



Air Quality at Your Street

– An air quality map for all addresses in Denmark

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Presentation

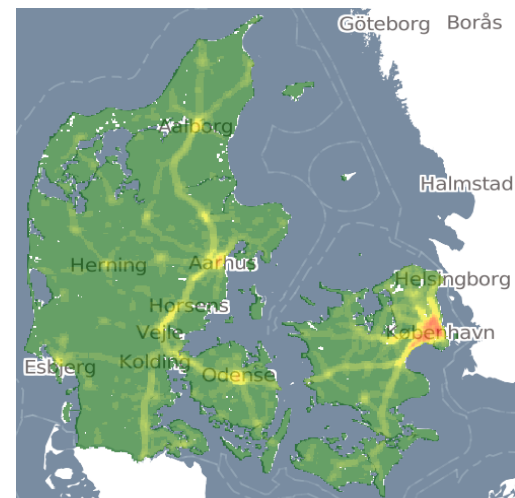
- › **Background and objectives**
- › **User interface of air quality map**
- › **Air quality models and input data**
- › **Evaluering of traffic input data and street geometry**
- › **Validation of air quality calculations against measurements**
- › **Geografic variation of air quality**
- › **Conclusion**

Background

- › **Citizens have great interest in information about air quality where they live, work, and their kids to kindergarten or school**
- › **A particular interest when buying/renting a new house or apartment**
- › **Authorities also want to get information about AQ in relation to urban planning or complains**
- › **Aarhus Convention from 1998 emphasises citizens' rights to environmental information**

