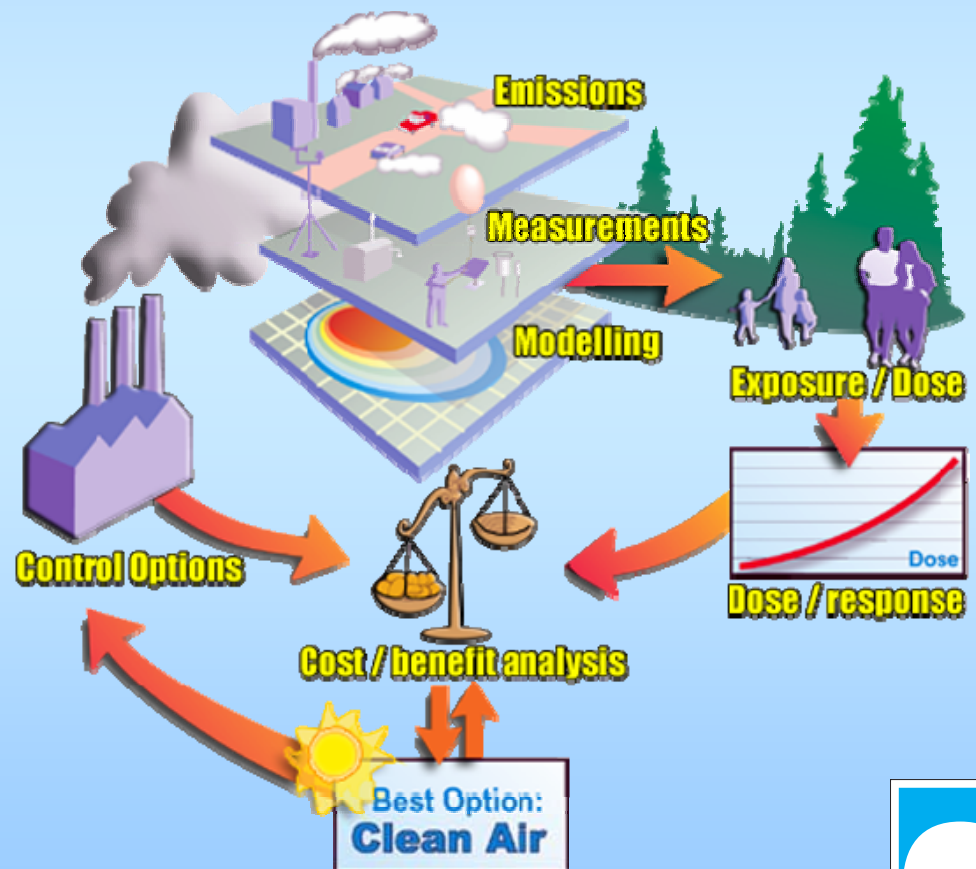


Emissions inventorying as an integrated part of the state of the art Air Quality Management System

*Air***Q***U***I***S*

Cristina Guerreiro
Herdis Laupsa
Rune Ødegård
Karl Idar Gjerstad



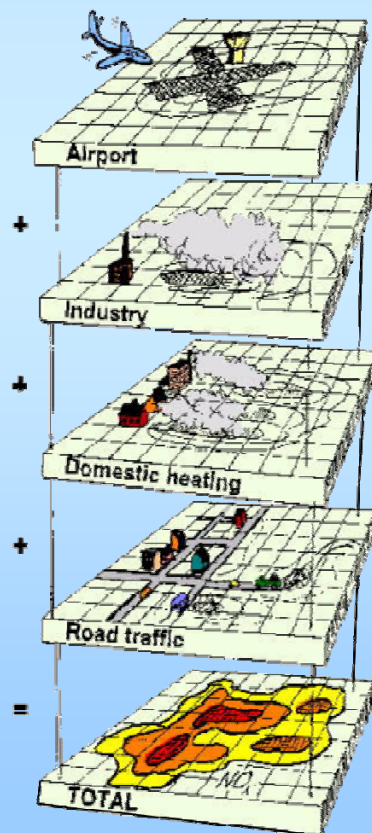
May 16, 2007

Norwegian Institute for Air Research



This talk presents the AirQUIS module for emission inventorying and its use for air quality assessment, modelling and management on urban scale

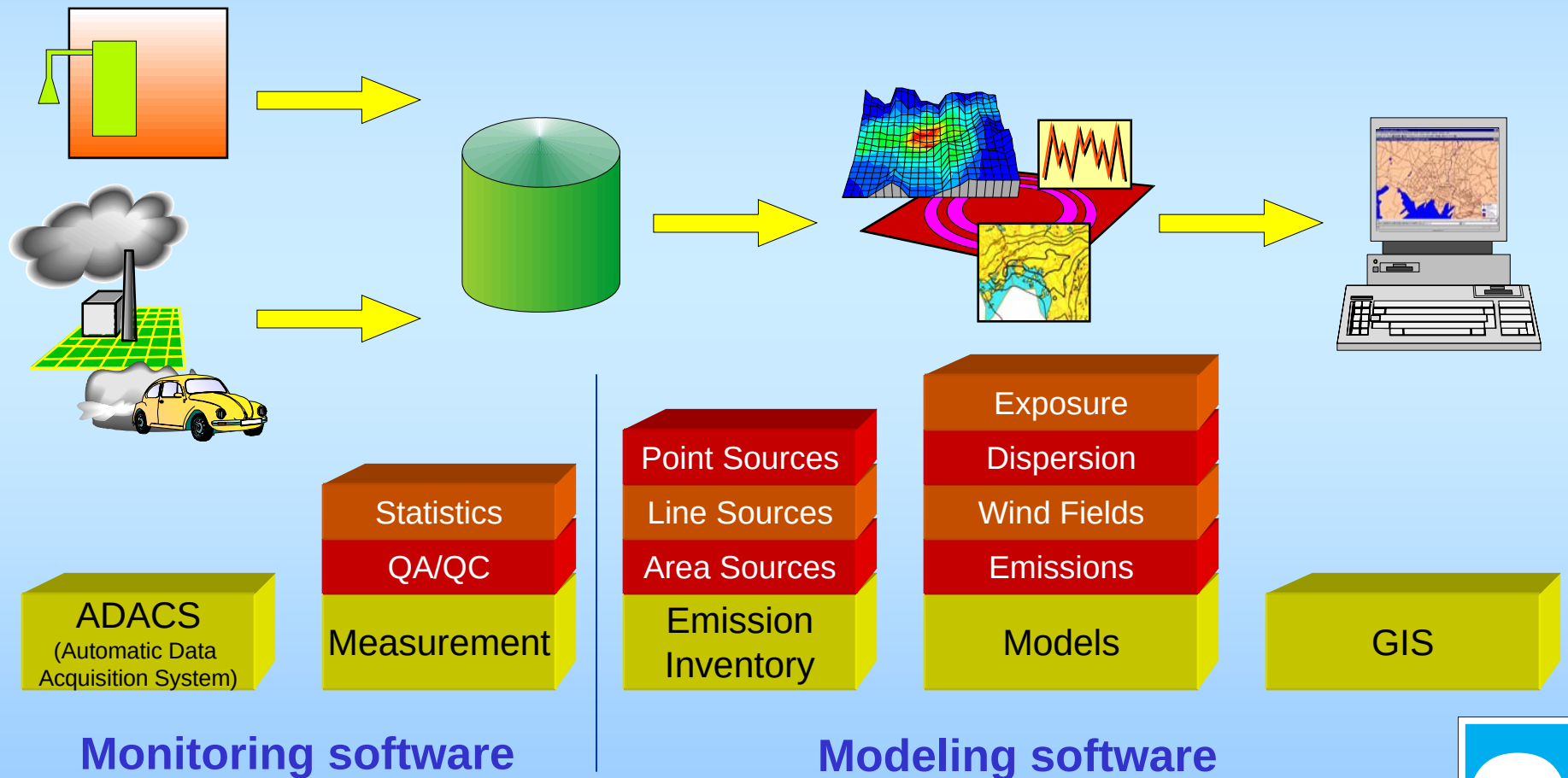
AirQUIS



- AirQUIS & Emission Inventory Module
- Emissions modeling and assessment
- Emissions management
- Concluding remarks

