National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

Some results from the second Netherlands Research Program on Particulate Matter (BOP II)

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Introduction

- Focus of BOP II: 1/ Secondary Inorganic Aerosols (SIAs), 2/ Carbonaceous material (EC/OC) and 3/ the origin of PM in the Netherlands
- The Netherlands Research Programs on Particulate Matter (BOP I & II) are funded by the Ministry of Infrastructure and the Environment
- BOP programs provide policy-oriented research on PM10 and PM2.5 in the Netherlands.
- BOP II was a framework of cooperation involving the Energy research Centre of the Netherlands (ECN), the National Institute for Public Health and the Environment (RIVM) and TNO.

1. Secondary Inorganic Aerosols in the Netherlands up-to-date

- Secondary inorganic aerosols (SIAs) contribute on average 40% to the mass of the particulate matter PM10 concentration in the Netherlands.
- Concentrations of SIAs in the Netherlands were found to be twice as large as previously (= before 2008) measured. The BOP II program showed that the current measurements are very robust now!
- A BOP II measurement campaign has shown
  - 1/ mass loss (depletion) for nitrate occurs in the new measurement method but this effect is negligible for annual averages
  - 2/ correction factors for the SIA components to connect old and new measurement methods.
- The regional air quality model LOTOS-EUROS (http://www.lotos-euros.nl/) was further developed in order to improve correspondence between measured and modelled SIA concentrations in the Netherlands.

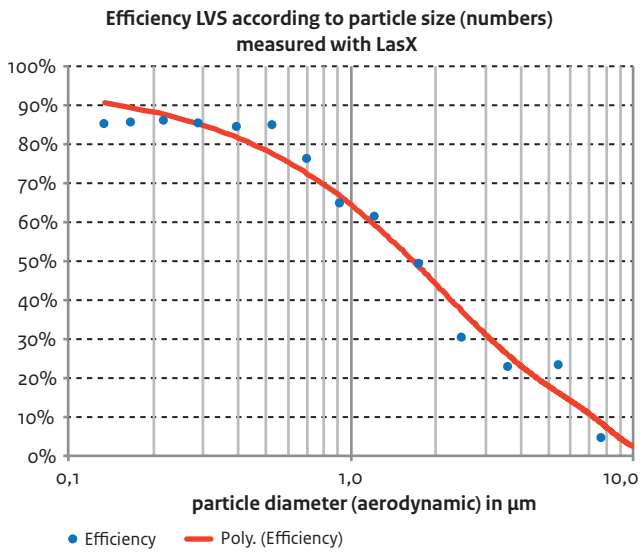

Figure 1 The efficiency of the old method to measure SIAs in PM_{10} in the Netherlands did not have the right cut-off for PM_{10}, hence the underestimation of the SIA concentrations.

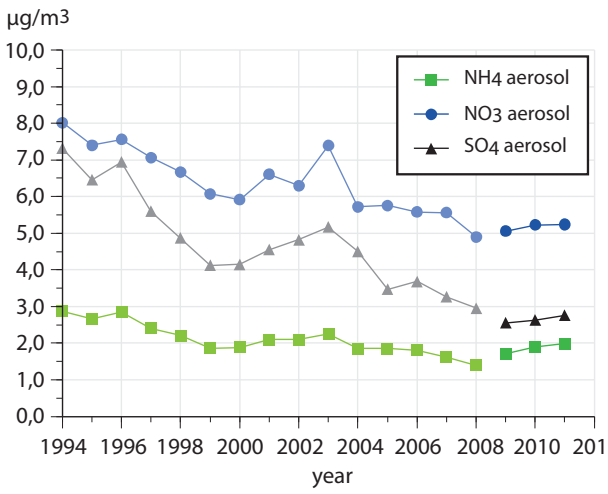

Figure 2 The annual averaged time series of SIA concentrations in the Netherlands at rural background stations over the period 1994-2011. The old time series (1994-2008) have been connected with the new time series (2009-2011) using correction factors.