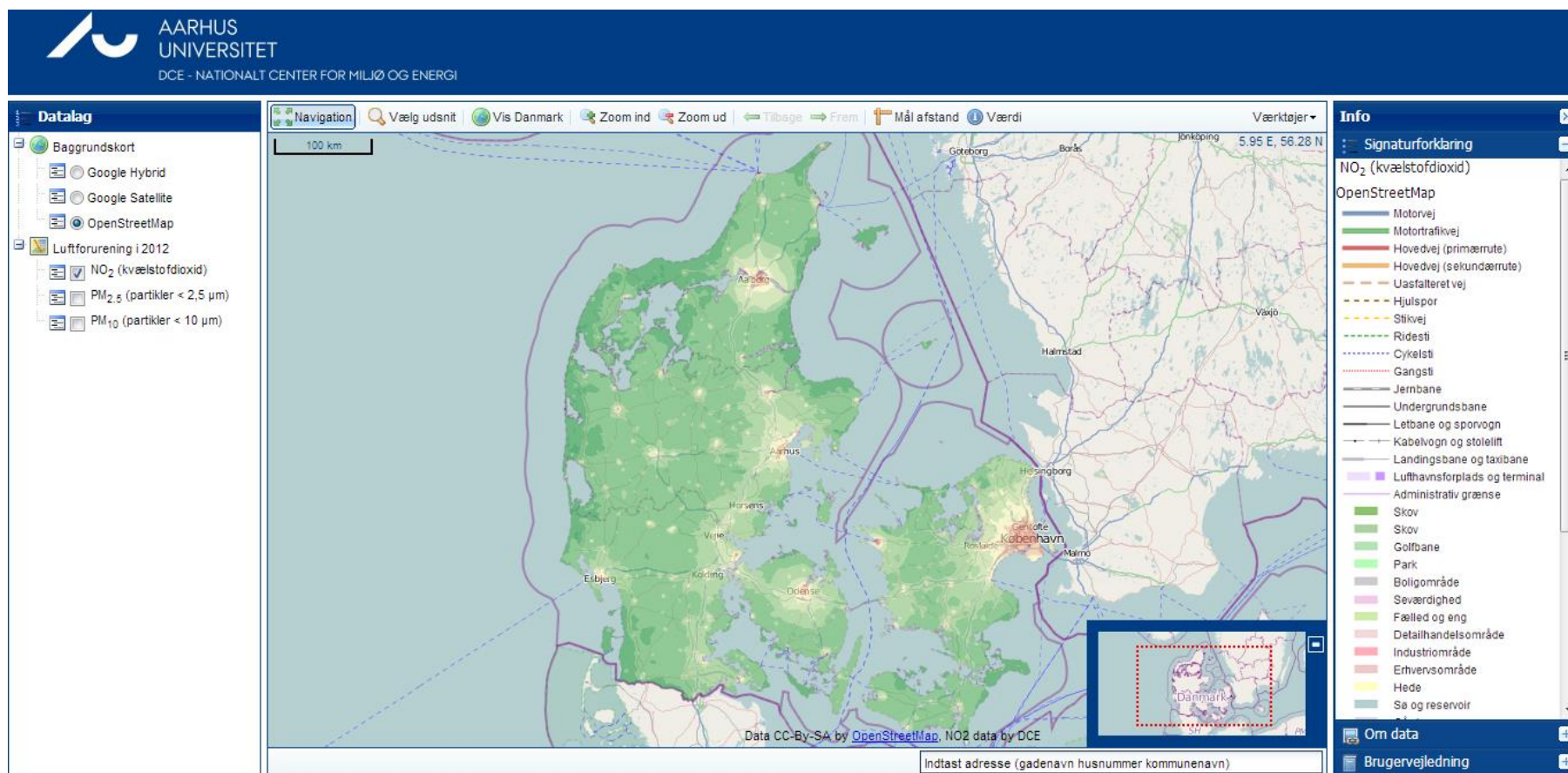
Objectives

- › an easy to use tool for modelled air quality data for all addresses in Denmark
- › focus on geographic variation and relative differences
- › popular interpretation of the data related to health risk
- › short description of models, data and uncertainties
- › NOVANA provides official statement of exceedances of air quality limit based on measurements and more QA model data