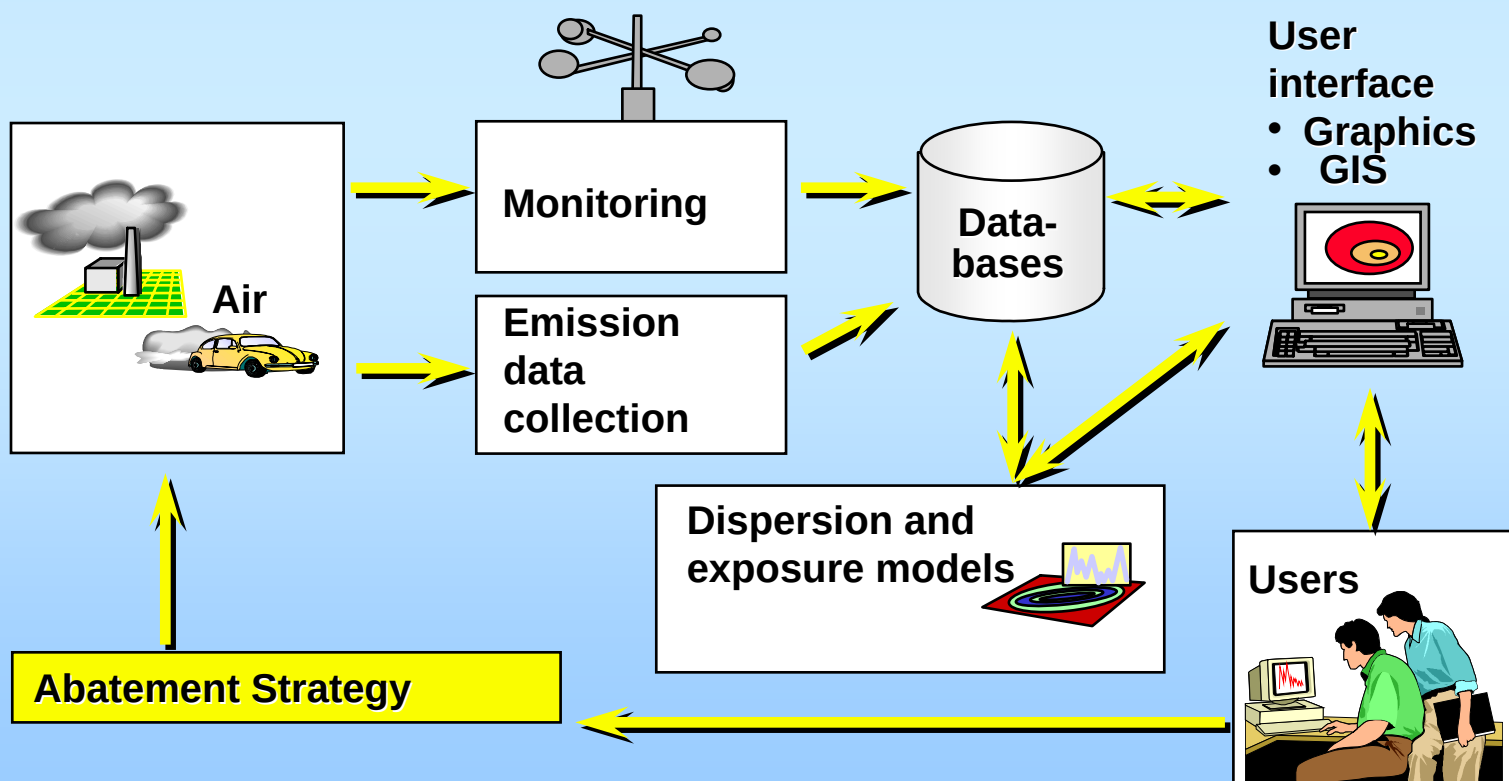
Air Quality Management and Information System

AirQUIS

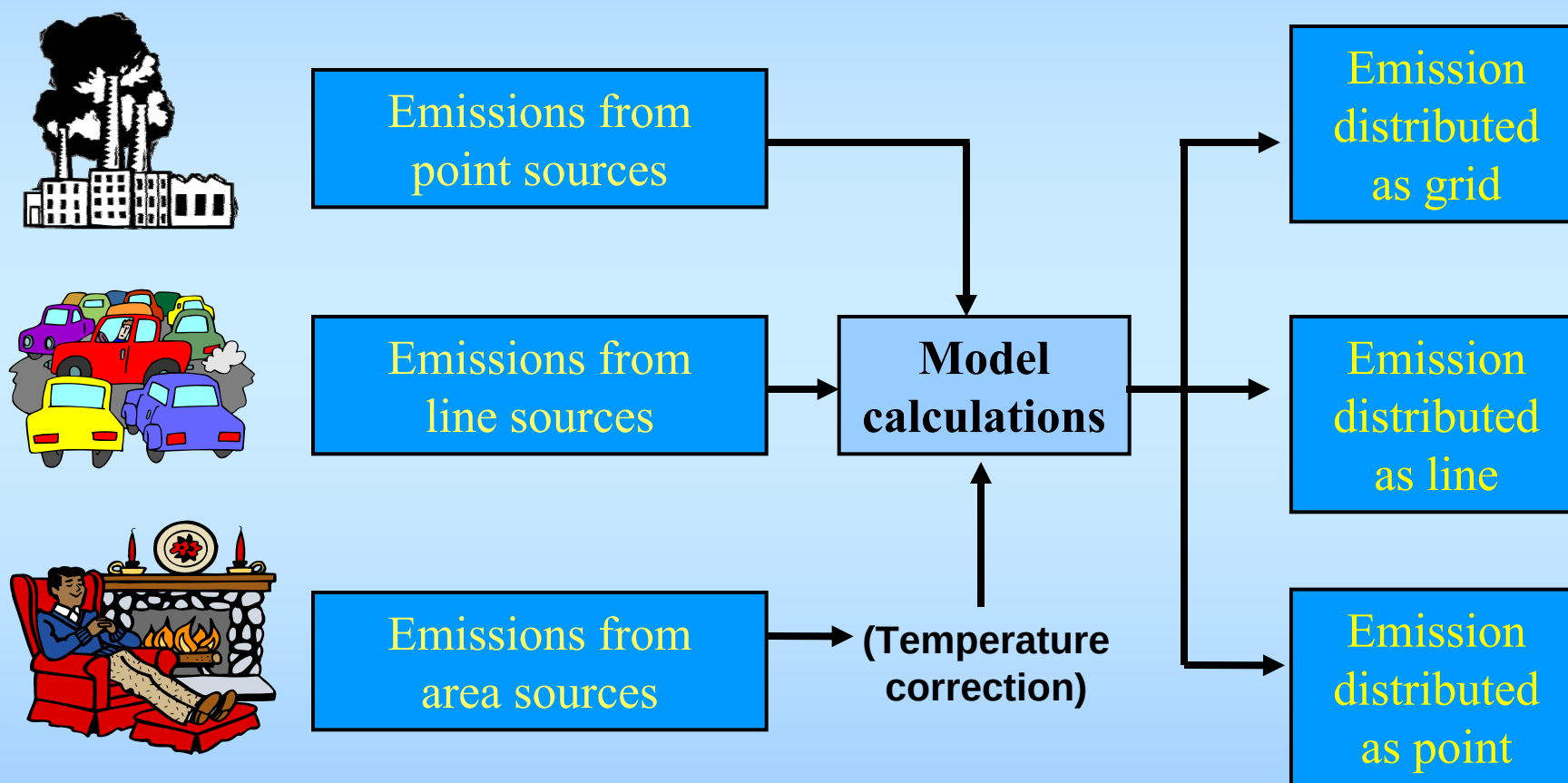


The main objectives of AirQUIS are:

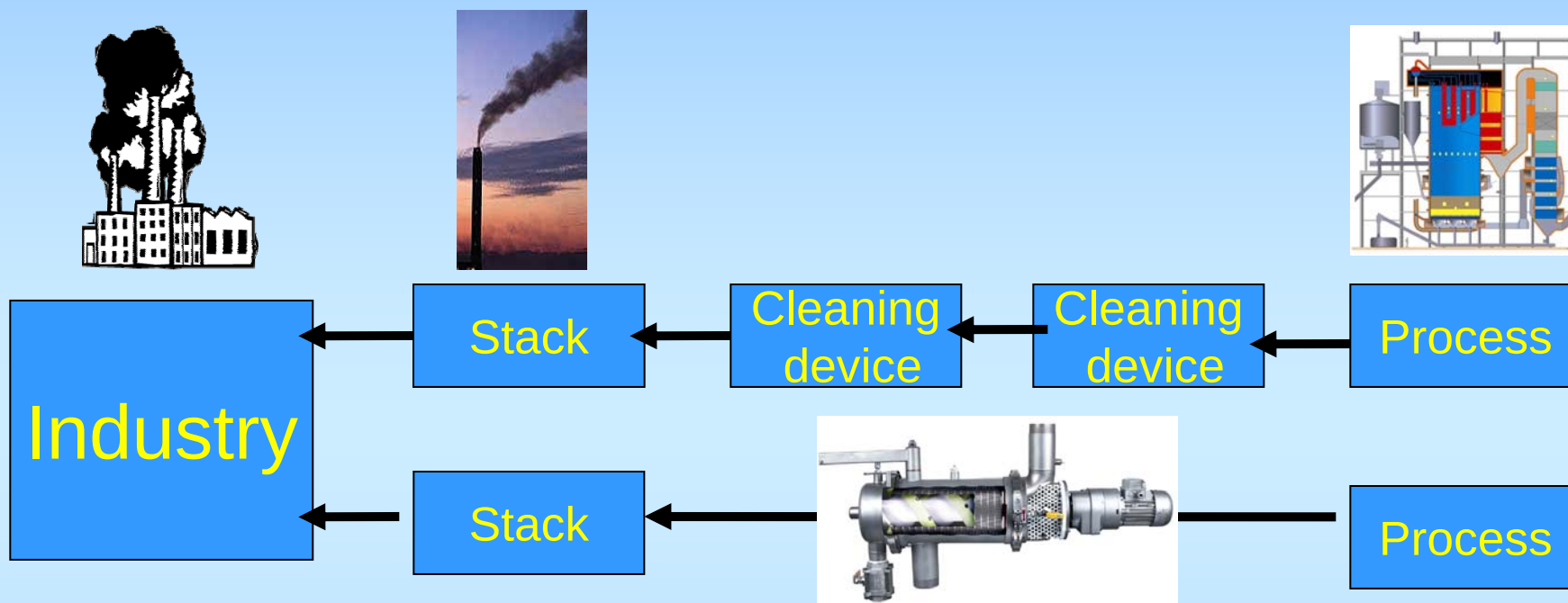
- To provide complete air pollution exposure information
- To develop cost-effective air pollution abatement strategies
- To present air quality data information



The Emission Inventory Module organizes de emission data by 3 types of sources



Point sources are single sources



Point source data:

- General facility identification
- Physical and geographical information of each stack
- Emission and release characteristics

Line Sources in AIRQUIS are sources emitting over a line like road traffic or maritime traffic

→ Static data:

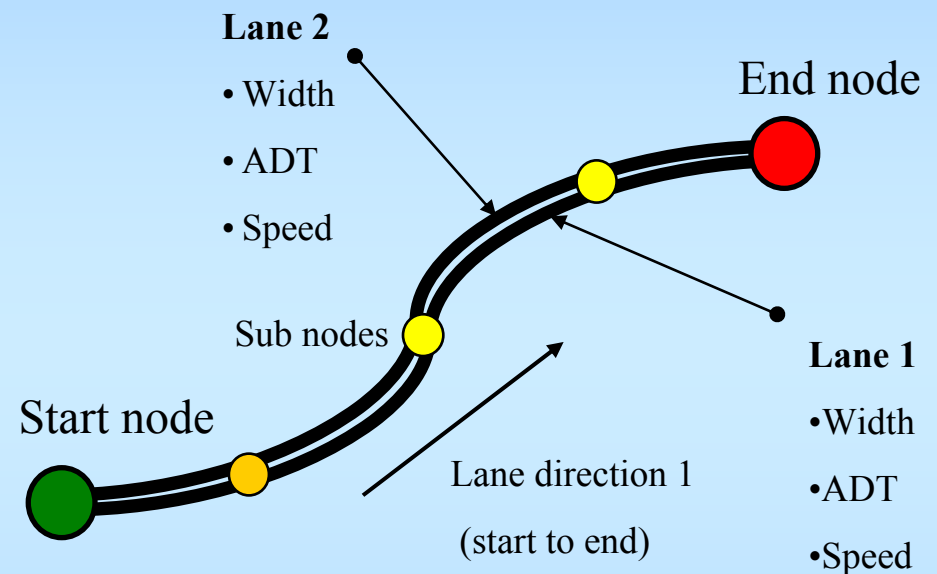
- geographical location
- static information (shape, width, gradient, etc).

→ Dynamic data:

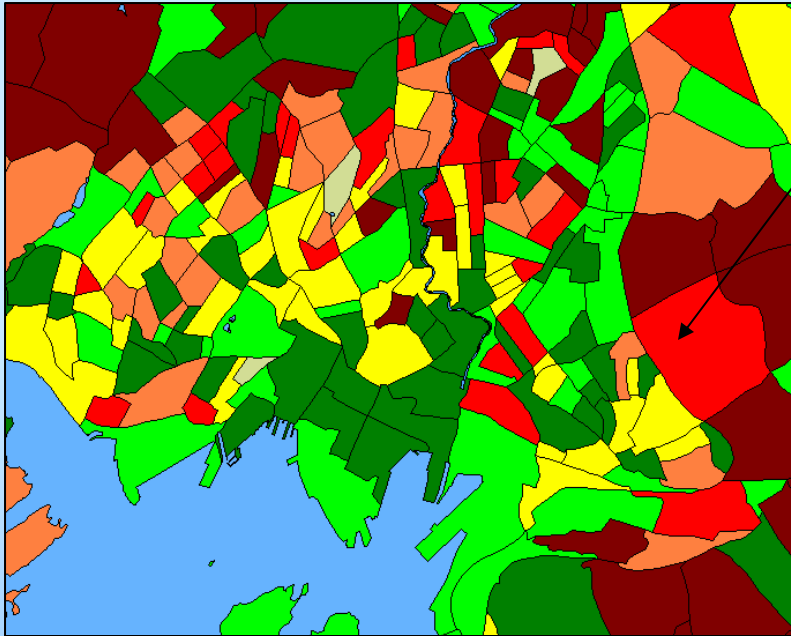
- annual daily traffic
- average speed
- vehicle distributions for different vehicle classes

