# 6 Eco-efficiency in redesigned extended supply chains; furniture as an example

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## Abstract

This paper shows how the eco-efficiency concept can be used to evaluate value and environmental performance when considering different scenarios for redesigning extended supply chains (ESCs). Results from a case study on furniture production in Norway are used to illustrate the concept.

An extended supply chain includes all processes necessary for production, use and end-of-life treatment of a product. The environmental performance of the products was assessed using LCA, and value performance was measured as life cycle cost. Instead of calculating absolute values using a traditional eco-efficiency ratio, relative values for different scenarios were calculated and presented graphically in an XY-diagram. This clearly visualises the alternatives that have the best environmental and value performance.

Six different scenarios were developed to assess how the performance of an existing ESC can be improved. The eco-efficiency for each scenario was compared with the present ESC. The results show that there is large and realistic potential for environmental improvements in the extended supply chain without an equivalent increase in life cycle costs.



*G. Huppes and M. Ishikawa (eds.), Quantified Eco-Efficiency*, 163–179.

## 6.1 Introduction

The growing concern for the environmental dimension of business strategy is resulting in a greater focus on environmental management (e.g. Porter and van der Linde 1995; Noci and Verganti 1999; Cramer 2000; Hall 2000; Ammenberg and Hjelm 2003; Banerjee et al. 2003; Hunkeler et al. 2004). More and more companies have also realised that this has consequences not only for the activities within the company, but for the entire supply chain (e.g. Lamming and Hampson 1996; Noci and Verganti 1999; Clift and Wright 2000).

The increased focus on environmental performance in companies has a manifold origin. Pressure from customers and legislation have often been identified as the two most important drivers (e.g. Florida 1996; Noci and Verganti 1999; Cramer 2000). Several companies are striving to stay ahead of legislation and competitors, in order to avoid more or less ad hoc interventions later on (Lamming and Hampson 1996), or to be able to influence future legislation in a way that would give them a competitive advantage (Barrett 1991; Taylor 1992). Expectations of cost savings are also an important factor, and environmentally proactive companies tend to have greater innovative power than other companies (Sharma and Vredenburg 1998; Noci and Verganti 1999).

The growing interest in environmental issues does not only influence the end producers. According to Noci and Verganti (1999) and Hall (2000), awareness and pressure from regulations and customers move upstream along the supply chain and accumulate. Environmental improvements in supply chains are thus attainable through a market-driven process if the end producers include applying environmental performance criteria when selecting suppliers. It is therefore necessary to ask sub-suppliers to meet not only product-oriented purchasing specifications (e.g. cost and quality requirements), but also specifications for environmental performance in the production process (Hall 2000).

To comply with increased requirements from customers and authorities, it is necessary for companies to be aware of the performance of their products throughout their life cycle. One possibility is to measure eco-efficiency in the extended supply chains (ESC). Michelsen et al. (2006) have demonstrated how this approach can be used to compare different