



## **Assessment of Present and Future Health-Cost Externalities of Air Pollution in Europe using the EVA Model System**

Jørgen Brandt (1), Jeremy D. Silver (1), Lise M. Frohn (1), Jesper H. Christensen (1), Mikael S. Andersen (2), Camilla Geels (1), Allan Gross (1), Ayoe B. Hansen (1), Kaj M. Hansen (1), and Gitte B. Hedegaard (1)

(1) Aarhus University, National Environmental Research Institute, Department of Atmospheric Environment, Roskilde, Denmark (jbr@dmu.dk, +45-(0)4630-1214), (2) Aarhus University, National Environmental Research Institute, Department of Policy Analysis, Roskilde, Denmark

Air pollution has significant negative impacts on human health and well-being, which entail substantial economic consequences. We have developed an integrated model system, EVA (Economic Valuation of Air pollution), to assess health-related economic externalities of air pollution resulting from specific emission sources/sectors. The EVA system integrates a hemispheric-scale atmospheric chemistry transport model (DEHM), gridded population data, exposure-response functions and monetary values applicable for European conditions. The EVA system has the advantage compared to other similar systems, that it estimates the actual contribution from specific emission sources and how they influence air pollution levels without assuming linearity of the non-linear behaviour of atmospheric chemistry. For this purpose a tagging method has been developed, calculating source-receptor relationships where the emission scenario of interest is calculated simultaneously with the background chemistry in the model. Using the EVA system, we assess the total impacts on human health and related external costs due to total air pollution levels in Europe, and these results are compared to other similar studies. Furthermore, we estimate the impacts and external costs of emissions from international ship traffic, since this sector is an important contributor to air pollution. As part of this, we examine the impacts of introducing the so-called SECA area (Sulphur Emission Control Area) in the North Sea and Baltic Sea. Both for international ship traffic and for the total air pollution levels, results are presented for present and future conditions, represented by the emission years 2000, 2007, 2011 and 2020. For the first three year, emissions are based on the EMEP emission database. For the year 2020, emissions are based on the NEC-II emissions for Europe in order to assess the impacts of the future general emission reductions.