→ Statistics on distribution of technology classes, fuels and age

→ Emission factors



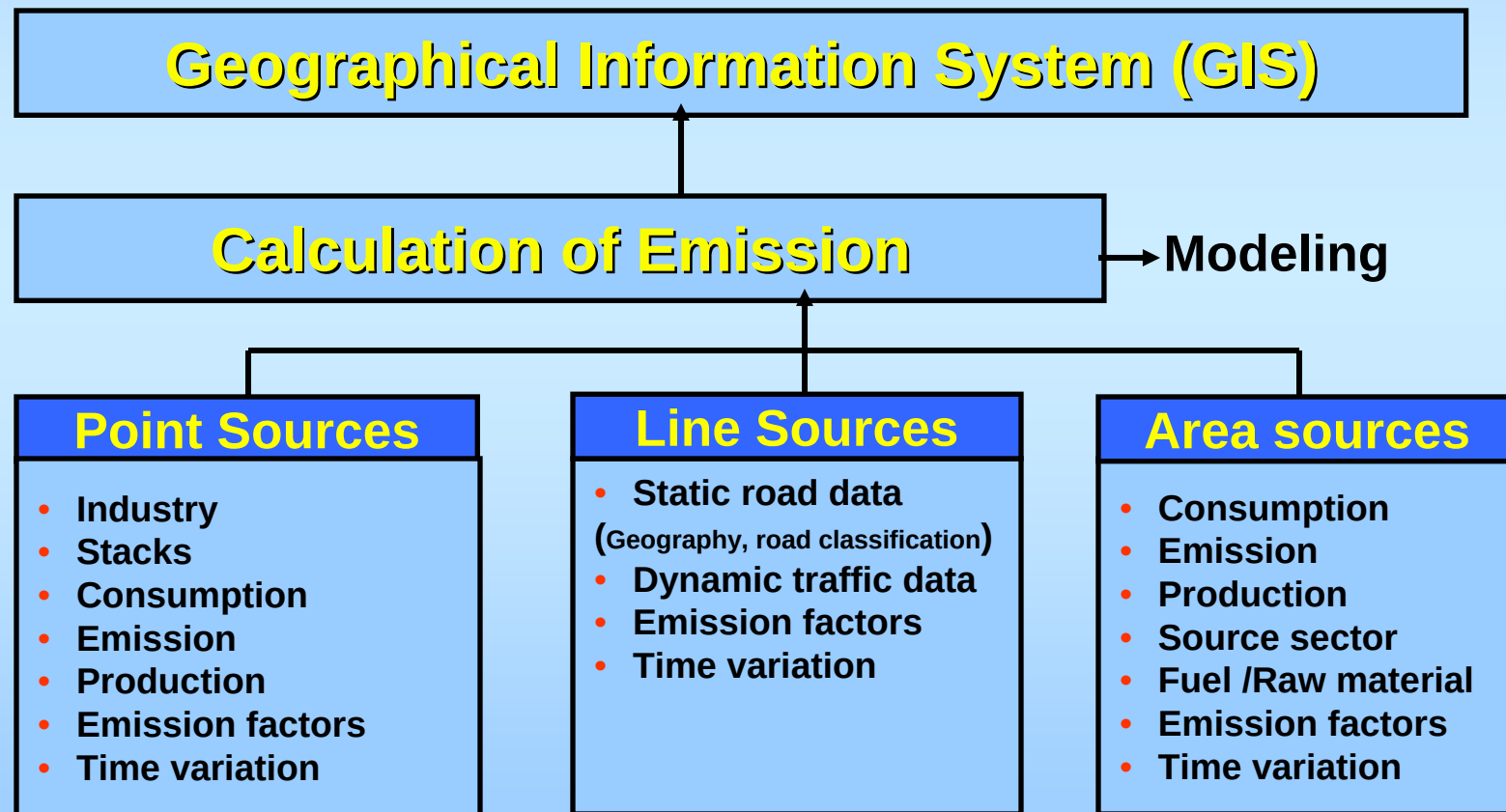
Area Sources in AirQGIS are associated with emissions distributed over regions or in a grid, like domestic heating sources, agricultural activities and/or traffic on smaller roads



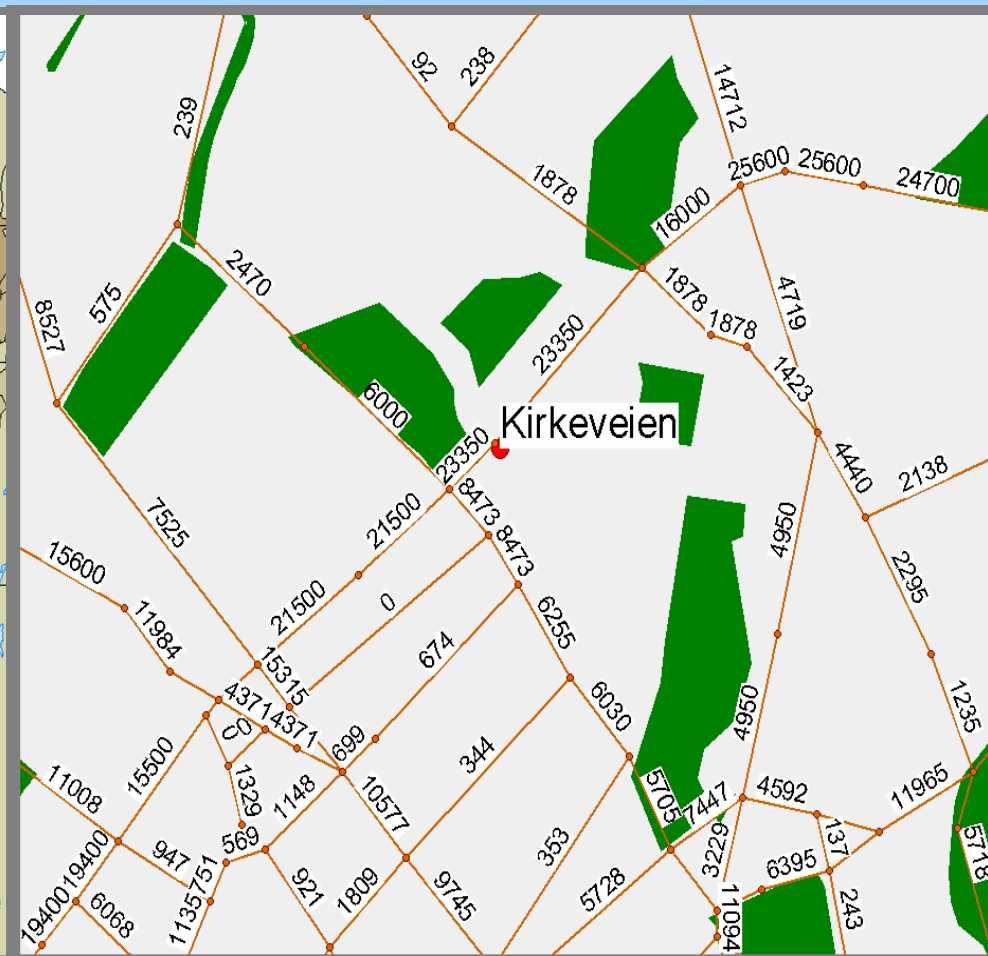
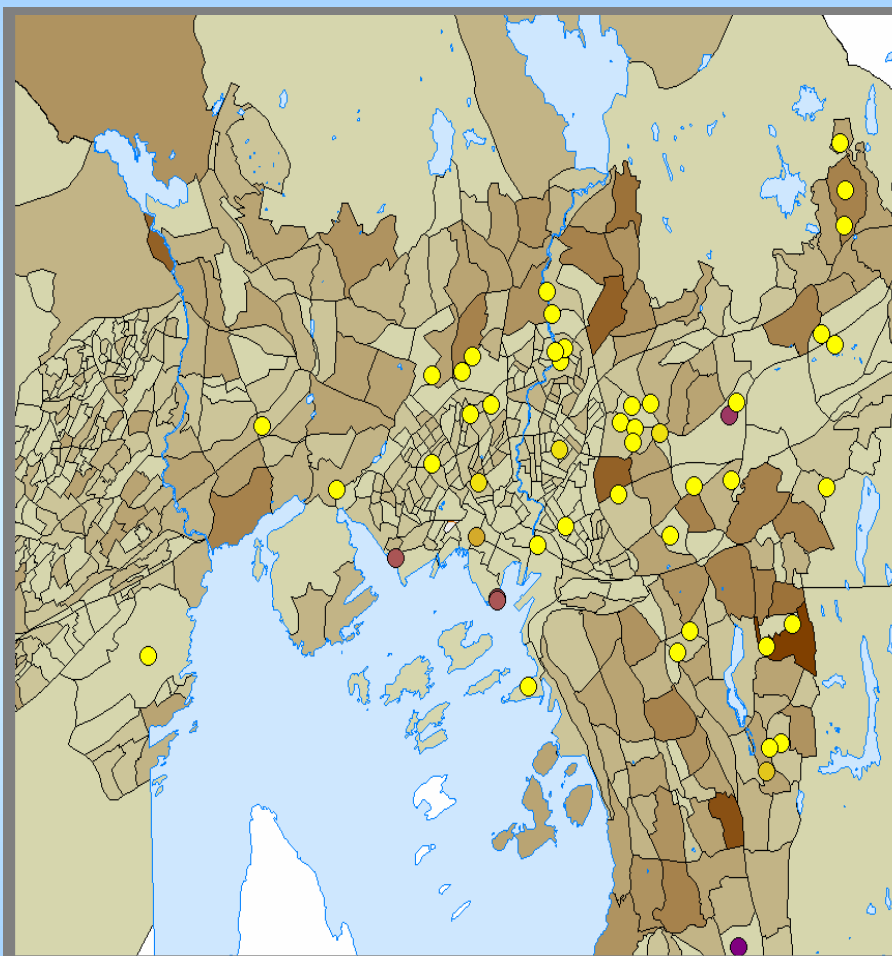
• **Area sources data**

