Tools to achieve this are life cycle analysis and design for the environment. The co-optimisation is not always easy. For example, it proved to be very difficult and took a lot of time and money to develop phosphate free detergents with equal washing power as the phosphate-based.

Berkhout and Smith suggest a stepwise approach for IPP, in which the scope of IPP is gradually expanded: from waste and resources management (phase 1), to consumer aspects (phase 2), final goods manufacturing and distribution (phase 3), and finally the inclusion of raw material production and intermediate goods production (phase 4).

▶ ... and its limits

This may be a sensible approach from a practical point of view but it runs the danger that the strong focus on an existing product system and its upgrading will bring forth little in terms of system innovation, which goes beyond individual products and involves social change. For example IPP may help to design cars for disassembly and to make them cleaner, but will probably not help to move towards a different way of satisfying mobility or to achieve low-mobility life styles, both of which requires changes in planning and work life.

I therefore propose that IPP should be complemented with policies that are explicitly aimed at system innovation. Such policies are not easy to design and implement. They raise difficult questions about responsibilities of societal actors, about the final goal, and about ways and steps to get there. Work on this issue is underway in the Netherlands under the label of „transition management“ (5). Elements of such a policy are:

- the establishment of a transition goal (involving a multitude of goals), based on visions of sustainable product systems being the outcome of societal discussions;
- the use of societal experiments with options that fit the sustainability vision; and
- the use of development rounds in which policies and transition goals are reviewed and redefined.

The role of government is that of a sociotechnical alignment actor (6). This means that policy is not just aimed at changing the economic frame conditions but also at creating visions and networks for learning and interaction, at changing the expectations, capabilities and assumptions of economic actors – broadening the mind set of actors and changing business models.

What we need is an effort along all three lines of product improvement, system redesign and system renewal, to secure benefits both in the short and the longer term.

References

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(2) The discussion of innovation types is based on Freeman, Chris/ Perez, Carlota: Structural Crises of Adjustment, Business Cycles and Investment Behaviour. In: Dosi, Giovanni et al. (eds.): Technical Change and Economic Theory, London 1988, pp. 38-66.

(3) A prominent example is Clayton, Anthony/ Spinardi, Graham/ Williams, Robin: Policies for Cleaner Technology. A New Agenda for Government and Industry. London 1999.

(4) Cf. for example Kemp, René: Technology and the Transition to Environmental Sustainability. The Problem of Technological Regime Shifts. In: Futures, Vol. 26 (1994), pp. 1023-1046; and Weaver, Paul et al.: Sustainable Technology Development. Sheffield 1999.

(5) Rotmans, Jan/ Kemp, René/ van Asselt, Marjolein/ Geels, Frank/ Verbong, Geert/ Molendijk, Kirsten: Transities & transitiemanagement. De casus van een emissiearme energievoorziening. Report for the 4th national environmental policy plan (NMP4). VROM, The Hague, forthcoming.

(6) Cf. Rip, Arie/ Kemp, René: Technological Change. In: Rayner, S./ Malone, E.L. (eds.): Human Choice and Climate Change. An International Assessment, Vol. 2. Washington D.C., pp 327-400; and Rip, Arie/ Schot, Johan: Anticipation on Contextualisation: Loci for Influencing the Dynamics of Technological Development. In: Lang, Christa/ Sauer, Dieter (Hrsg.): Paradoxien der Innovation. Perspektiven sozialwissenschaftlicher Innovationsforschung. Frankfurt/ New York 1999.

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