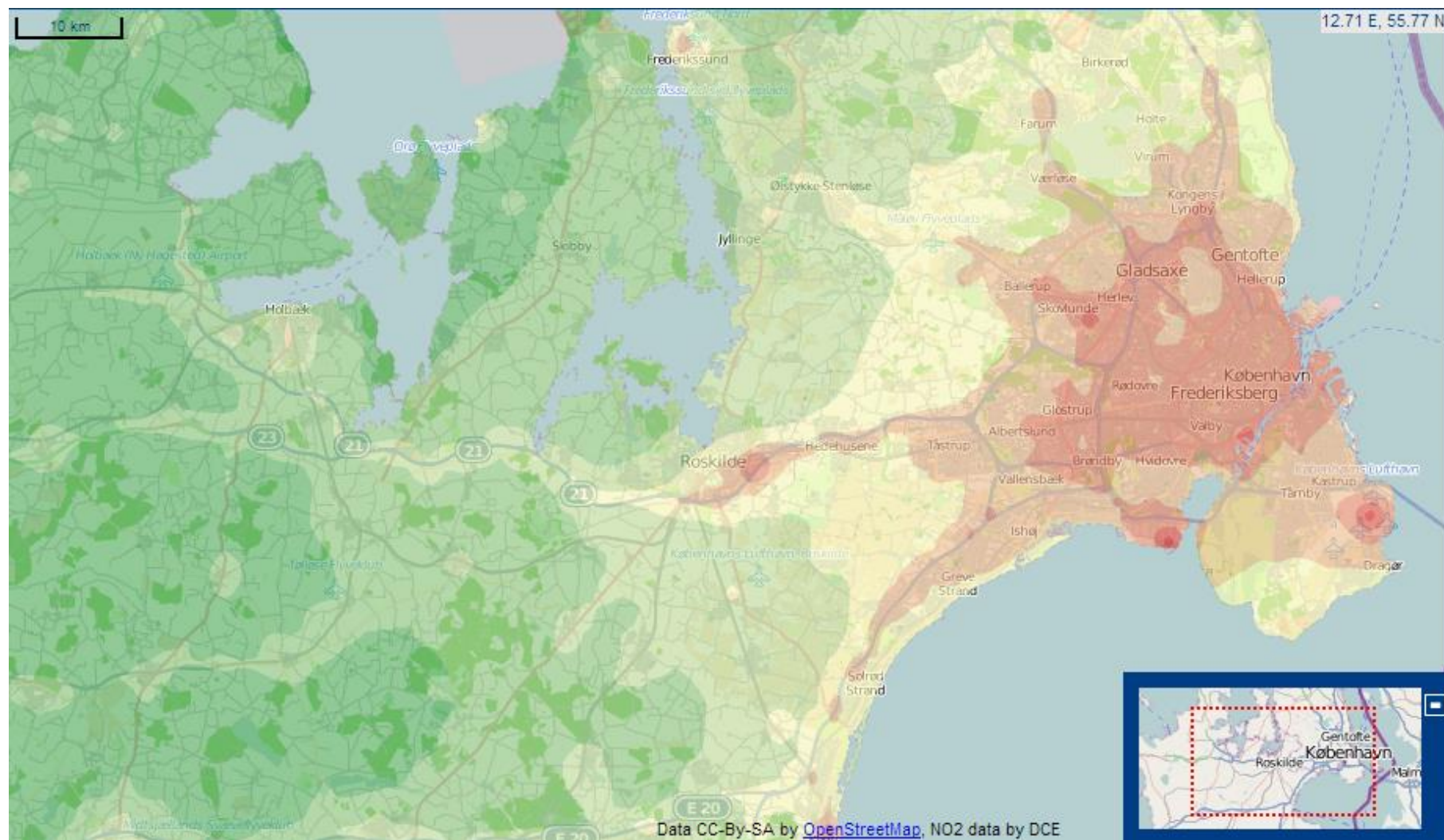




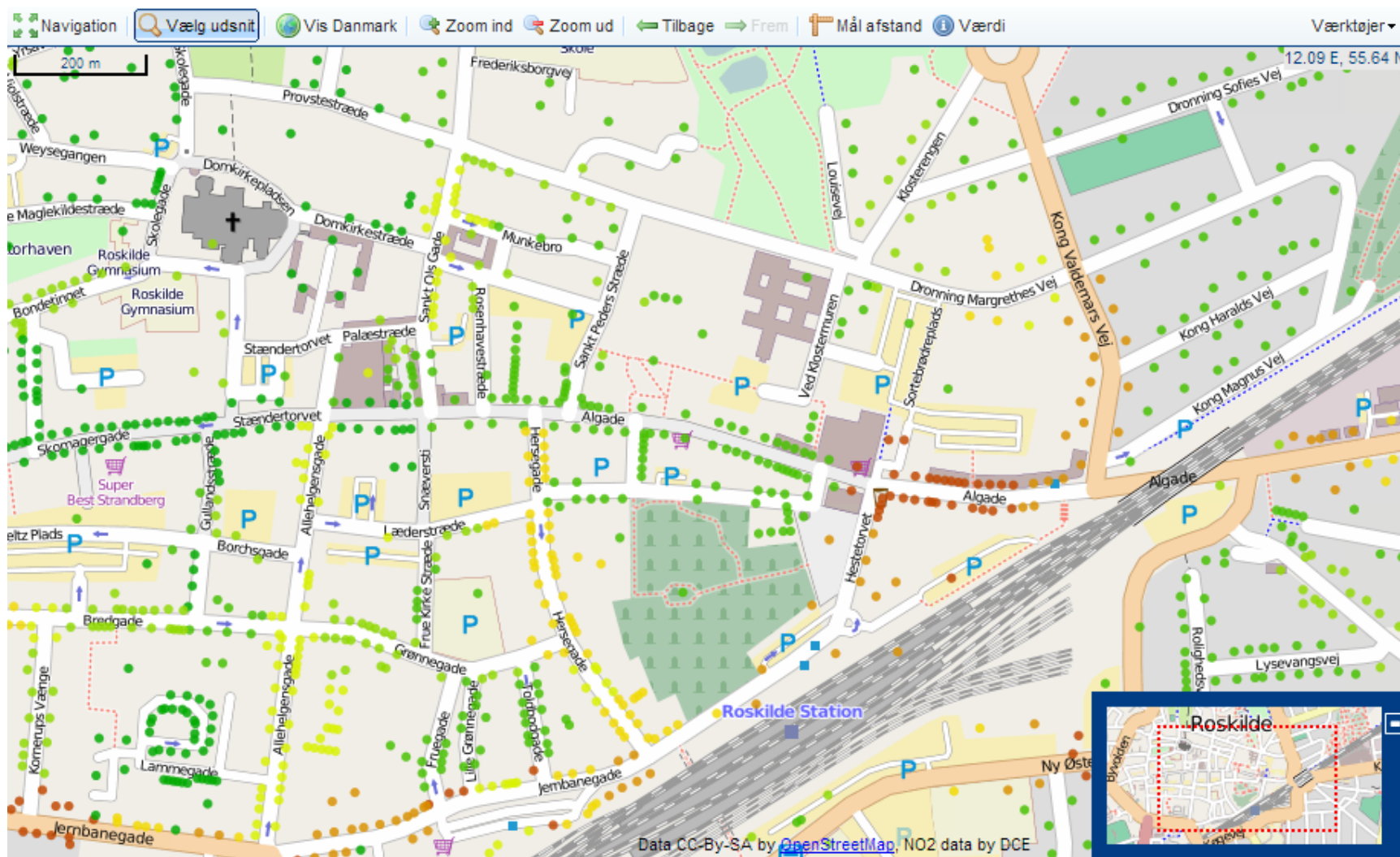
User interface in GeoExt



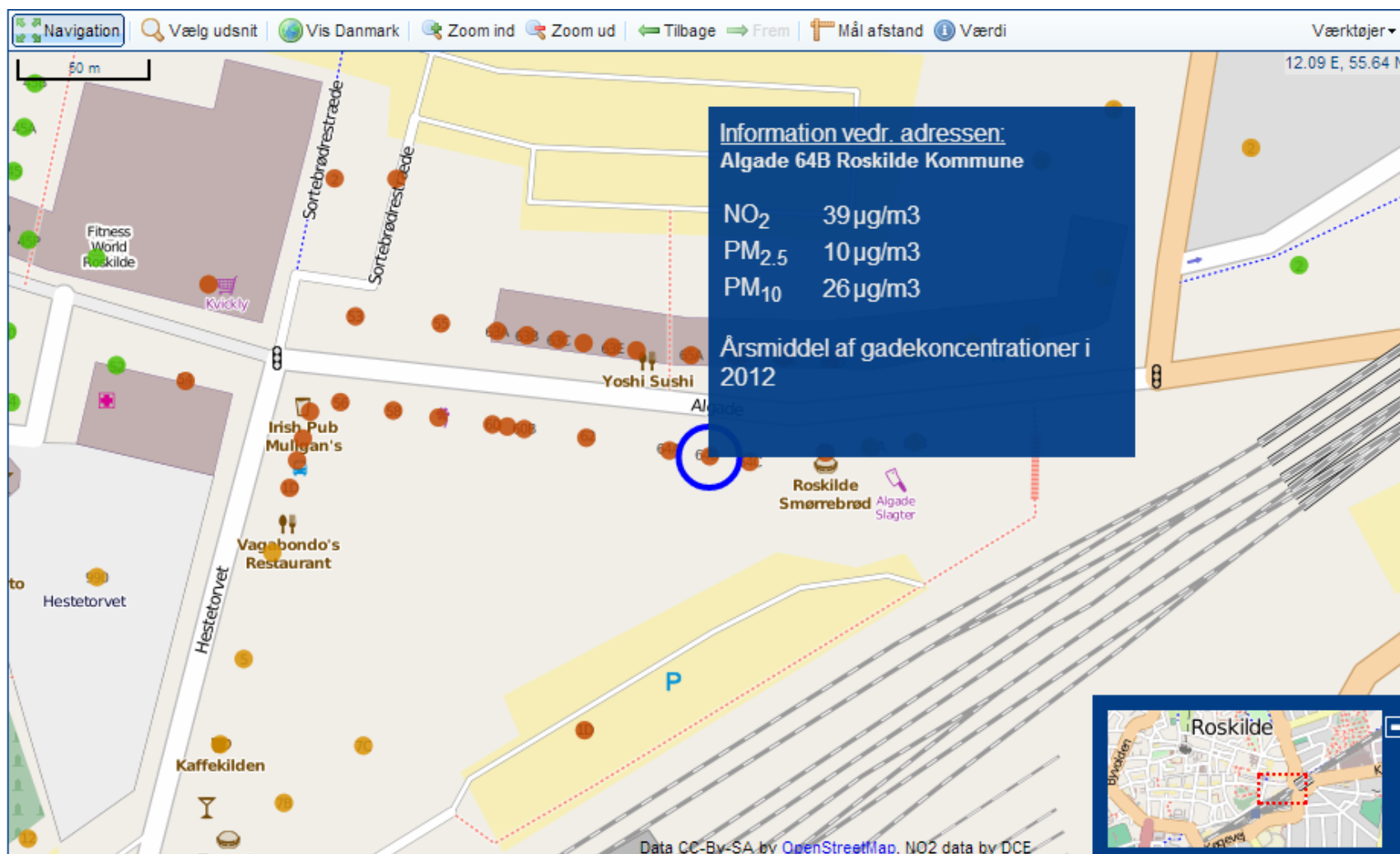
Urban background concentrations of NO_2



Street concentrations of NO_2



Street concentration at specific address

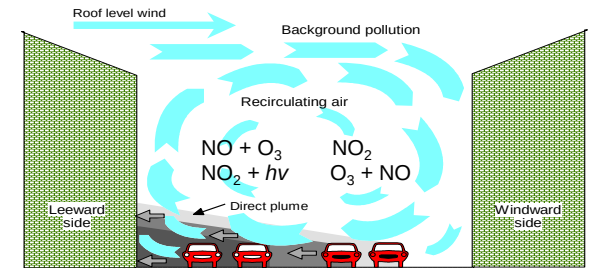
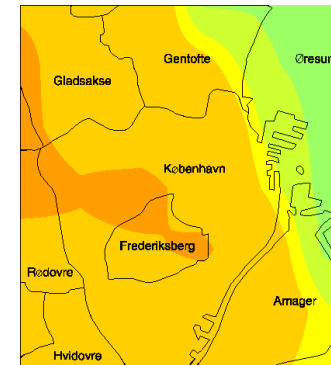
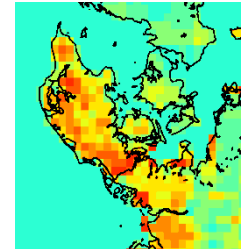


Features

- › **Health related pollutants of NO_2 , $\text{PM}_{2.5}$ and PM_{10} as annual mean in 2012**
- › **Interactive webGIS environment**
- › **Search AQ at specific address in Denmark**
- › **Indicative comparison with limit values**
- › **About data**
 - › Brief background information about pollutants and health risks
 - › How AQ is modelled and uncertainties
- › **Short user manual**
- › **Website expected to be launched at later stage**