- Regions/Grid cell ID
- Emission/
Consumption data
- Emission factors

AirQUIS Emission Inventory Module organizes and stores data in a bottom up inventory directly coupled to the integrated GIS



Connecting emission models to GIS improves the user's ability to assess and manage the emissions



NOx emissions from domestic wood burning (t/y) and industrial sources (g/s)

Annual Daily Traffic



The aggregation functionality provides an efficient way to analyse and aggregate emission data

The user may view emissions
(*point/ line/ area sources*)

aggregated by:

- **Regions**
- **Source sectors**
- Fuels/
components

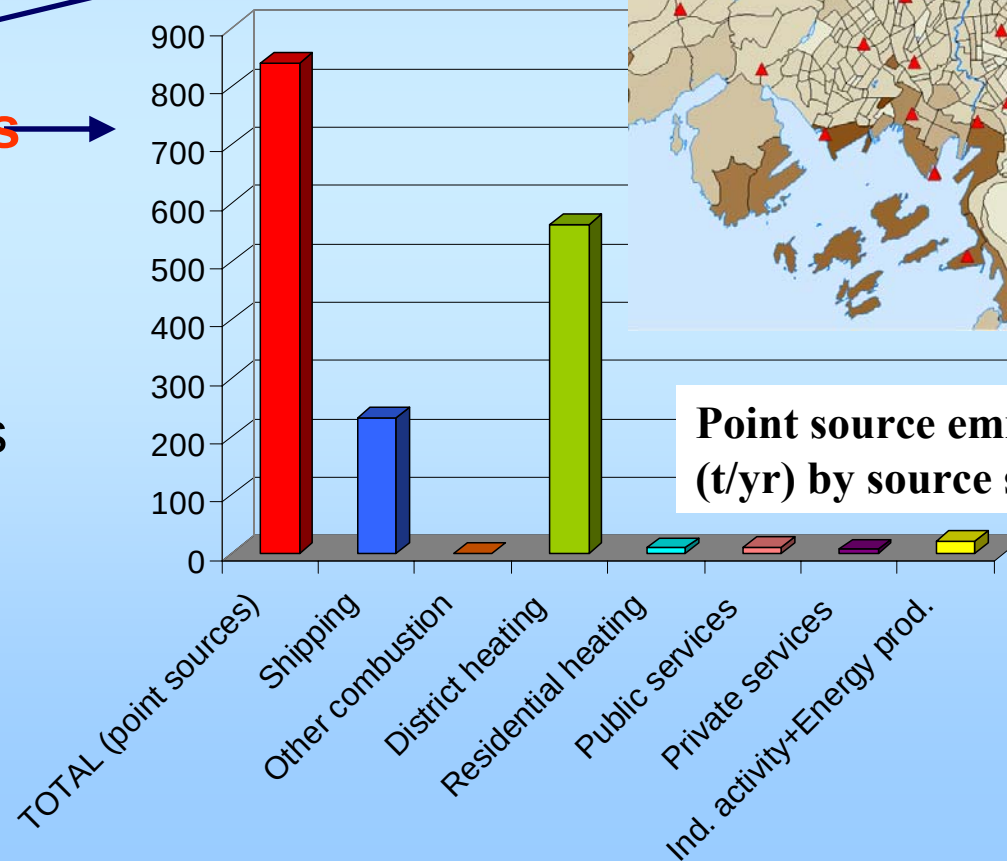
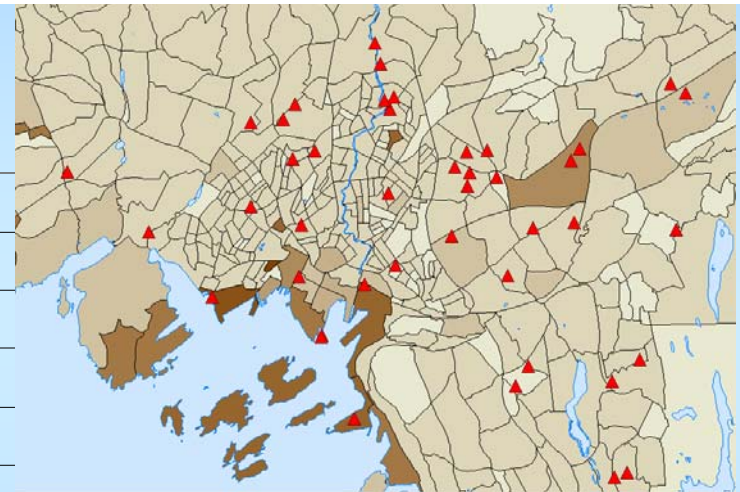
Point sources:

- Industrial plants
- Owners

Line sources:

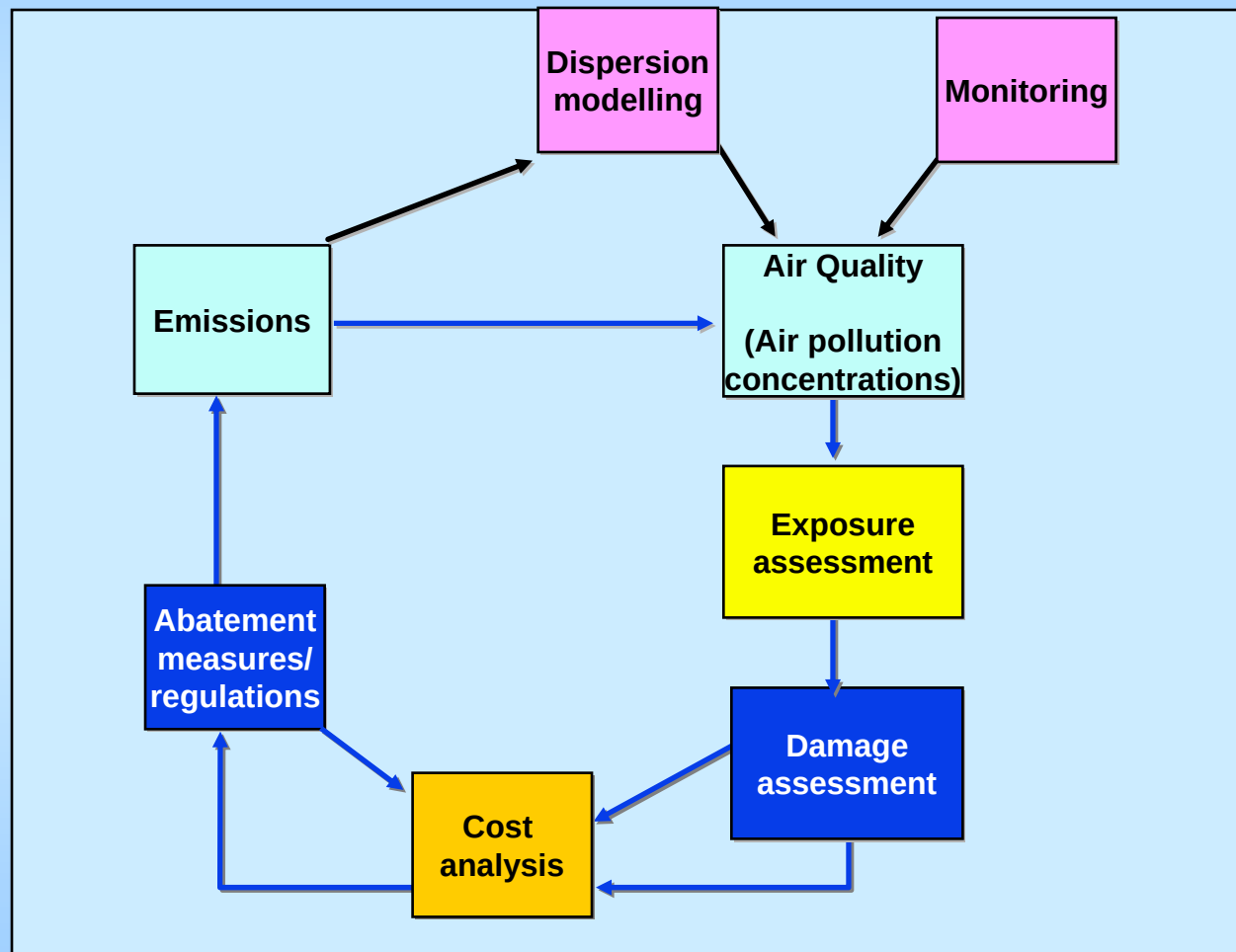
- Vehicle classes
- Road classes

NO_x emissions in Oslo from area and point sources by administrative region

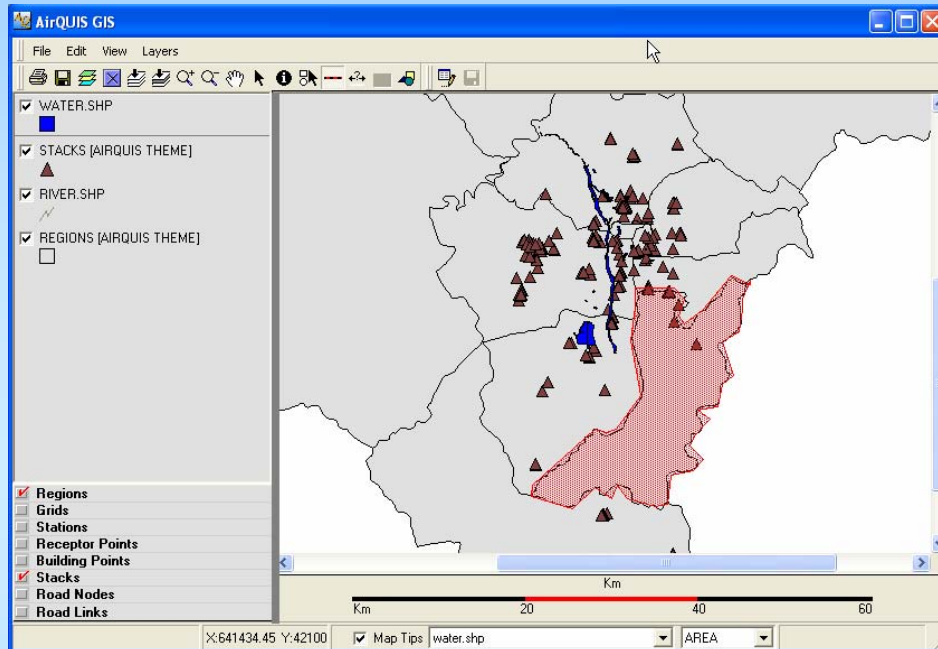


Point source emissions of NO_x
(t/yr) by source sectors in Oslo

Emissions management is an important part of Air Quality Management



The Abatement Functionality was designed to study the impact of emissions changes on AQ



Area and point sources, changes of emissions/emission conditions for:

- Each individual source,
- One or several source sectors,
- A geographical area,
- Specific fuel types.

Line sources:

- Emission factors,
- Annual daily traffic,
- Speed and
- Vehicle distribution

can be changed for

- User specified roads,
- Geographical areas,
- Road classes,
- Specific fuel types or
- Vehicle classes.

What shall such functionality be able to give us information about?



➤ Effects of reductions /enhancements of emissions or changes in emission conditions from e.g. industry, heating, **on ambient concentrations and population exposure**

➤ Effects of measures on traffic: abatement, increase, new planning, new technology

➤ Create data for blame matrixes:

✓ What percentage do specific sources contribute to the total picture

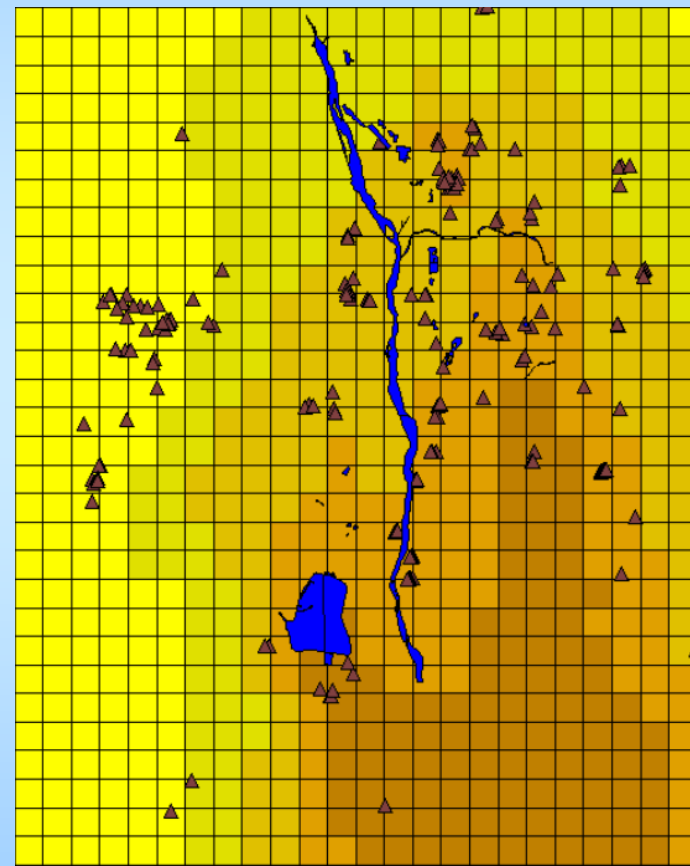
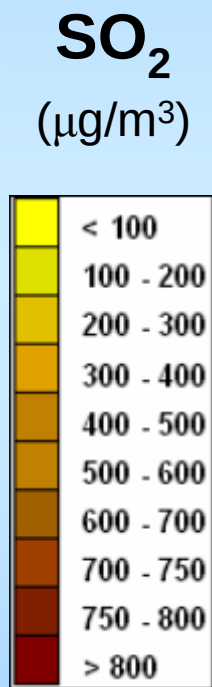
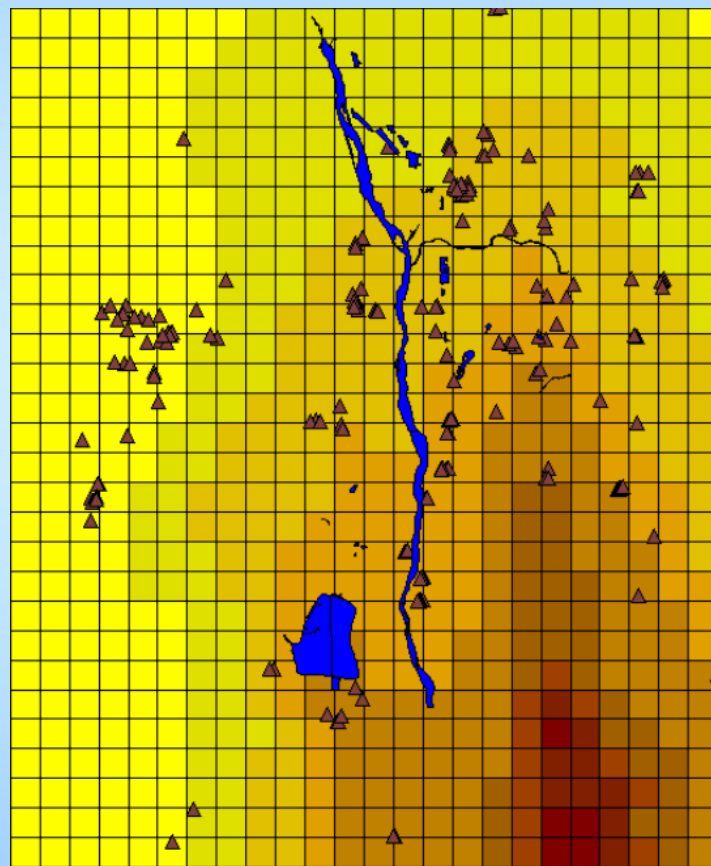
✓ **What measures will have best effect on pollution concentrations**



