Use of Atmospheric Dispersion Models for Urban Air Quality Management

in Poland and Other CEE Countries

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Air quality management – modern approach

Innovative ways to improve the air quality:

- Professional expertise
- Advanced tools including emission inventory systems, air dispersion models and forecasting software

Result:

- Air Quality Action Plan (AQAP) - knowledge package for decision makers

Situation in Poland

- The number of zones requiring AQAPs increased from 13 (first assessment for 2002) up to 96 in 2005.
- The main pollutant: PM10 (79 zones in 2005)
- The main source of PM10: residential stoves and boilers (solid fuels).
- Continuous development of Action Plans in major cities and smaller towns.

Other CEE countries

- Czech Republic: PM10 daily concentration limit exceeded in 35% of the territory (>65% population area)
- Transboundary air quality management system developed in four pairs of cities in Bulgarian-Romanian boundary region.

Criteria of model selection

One of the main factor considered is the model accuracy. Polish regulations set up the required accuracy depending on the pollutant and concentration averaging time.

Pollutant	Averaging time	Required accuracy
PM_{10}	24 h	50%
SO_2, NO_2	24 h	50%
SO_2, NO_2	annual	30%

Air quality modelling guidelines

- Issued in Poland by the Ministry of Environment in 2003.
- Important source of knowledge on models for decision makers.
- Four lists of models: screening, non-urban, road, urban.

Case study – Krakow project

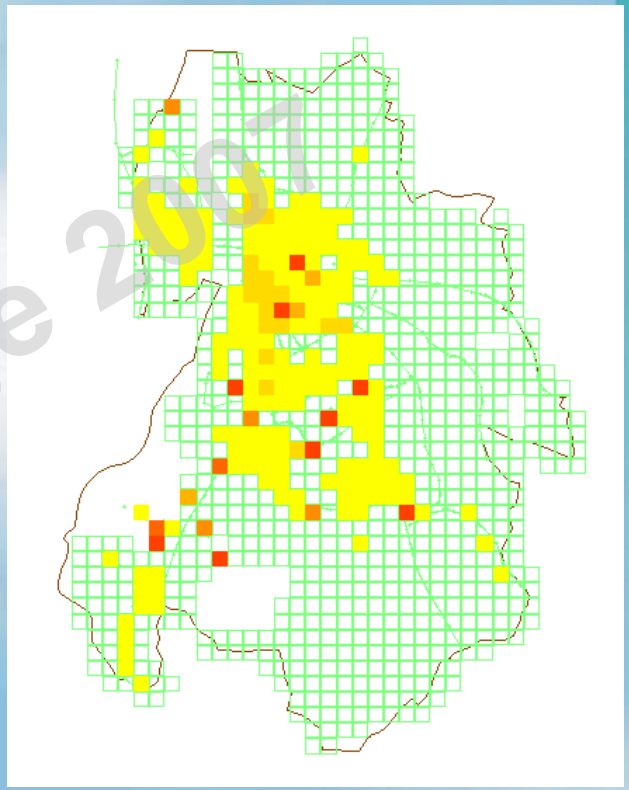
- Five zones
- Different types (industrial, residential, mixed)
- Different size (from 50 to 1250 km^2)
- Carried out by ATMOTERM in 2005 and 2006 in close co-operation with local administration

Problem identification

- Pollutants (PM10, NO_x, SO_2)
- Measurement results analysis (data from automatic stations)
- Real data availability and base year selection
- Forecast year selection (2010/2015)

Emission inventory

- Industrial sources (combustion, technology)
- Main roads
- Area sources (including domestic/utilities sources) divided into 500 m x 500 m or 1000 m x 1000 m grid cells