AQ models

- › **Regional background concentrations**
 - › DEHM (Danish Eulerian Hemispheric Model)
 - › Adjusted for PM mass closure
 - › Geographic resolution 5,6 km x 5,6 km in DK
- › **Urban background concentrations**
 - › Urban Background Model (UBM)
 - › Coupled to DEHM in one hour time step
 - › Geographic resolution 1km x 1km
- › **Street concentrations**
 - › OSPM (Operational Street Pollution Model)
 - › AirGIS (automatic generation of input data to OSPM about traffic and buildings)
 - › Geographic resolution: address level



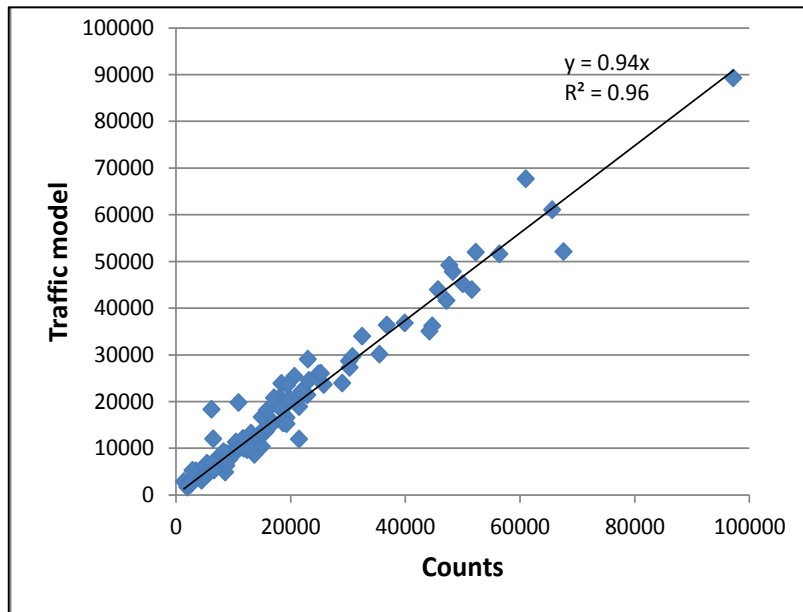
Input data for Denmark

› **Emission data**

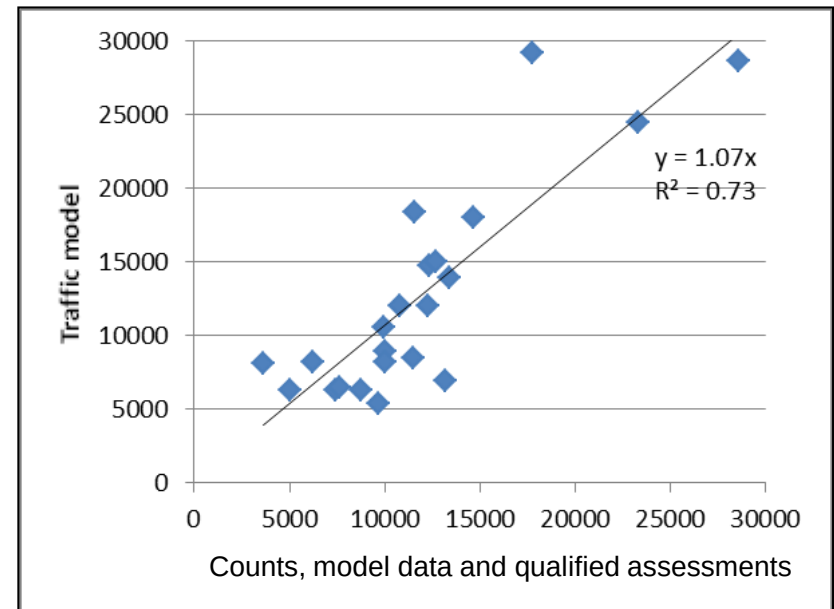
- › 1x1 km² resolution based a geographic distribution of national emission inventory based on geographic variables (SPREAD)
- › **GIS road network based on national traffic model (LTM) at navteq road network from DTU Transport**
- › **Travel speed data from SpeedMap from Danish Road Directorate**
- › **GIS building polygons with building height estimations based on National Elevation Model**
- › **GIS national address database**

Evaluation of modelled traffic data

Copenhagen (109 counting locations)



Aalborg (22 "counting locations")



Poor correlation between modelled and counted heavy-duty vehicles.
Therefore assumed default values:
4.5% for urban streets and 10% for motorways.