**source data for a cost/
benefit analysis**

Abatement Functionality

→ study the impact of burning briquettes instead of raw coal for house heating in Taiyuan



Base case emission scenario

40 % reduction in SO₂ emissions

Study the impact of the reduction of the speed limit on PM₁₀ concentrations

Abatement Scenario Definition

Identification
ID: 2 Name: Abatement Scenario PM10

Area Sources | **Line Sources** | Point Sources

☒ Include Line Sources

Selection Criteria

Selection Criteria for Road Links

ID	ROAD CLASSES
☐ 1	Major road / transit road
☐ 2	City centre street
☐ 3	Residential area street
☐ 4	Industrial area street

☐ Select All ☐ Deselect All

Control Measurement on

☒ All roads (independent of ADT)
☐ Include as line sources when ADT >= []

Control Measurement

Changes in ADT | ☒ **Changes in Speed** | Changes in Vehicle Dist.

☐ Homogeneous Changes
[] %

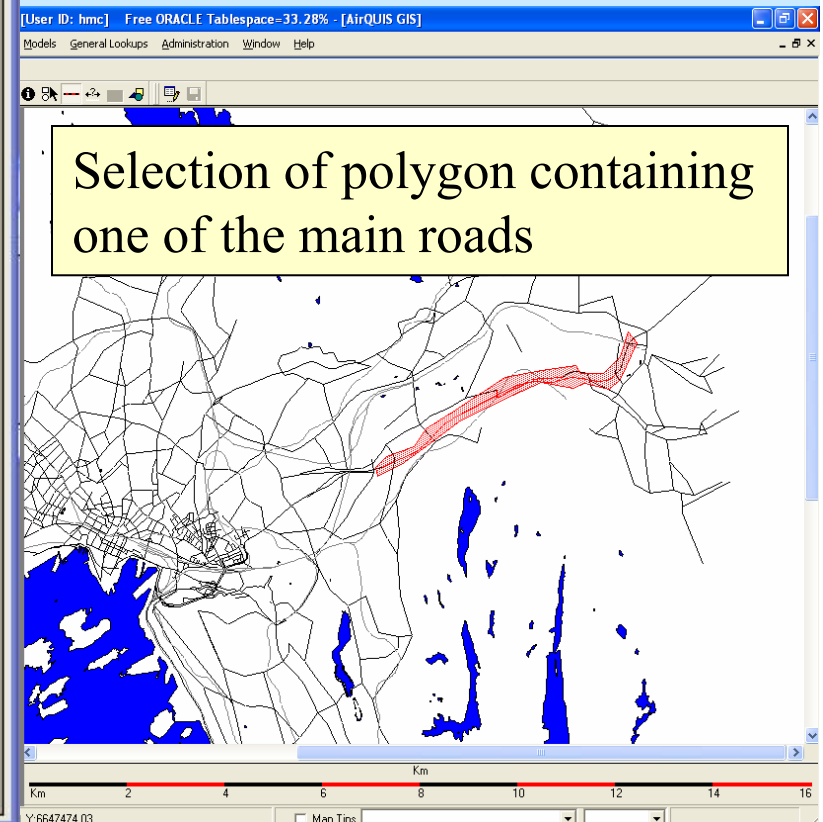
☒ Area Specific Changes

CHANGES	AREA
-25	☒
-25	☒
-25	☒

ROADLINK

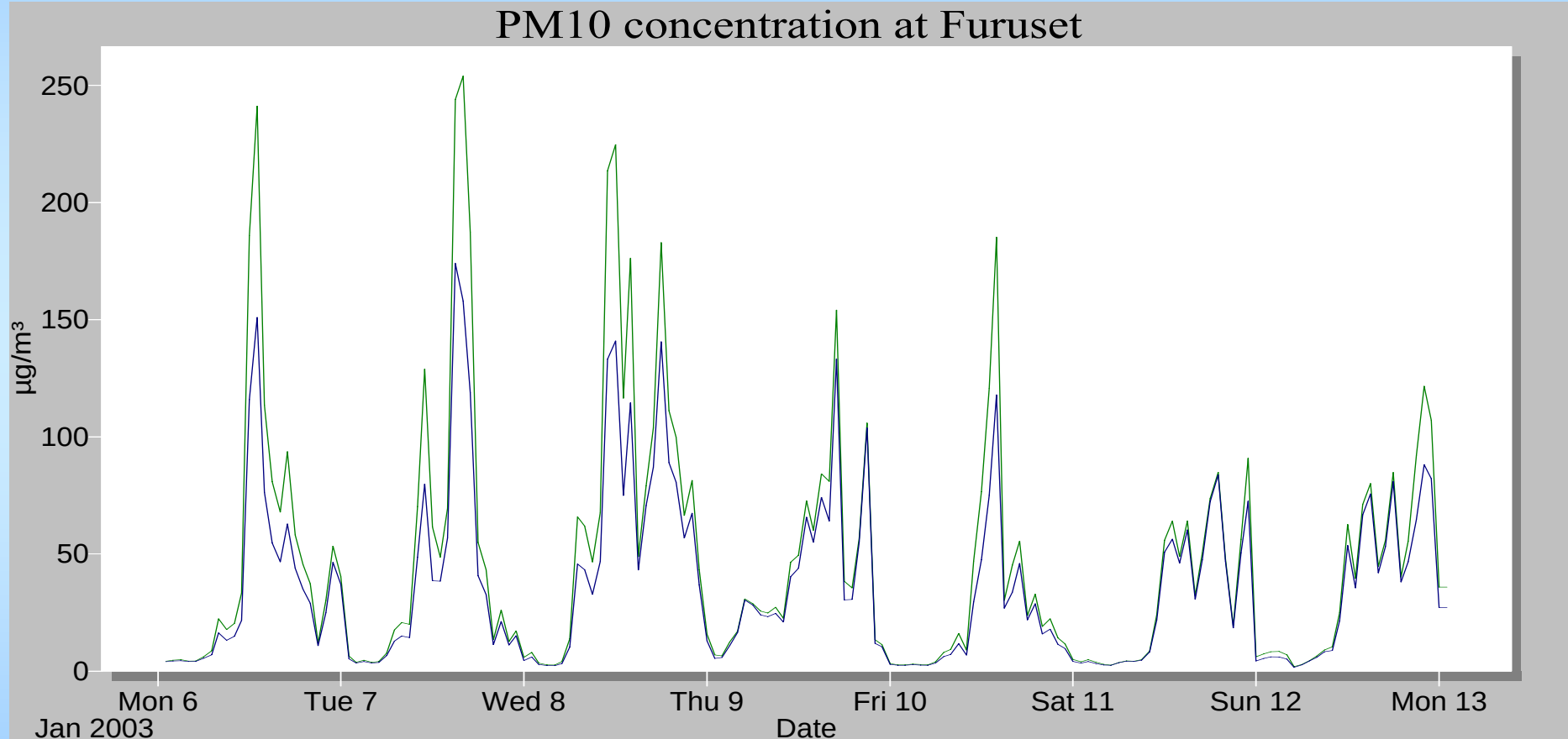
☐	BEDRIFTSVN.
☒	ØSTRE AKER V
☒	ØSTRE AKER V