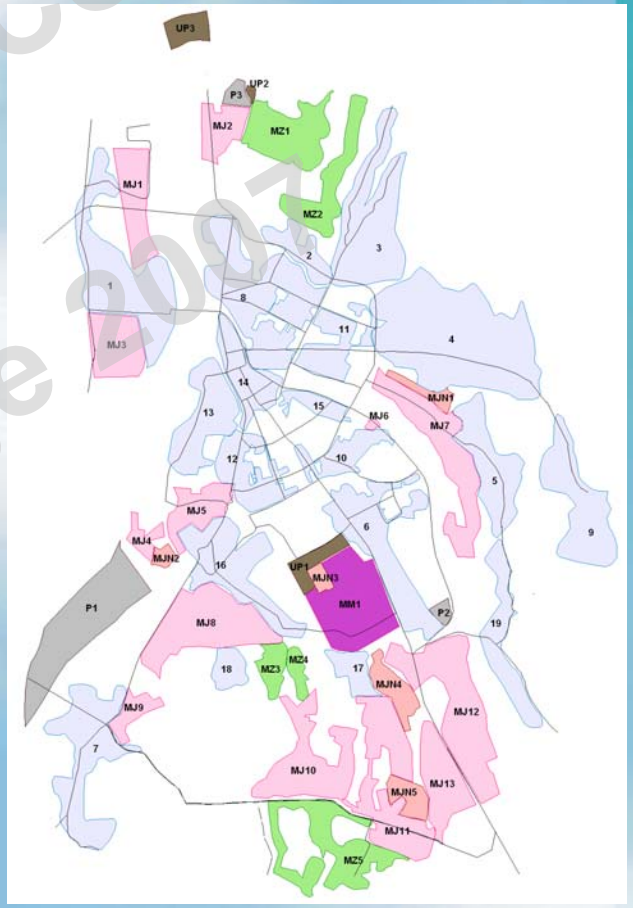


SOZAT information system

- The system to support range of environmental tasks including emission inventory
- Software system created by ATMOTERM
- The system can be employed by industrial plants as well as by cities or regional administration

WKE emission inventory software

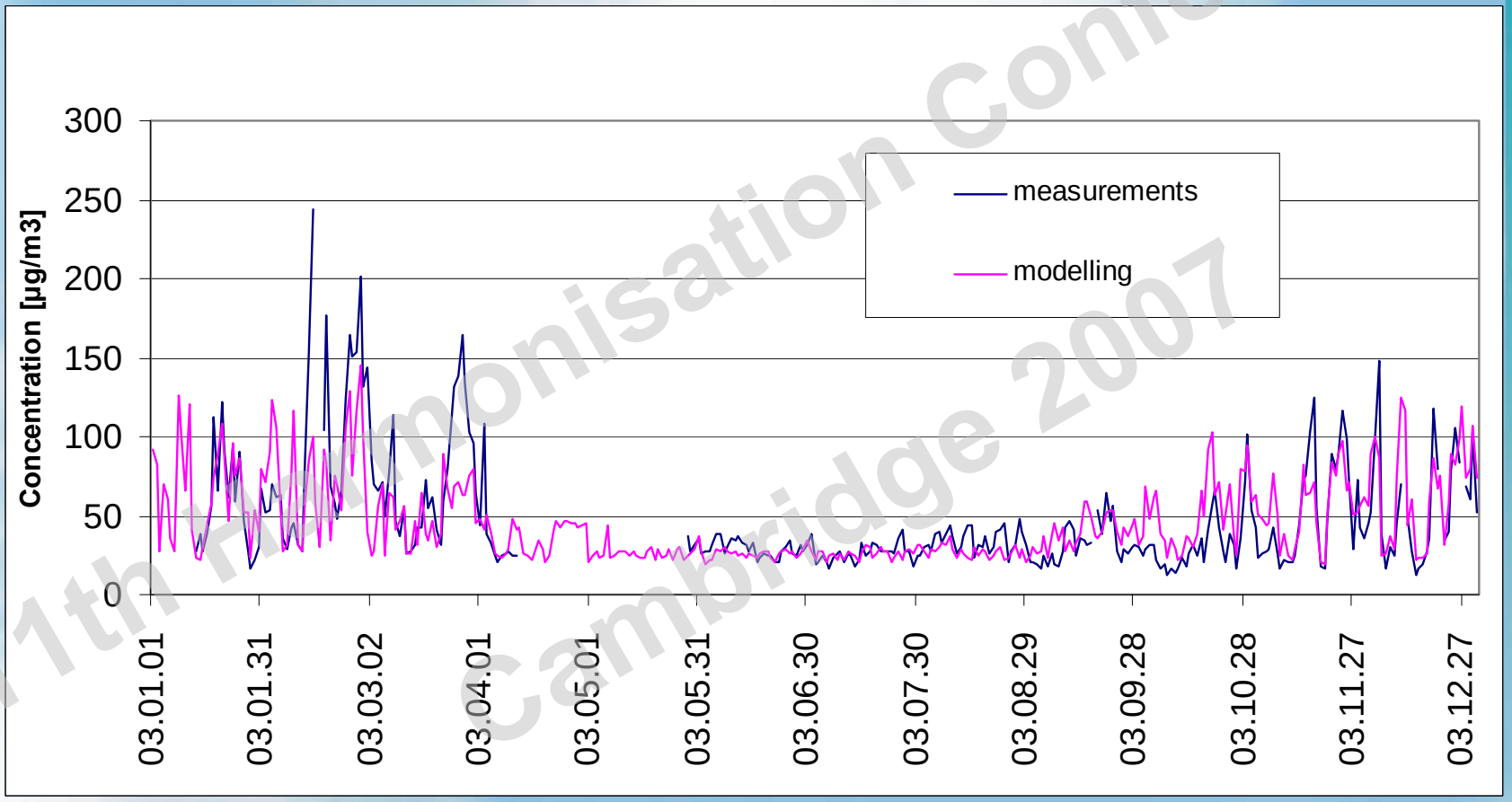
- Customized version of SOZAT© for air quality management
- Includes special functions for road and grid (area) emission sources
- Provides useful tools for emission forecasts and simulations



