



## Contribution from the ten major emission sectors in Europe to the Health-Cost Externalities of Air Pollution using the EVA Model System – an integrated modelling approach

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We have developed an integrated model system, EVA (Economic Valuation of Air pollution), based on the impact-pathway chain, to assess the health-related economic externalities of air pollution resulting from specific emission sources or sectors, which can be used to support policy-making with respect to emission control. Central for the system is a tagging method capable of calculating the contribution from a specific emission source or sector to the overall air pollution levels, taking into account the non-linear atmospheric chemistry. The main objective of this work is to identify the anthropogenic emission sources in Europe and Denmark that contribute the most to human health impacts. In this study, we applied the EVA system to Europe and Denmark, with a detailed analysis of health-related external costs from the ten major emission sectors and their relative contributions. The paper contains a thorough description of the EVA system. The conclusions in the paper are sensitive to the toxicity of the different types of atmospheric particles, and therefore the existing knowledge of health impacts from particles is reviewed. We conclude that with our present knowledge we are not able to distinguish between the impacts from different particle types and therefore the toxicity of the particles is handled equally in the overall results. The main conclusion from the analysis of the ten major emission sectors in Europe and Denmark is that the major contributors to health-related external costs are major power production, agriculture, road traffic, and non-industrial domestic combustion, including wood combustion. The major power plants in Europe contribute with around 25% of the total health related external costs relative to all sources in Europe, while the Danish power plants only contribute with less than 10% relative to all Danish sources. Our results suggest that the agricultural sector contributes with 25% to health impacts and related external costs. We conclude that when regulating the emissions of ammonia from the agricultural sector, both the impacts on nature and on human health should be taken into account. The contribution from the road transport sector was estimated to around 18%. We also found that the contribution from domestic heating based on wood burning in Denmark has increased significantly and has become the major contributor to health-related external costs. The results in this study confirm that air pollution constitutes a serious problem to human health and that the related external costs are considerable.