Tools for assessing emissions and urban air quality abatement studies

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AirQUIS is a system for air quality management developed by NILU.

The system has functionality for collection and statistical evaluation of data from monitoring stations, a module that provides a user-friendly way of treating emission data as well as models for calculating emissions, wind fields, dispersion and exposure. The integrated Geographical Information System (GIS) platform provides easy access to the data and gives a user-friendly and understandable data presentation tool. New functionality has been implemented in AirQUIS in order to provide efficient ways for assessing emissions and studying air quality abatement.

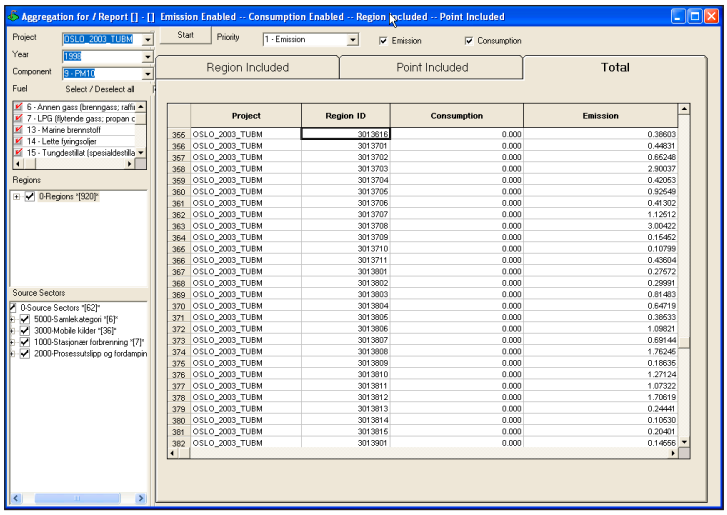

Figure 1: Total emission of PM_{10} from area sources and point sources in regions in Oslo (tons/year).

The Aggregation Functionality

The Aggregation Functionality gives the user a general view over emissions from area sources and point sources. The user may view consumption and emission data aggregated within geographical regions, source sectors, industrial plants, owners and stacks. Figure 1 shows the total emission of PM_{10} from point sources and area sources aggregated within geographical regions in Oslo.

The Abatement Functionality

The Abatement Functionality has been implemented in AirQUIS in order to provide an efficient tool to study the impact of different measures on air quality. This functionality makes it possible to alter emissions from line sources, area sources and point sources at the same time. It is possible to carry out changes within selected areas for all sorts of sources by using the GIS. For line sources the user may introduce changes on ADT, speed and vehicle distribution. Emission-, dispersion- and exposure calculations can be performed based on an abatement scenario. The Abatement Functionality has been used to study the impact of altered emissions from industry, domestic heating and traffic in Taiyuan (China) and some Norwegian cities.

The burning of coal in domestic boilers is a major source of SO_2 emission in Taiyuan. The Abatement Functionality was used to study the impact of burning briquettes instead of raw coal in Xiaodianqu, a part of Taiyauan. The change from raw coal to briquettes gave a 40 % reduction in the SO_2 emission. The abatement study was carried out by reducing the emission of SO_2 due to raw coal by 40 % in the specified area.

Figure 2 shows how Xiaodianqu is selected from the GIS in AirQUIS. Figure 3 shows the calculated average SO_2 concentration in Taiyuan in the period 07.02.2002 – 14.02.2002 with original emission sources, while Figure 4 shows the SO_2 concentration for the same period with abatement on raw coal in Xiaodianqu. The change of fuel for domestic boilers had a large impact in this part of Taiyuan. Abatement studies were also performed on point sources, reducing emissions of SO_2 from these sources. This had a positive impact on the air quality, but the simulated difference was smaller than in the case of change of fuel for domestic boilers.

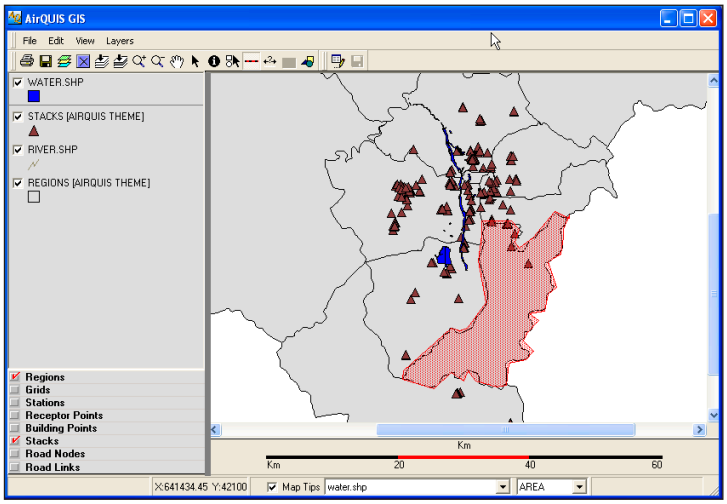

Figure 2: Selection of polygon containing Xiaodianqu in Taiyuan.

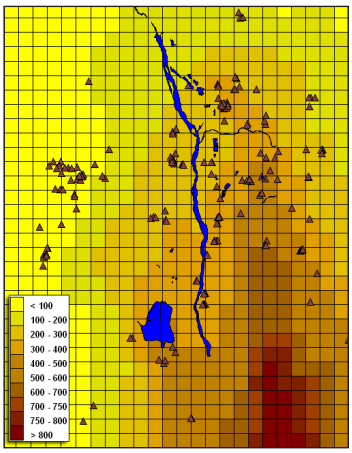

Figure 3: Average calculated SO_2 concentration in $\mu g/m^3$ in the period 07.02.2002 – 14.02.2002. Calculation is without abatement.

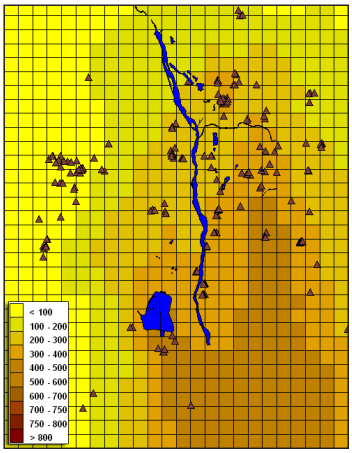

Figure 4: Average calculated SO_2 concentration in $\mu g/m^3$ in the period 07.02.2002 – 14.02.2002 with briquettes instead of raw coal in Xiaodianqu.

References

Mc Innes H., Jablonska H. T. B., Innset B. (2006) *Tools for emission assessment and abatement studies.* Norwegian Institute for Air Research, TR 01/2006

AirQUIS: *www.nilu.no/airquis/*