



Anthropogenic emissions of primary particulate matter in Europe and their future trends

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Particulate matter has been with us for decades and although significant efforts were made to reduce its emissions the problem remains and will remain for years to come. The understanding of PM sources, their strengths and characteristics (size and chemical speciation) has improved dramatically but there are still important gaps in knowledge and uncertainties when it comes to chemical speciation of sources, spatial and temporal distribution, impact of control technologies on the whole spectrum of PM species or even level of activity for some sectors, e.g. biomass combustion in domestic appliances.

This presentation addresses emissions of primary PM, specifically PM₁₀, PM_{2.5} and carbonaceous aerosols, from anthropogenic sources in Europe. The characteristics of emissions between 1990 and 2000 in different parts of Europe is discussed and an assessment of future developments is presented. The results are based on the outcomes of several recent projects and modeling activities (using RAINS model) within the Clean Air For Europe (CAFE) program.

Total European PM₁₀ emissions have been estimated to drop from about 12 Tg in 1990 to 6 Tg in 2000 with PM_{2.5} reduced from about 7 to 4 Tg in the same period. The share of PM_{2.5} in PM₁₀ increased owing to the fact that significant reductions were made in stationary combustion rather than mobile sources. The contribution of Western European countries increased in this period from below 30 percent to nearly 35 percent, similarly for both PM size fractions. This is explained primarily by the structural changes in Central and Eastern Europe in the beginning of 90's where largest reductions of European PM emissions took place. It is expected that further reductions of PM emissions will result from legislation already in place. RAINS model calcula-

tions suggest that within the next 10 to 20 years such reductions will reach 20 to 30 percent of the 2000 emissions.

The sectoral structure of PM emissions has changed over time from industry dominating emissions in 1990 to a more balanced distribution between industry, residential combustion and transport in 2000. While the contribution of domestic combustion remains at about 30 percent, the transport share increased from 10-15 percent to 20-25 percent. The structure varies greatly between countries and regions and while in the EU-15 it is expected that the share of transport will decline by 2020 to about 20 percent, in several Central and Eastern European countries an increase from contributions of less than 10 percent in the early 90's to over 20 percent of total PM budget is estimated.

The European emissions of BC and OC in 2000 are estimated at 0.7 and 1 Tg, respectively. The main sources of both BC and OC are exhaust emissions from traffic and residential combustion of solid fuels, which together amount to over 80 percent of the total. The structure is distinctly different between Western and Eastern Europe; the latter dominated by residential combustion emissions while transport sources are the most important in Western Europe. By 2020 the BC emissions are projected to decline by about 35 percent and OC by 25 percent, largely due to implementation of stringent standards in the transport sector and fuel switching in the residential sector.