New calculation methods leads to more accurate air quality assessments

Air pollution from traffic and the associated health impact is an environmental problem in many European cities. Studies have shown that pollution from vehicles is the cause of approximately 700.000 yearly premature deaths in Europe. To reduce this problem, the European Union air quality directive was enacted which imposes strict limit values that the member countries have to comply with. This has led to a number of initiatives in the respective countries such as the use of catalysts and filters or the introduction of congestion taxes.

The monitoring of the development in pollution levels is often done using measurement equipment. Setting up and running a monitoring station is however a very costly activity. Consequently the number of measurement stations in a given urban area is often quite low. For instance in Copenhagen, a town of approximately 600.000 people, there are only two permanent monitoring stations in the streets.

To compensate for the low number of monitoring stations, advanced mathematical calculations performed on a computer is used to calculate the air pollution level at locations where there are no measurements. One often used calculation procedure is the Operational Street Pollution Model (OSPM).

A new study from the Institute of Chemical Engineering, Biotechnology, and Environmental Technology at University of Southern Denmark examines whether it is possible to improve the OSPM calculation procedure.

To test the accuracy of the calculation procedure, the strengths and weaknesses of the model was analysed by comparison with measurements from five streets in Denmark. This analysis served to direct the researcher's attention to the aspects of the calculation procedure in most need of improvement.

Moreover, the calculation procedure was improved by allowing for the calculation of air pollution from different lanes on a road. This is for example important for roads where many cars are driving in one direction but few cars are driving in the other direction. When the researchers compared the more advanced calculation procedure with measurements from Copenhagen, Denmark and Stockholm, Sweden they found better agreement between the model and the measurements when taking the different lanes into account.

Lastly the researchers modelled the wind speed over an urban area. This wind speed is important since the stronger the wind, the more the pollution will be diluted. Moreover, the wind will be calmer when passing over areas with tall buildings compared to when the wind is passing over a park or a lake. When comparing to measurements of the wind speed from rooftops in Copenhagen and Aarhus, the researchers could calculate the average wind speed with a reasonable success.

All in all the study paves the way for more accurate ways to calculate the urban air quality in the coming years.

Further reading:

Ottosen, T.-B., *Improved Local Air Quality Modelling for Complex Urban Landscapes,* Ph.D. thesis, Institute of Chemical Engineering, Biotechnology- and Environmental Technology, University of Southern Denmark