

2 Maximum abatement costs for calculating cost-effectiveness of green activities with multiple environmental effects

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2.1 Introduction

We have proposed a Maximum Abatement Cost (MAC) method as a means of assessing preferential purchasing with multiple environmental effects (Oka et al., 2005). The MAC method allows assessment of the cost-effectiveness of introducing a product with less emissions of some pollutants than conventional products. In the MAC method, the reduction of a pollutant is multiplied by the MAC, the maximum unit cost of the measures taken elsewhere in society to reduce the pollutant, and is added up over the relevant pollutants. The total sum, called Avoidable Abatement Cost (AAC), is compared with the additional private cost of the product for the purchaser. When the additional private cost is smaller than the AAC, the product is regarded as relatively efficient.

Our previous article (Oka et al. 2005) described the MAC method in detail, as well as presenting an application of the method, and discussing differences between the MAC method and several existing weighting methods for life cycle assessment (LCA), along with the advantages and limitations of the MAC method. The purpose of this article is to provide

a basis for calculation and report some results on the estimated maximum cost of reducing the environmental burden for various parameters required for this method. The Mac values are presented for nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon dioxide (CO_2), particulate matter (PM), theoretical oxygen demand (TOD), trichloroethylene (TCE) and perchloroethylene (PCE), heavy metals (HM), volatile organic compounds (VOC) and dioxins (DXN).

This paper first presents an explanation of the concept of MAC, as far as necessary for the following description of the estimated MAC values for the individual parameters. Next, the estimations are described in detail.

2.2 Maximum Abatement Cost (MAC)

MAC is defined as the highest unit cost, i.e., the cost per kilogram of emission reduction, of the activity that has the highest unit cost among all the activities carried out or expected to be carried out shortly to reduce the emission of a substance or a group of substances, here specified for Japan. These emission reducing activities are carried out on the basis of decisions by people and industries with the aim of complying with government regulations, earning a good reputation or obeying their own moral belief.

In order to determine the MAC, the activity incurring the highest unit cost must be specified. Strictly speaking, when a particular person or company is carrying out an activity with exceptionally high unit reduction cost, this very high unit cost may be adopted as the MAC value. Also, when an activity can be divided into several parts that have different unit costs, the partial activity with the highest unit cost may be adopted as the one representing the MAC. However, it is difficult to identify a small activity with very high unit cost contributing only a tiny part of the emission reduction, and it would not be appropriate to use the value for an exceptional activity as a reference value for assessing other activities. For these reasons, we have determined the MAC values from data on the unit cost of emission reduction for activities widely adopted in society.