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# Assessment of Health-Cost Externalities of Air Pollution at the National Level using the EVA Model System

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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 (External Valuation of Air pollution), to assess health-related economic externalities of air pollution resulting from specific emission sources/sectors. The EVA system was initially developed to assess externalities from power production, but in this study it is extended to evaluate costs at the national level. The EVA system integrates a regional-scale atmospheric chemistry transport model (DEHM), address-level population data, exposure-response functions and monetary values applicable for Danish/European conditions. Traditionally, systems that assess economic costs of health impacts from air pollution assume linear approximations in the source-receptor relationships. However, atmospheric chemistry is non-linear and therefore the uncertainty involved in the linear assumption can be large. The EVA system has been developed to take into account the non-linear processes by using a comprehensive, state-of-the-art chemical transport model when calculating how specific changes to emissions affect air pollution levels and the subsequent impacts on human health and cost. Furthermore, we present a new "tagging" method, developed to examine how specific emission sources influence air pollution levels without assuming linearity of the non-linear behaviour of atmospheric chemistry. This method is more precise than the traditional approach based on taking the difference between two concentration fields. Using the EVA system, we have estimated the total external costs from the main emission sectors in Denmark, representing the ten major SNAP codes. Finally, we assess the impacts and external costs of emissions from international ship traffic around Denmark, since there is a high volume of ship traffic in the region.