Speed is reduced from 80 to 60 km/h on the 3 main roads into Oslo



Definition of Abatement Scenario

The 20 km/h reduction of the speed has a significant effect on the maximum conc. values



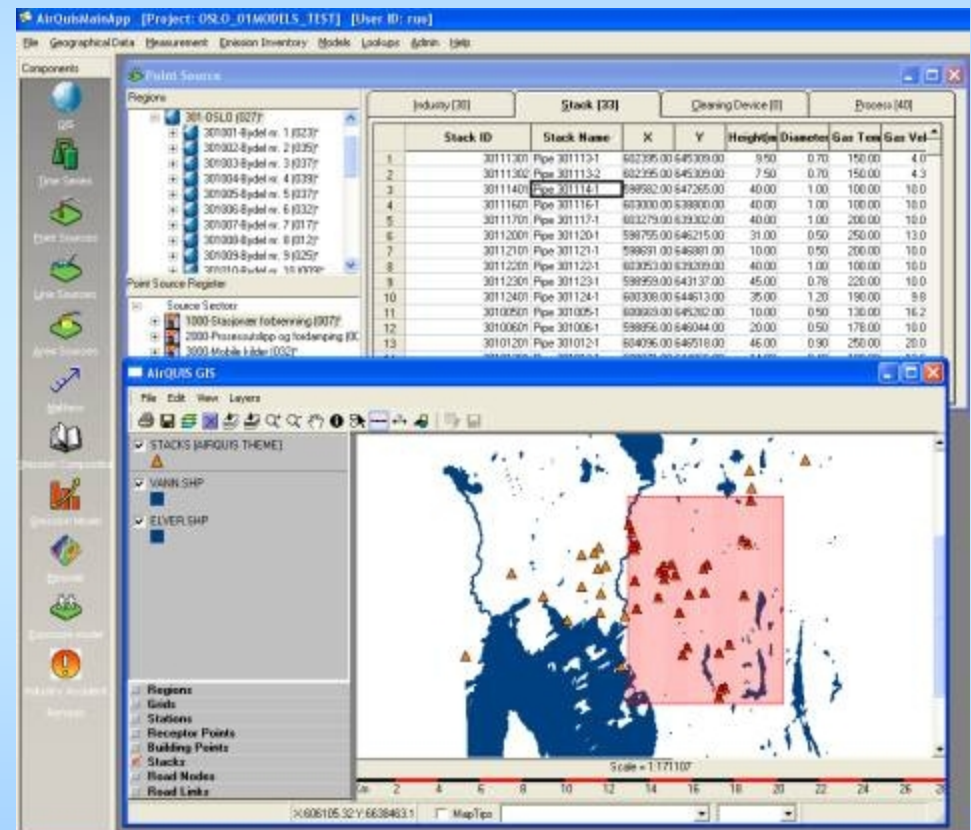
Hourly conc. of PM_{10} ($\mu\text{g}/\text{m}^3$) at Furuset.

Green line - Base case scen.; Dashed blue line - abatement scen.



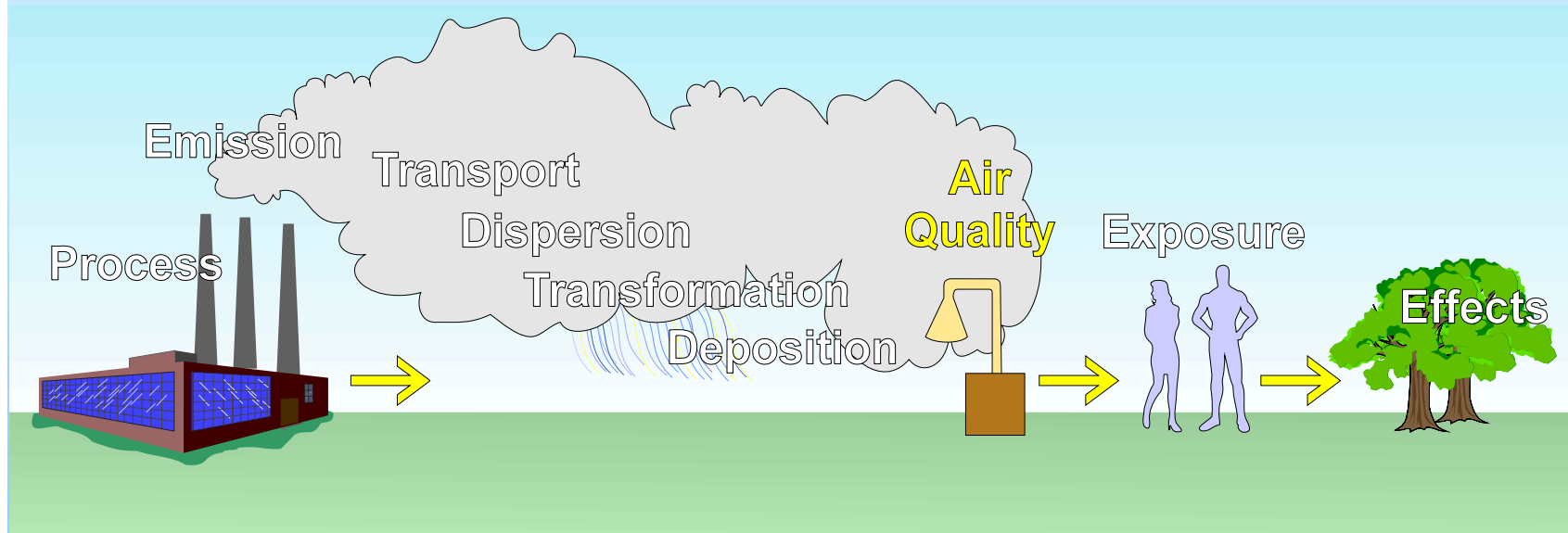
The AirQUIS module for emission inventorying is a user-friendly tool for producing a bottom up atmospheric emissions inventory

- The graphical user interface combined with a flexible database makes the system user friendly and efficient, in spite of its complexity.
- The emission inventory tool is used to assess the contributions from individual sources, source categories and geographical areas.



It provides the necessary tools for data handling and model calculations required for AQ assessment and management.

- It contains functionalities for studying the impact of emission abatement measures or changes in emissions/emission conditions on air quality and exposure on urban scale
- The GIS platform is used for the visualisation, presentation, update and management of the emission data.



AirQUIS has been successfully used in assessment, modelling and management of air quality worldwide



Norwegian Institute for Air Research

www.nilu.no

NILU
POBox 100
No-2027 Kjeller
Norway
Fax: +4763898050
E-mail: nilu@nilu.no