Air quality modelling

- Selection of air pollution dispersion model (ADMS-Urban)
- Model verification – comparison between measurements and modelling results for the same time period
- Sources apportionment (high contribution of domestic/utilities sources for most of zones)
- Base year calculations – for the recent available real data (emission, meteorology)

Model verification



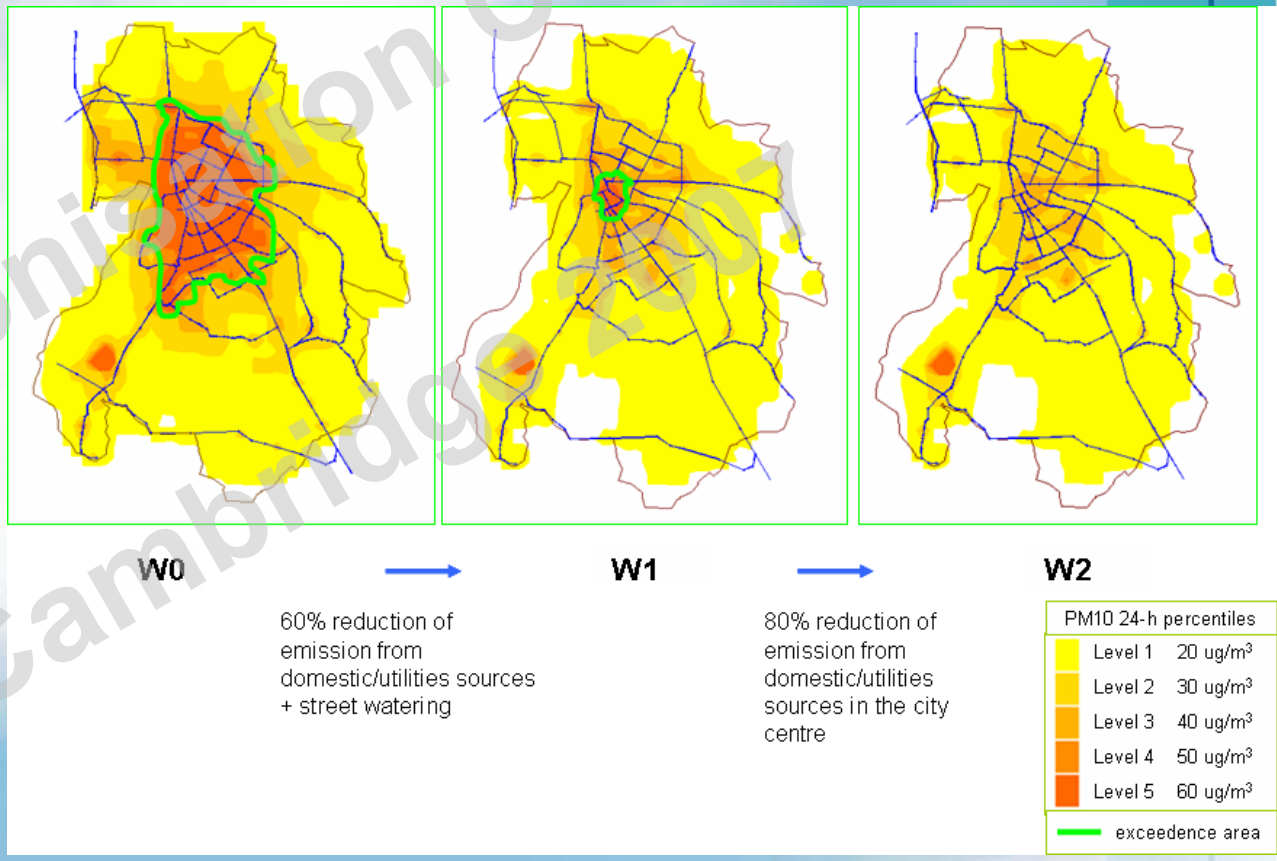
- PM10 daily concentrations in Skawina, Poland, 2003
- Good agreement between measurements and modelling achieved

Role of modelling for decision making process

- Defining and prioritizing possible options for emission reduction from different sources
- Air quality modelling for scenarios
- Selection of the best possible action plan scenario

Modelling results and planned emission reductions

- Example of PM10 concentration maps showing the forecasted results of action plan options
- W0 – baseline
- W1 – 60% PM10 emission reduction from domestic sources
- W2 – as W1 but with 80% emission reduction in the city centre



Conclusions

- Complex mathematical modelling tools are used by local authorities for air quality management projects.
- The projects lead to serious decision making – set up of long-term improvement plans and implementation of short-term actions.
- It is crucial to ensure the proper reliability of modelling tools. There is a real need to develop harmonised set of parameters which describe the air quality models in terms of accuracy, verification record and applicability to urban areas.