Model vs. NOVANA NO₂ measurements

NO₂ - Comparison of model results from Air Quality at Your Street and measurements under NOVANA in 2012 (annual mean)

Unit: µg/m ³	Measurements	Model results	Difference	Models
<i>Traffic:</i>				
Copenhagen-HCAB/1103	47/55*	50	-10%-+6%	DEHM/UBM/OSPM
Copenhagen-Jagtvej/1257	38	42	11%	DEHM/UBM/OSPM
Aarhus/6153	35	29	-17%	DEHM/UBM/OSPM
Odense/9155	26	30	17%	DEHM/UBM/OSPM
Aalborg/8151	30	53	75%	DEHM/UBM/OSPM
<i>Urban background:</i>				
Copenhagen/1259	17	18	4%	DEHM/UBM
Aarhus/6159	17	15	-13%	DEHM/UBM
Odense/9159	13	14	5%	DEHM/UBM
Aalborg/8159	13	12	-5%	DEHM/UBM
<i>Regional background:</i>				
Risø-Lille Valby/2090	9	12	29%	DEHM/UBM
Keldsnor/9055	8	8	-4%	DEHM/UBM
Limit value	40			

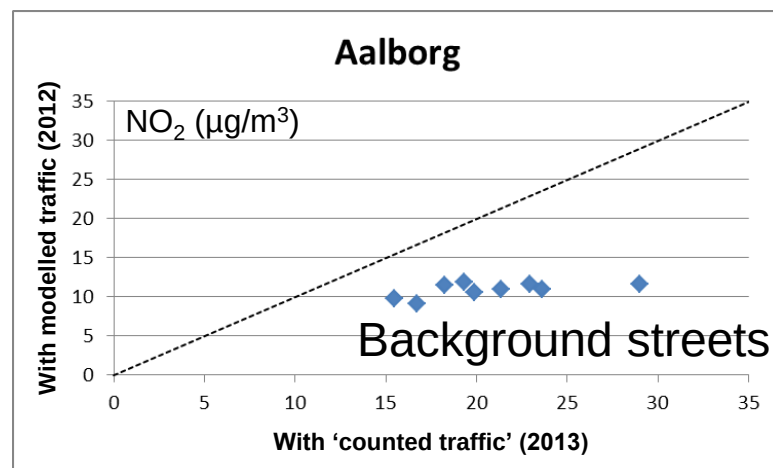
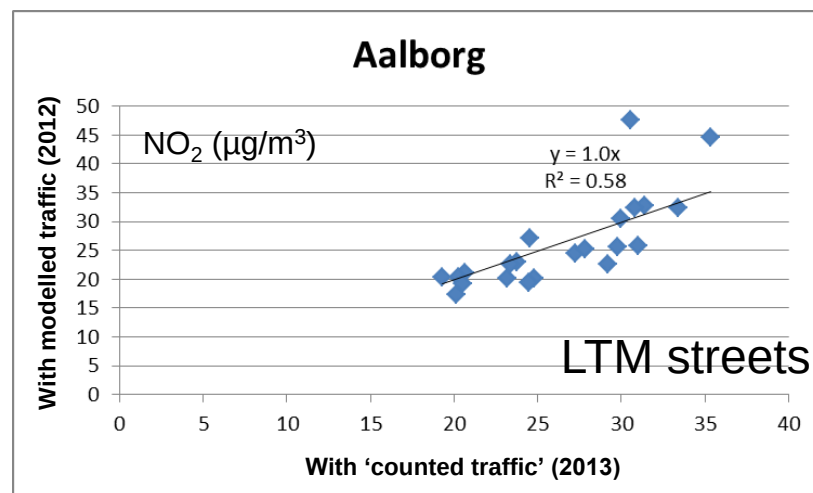
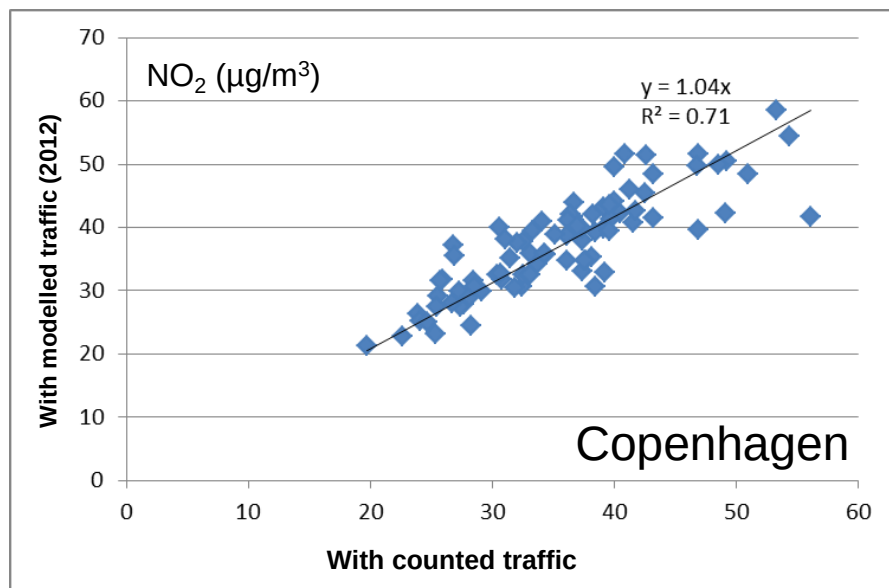
Note: *Measured level is 55 µg/m³ at monitor station at HCAB but due to change of street layout the nearest traffic lane has become closer to the monitor station causing a jump in measured concentrations of about 8-9 µg/m³. Without change in street layout 47 µg/m³ is expected based on parallel measurements. OSPM is more representative of measurements without the jump as OSPM calculations reflect concentrations at building façades.