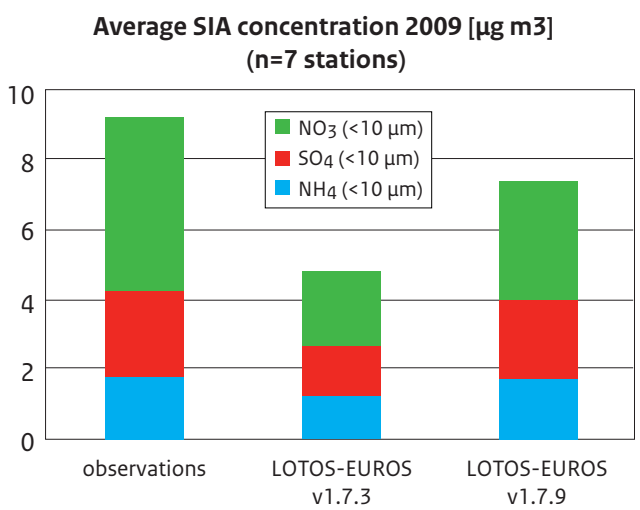

Figure 3 The observations of SIAs (left), the old model results (middle) and the new model results (right) with LOTOS-EUROS.

2. Carbonaceous material in PM: going from regional to traffic locations in Rotterdam

- The contribution and composition of regional, urban and traffic sources to $PM_{2.5}$ and PM_{10} in the city of Rotterdam, the Netherlands was measured over the course of a year.
- The urban background of $PM_{2.5}$ and PM_{10} is dominated by the regional background. The urban emissions (including traffic) contribute less than 15%.
- At the traffic location, the concentrations are a factor 2-3 elevated against the urban background for *elemental carbon (EC)*, heavy metals (copper and zinc) from brake and tire wear, and re-suspended road dust.
- The urban background is hardly increased by local traffic-related PM emissions such as EC and OC from exhaust emissions, heavy metals from brake and tire wear and road dust from re-suspension.

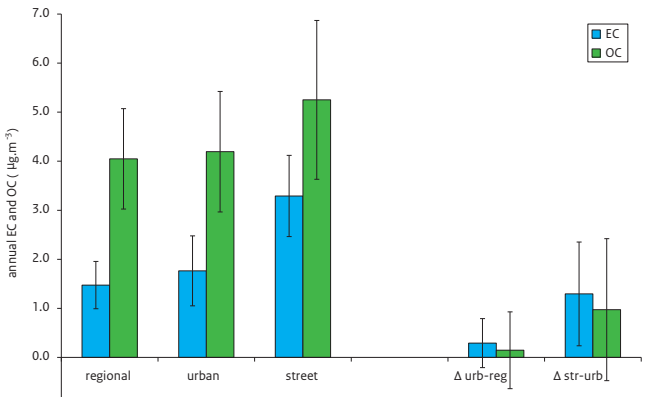

Figure 4 The combustion aerosol (EC) is elevated by more than 70% in going from the urban background to the traffic location. Organic carbon (OC) on the other hand only slightly increases.

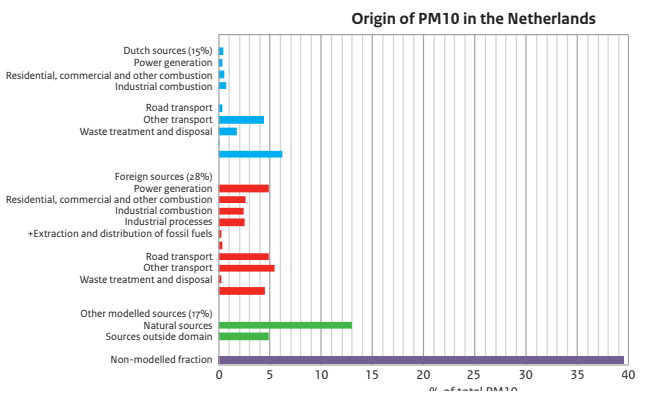

Figure 5 Result from the calculations with LOTOS-EUROS for the source attribution of PM in the Netherlands.

3. Origin of PM in the Netherlands

- A labelling module (source apportionment) was implemented in the regional air quality model LOTOS-EUROS (http://www.lotos-euros.nl/)
- This allowed for calculating the source attribution of PM_{10} and $PM_{2.5}$ in the Netherlands (years 2007-2009)
- Anthropogenic PM in the Netherlands: 1/3 is Dutch origin & 2/3 is from abroad.

References

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All reports of BOP II will be on-line available at:
http://www.rivm.nl/Onderwerpen/Onderwerpen/ F/Fijn_stof/BOP_II_het_vervolg_op_het_Nederlands_onderzoeksprogramma_fijn_stof
Although the site is in Dutch ... the reports are in English and can be found at the bottom of the above web-site (BOP II Publicaties). The last reports will be uploaded before the end of the year.

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