12 A strategic policy model for promoting secondary materials use

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Abstract

This paper discusses problems associated with the development of a tax and subsidy policy to promote the use of secondary materials converted from industrial waste as a substitute for virgin materials. The main purpose of the study was to examine how a set of tax and subsidy levels modifies consumption and affects welfare. For this purpose, a static partial equilibrium model was developed, taking into account welfare effects in production and consumption under economic and ecological constraints. The results of the study indicate that a virgin materials tax combined with subsidies for waste converters could be an effective policy to promote the use of waste-based secondary materials.

12.1 Introduction

Sustainable development is a concept commonly used to assess the impacts of human activities on nature, the environment and the resource base. The Johannesburg Declaration on Sustainable Development, adopted at the World Summit on Sustainable Development (WSSD) on 4 September 2002 (WCED, 2002), reaffirmed the commitment to sustainable development and urged parties to 'assume a collective responsibility to advance and strengthen the interdependent and mutually reinforcing pillars of sustainable development – economic development, social development and

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environmental protection – at local, national, regional and global levels'. In respect of economic and social development, sustainable production and consumption (SPC) is an essential requirement. SPC is defined as the use of goods and services to meet basic human needs and raise the quality of life while simultaneously minimising the use of natural resources, the use of toxic materials and the emission of wastes and pollutants over a product's life cycle, so as not to risk the ability to meet the needs of future generations (WCED 1987; Hinterberger et al. 1999). In the process of fulfilling human needs and enabling better quality of life, the industrial sector uses virgin materials and energy extracted from natural resources to produce goods. As these resources are normally non-renewable, their depletion is putting our future generations at risk. In addition, both the extraction process and the production activities produce unused by-products or wastes that are harmful to the environment and cause ecological problems. In terms of this problem, Haake et al. (1999) regarded industry as a prime factor in sustainable development.

In response to environmental problems caused by the industrial activities described above, Industrial Ecology (IE) is emerging as an approach aiming at closing the materials cycle to develop industries which minimise the use of resources and the production of wastes (Allenby 1999). This aim is in line with the concept of eco-efficiency, which is to enable more efficient production processes and better products and services while reducing resource use and pollution.

One of the implementations of IE is the development of 'eco-industrial parks' such as that of Kalunborg in Denmark. The principle underlying such eco-industrial parks is to utilise the waste material from one firm as a raw material for another (Graedel and Allenby 1995; O'Rourke 1996; Ehrenfield and Gertler 1997; Lowe and Evans 1995). By utilising waste as a substitute for virgin material, this strategy simultaneously reduces environmental damage due to waste materials and extraction processes, and reduces the rate of exhaustion of natural resources.

In general, existing eco-industrial parks provide symbiotic industrial facilities which allow a chain of waste production and utilisation to be physically set up. However, such arrangements are rare, as most existing firms are not located in close proximity to each other and many types of waste cannot be used directly as raw materials. Consequently, conversion processes are required.