Example of large discrepancy in Aalborg

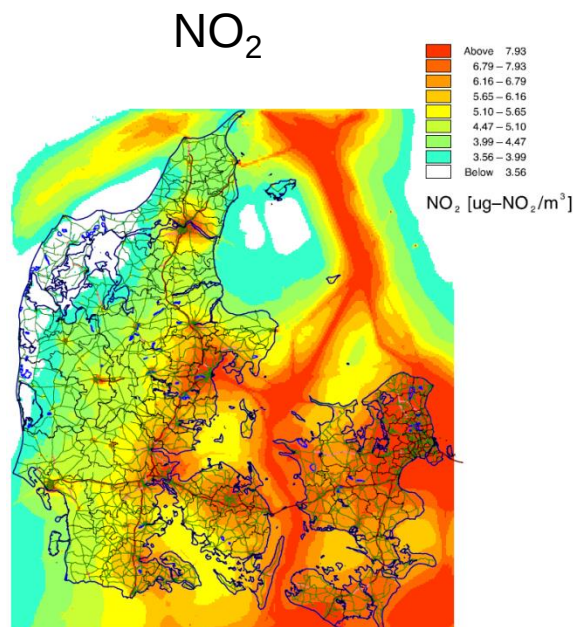


- › **Street geometry at measuring station at Aalborg**
- › **AirGIS model estimates street width to 21 m due to two small buildings**
- › **Width of 41 m is more representative**
- › **Modelled concentrations become too high**

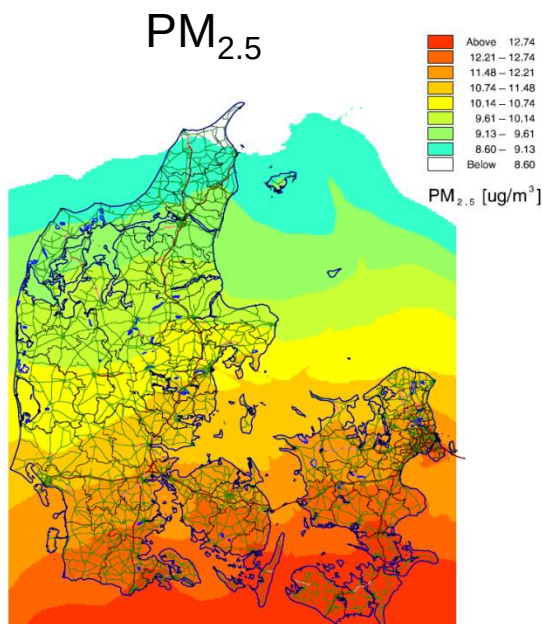
NO₂ with modelled and counted traffic



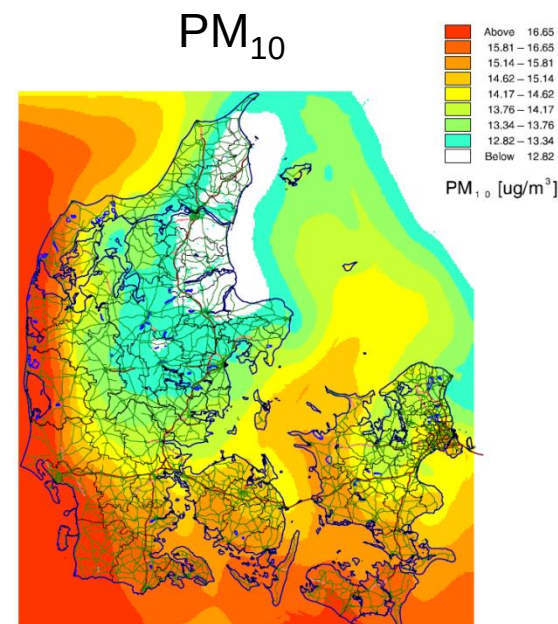
Urban background variations



- › Traffic sources and ships emissions clearly visible

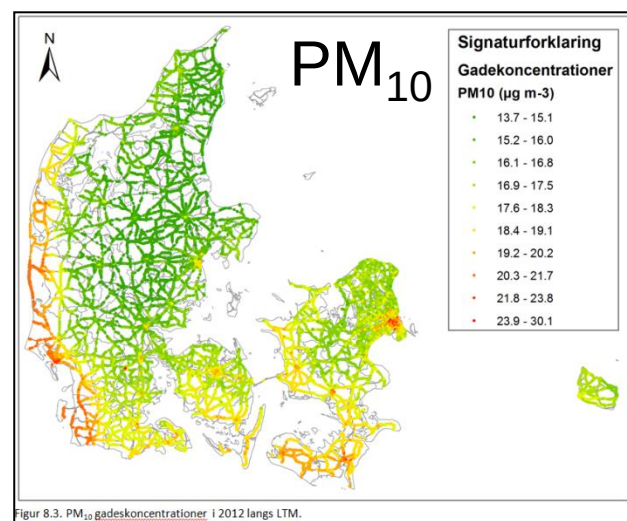
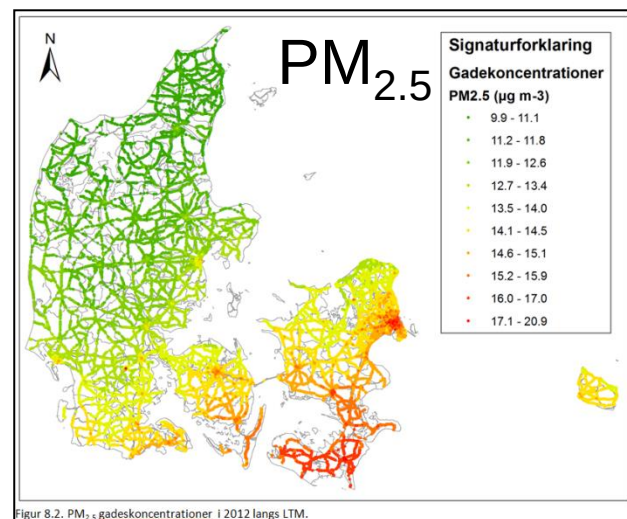
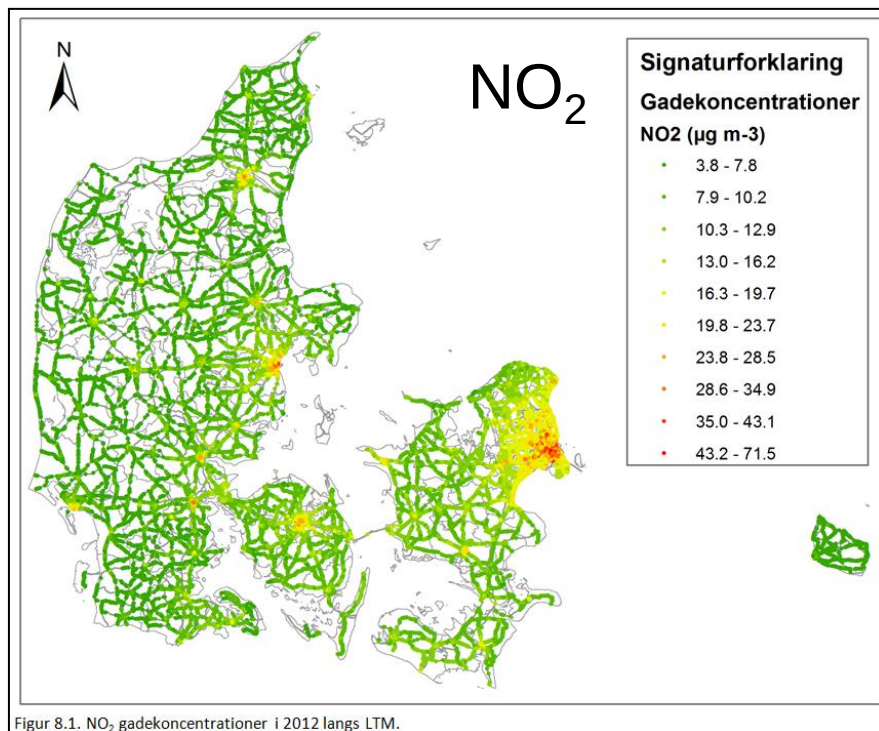


- › Dominated by long-rang and local sources hardly visible. Gradient from south.



- › Dominated by long-rang and local sources hardly visible. Sea salt visible.

Geografic variation at address level



Conclusion

- › **Air Quality at Your Street gives in general a fairly accurate picture of air quality and its geographic variation and relative difference between areas**
- › **– however, it may be very wrong at single addresses due to input data that is not representative**

Acknowledgement

- › **DCE – Danish Centre for Environment and Energy under Aarhus University financed by the project**
- › **Technical University of Denmark (DTU Transport) provided traffic data from the Danish National Traffic Model (LTM)**
- › **Danish Road Directorate provided data on travel speeds**