FAIRMODE WG2
Urban Emission Inventories

Activities 2014-2016

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NILU

Outline

1. Motivation

2. Implications to other working groups

3. Proposed Work Plan for 2014

4. Request to participants for the Technical meeting

5. Questions to discussion

FAIRMODE review of air quality legislation

In 2012, FAIRMODE identified the following major applications of models within the Air Quality Directives:

1. **Assessment** of air quality levels to establish the extent of exceedances and establish the population exposure

2. **Forecasting** air quality levels for short term mitigation and public information and warnings

3. **Source allocation** to determine of the origin of exceedances and provide a knowledge basis for planning strategies

4. **Evaluation of plans and measures** to control AQ exceedances

… reflected in today's FAIRMODE structure
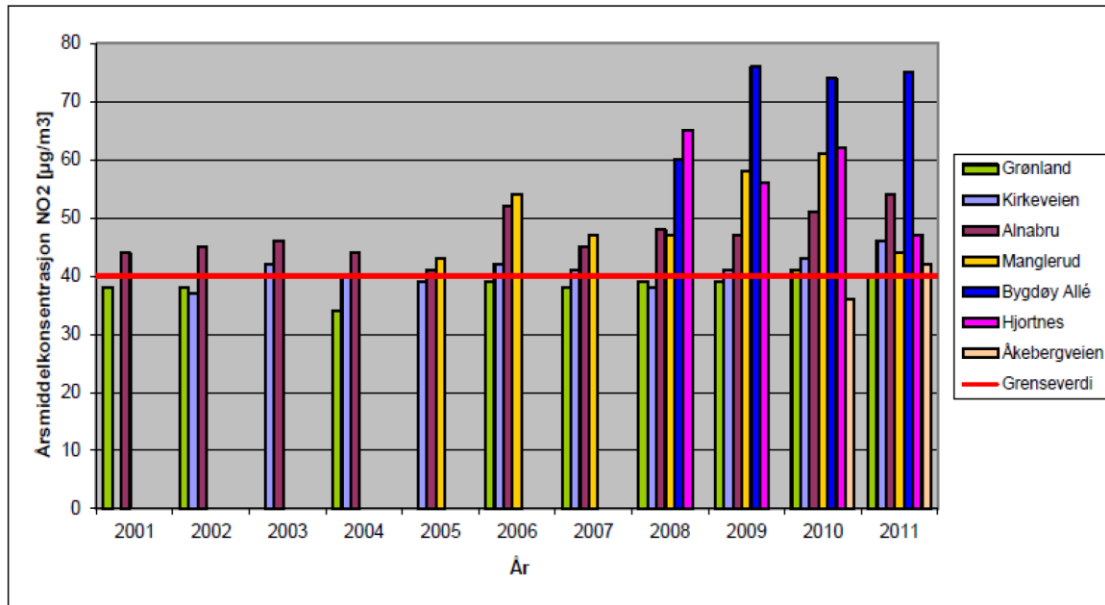
European Commission

Major applications of models in the AQD

I. _Assessment_ of air quality levels to establish the extent of exceedances and establish the population exposure ⟹ **WG1**

II. Urban _Emission_ Inventories ⟹ **WG2**

III. _Source allocation_ to determine of the origin of exceedances and provide a knowledge basis for planning strategies ⟹ **WG3**

IV. Assessment of _plans_ and measures to control AQ exceedances ⟹ **WG4**

Urban air pollution continues to be a problem
Air pollution in Oslo

Årsmiddel for NO$_2$ 2001- 2011 i µg/m^3. Den røde linjen viser grenseverdien som har vært gjeldende siden 2010.

grenseverdien for timemiddel av NO$_2$ i perioden 2001-2011[5]. Den røde har vært gjeldende fra 2010.

Kilder: Statens vegvesen og Oslo kommune Bymiljøetaten

Oslo kommune
Bymiljøetaten
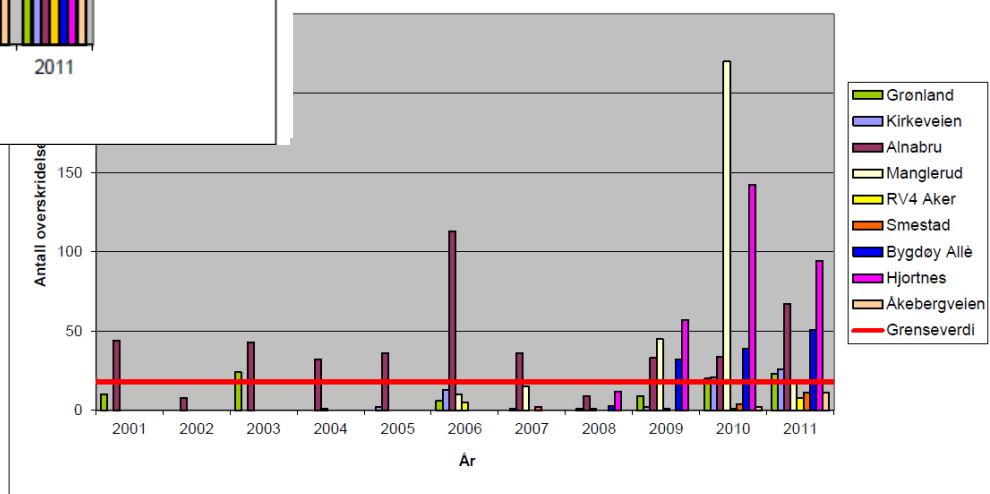
Air Quality Forecast

Air Quality Forecast for Oslo:

- The air quality was **good** this morning, Wednesday March 13, at
  air quality is expected in the downtown area and along the main
  poor air quality along the main throughfares[2]. Road dust and exh
  evening **moderate** air quality is also expected in areas with exte

Urban inventories needed for all activities in FAIRMODE

1. Forecasting, urban planning and local management practices

2. Assessment of urban air quality and exposure (ususally for this purpose approaches are centralised, measurements and models are used)

3. Reporting – local input to national emission inventories

4. Source apportionment (through modelling)

5. Evaluation of measures (through modelling, in connection to national projections)

Importance of emission inventories is firmly established in the FAIRMODE recommendations (#4)

Recommendation: FAIRMODE ~~improve~~ the compilation, consistency ~~data suitable for AQ modeling und~~
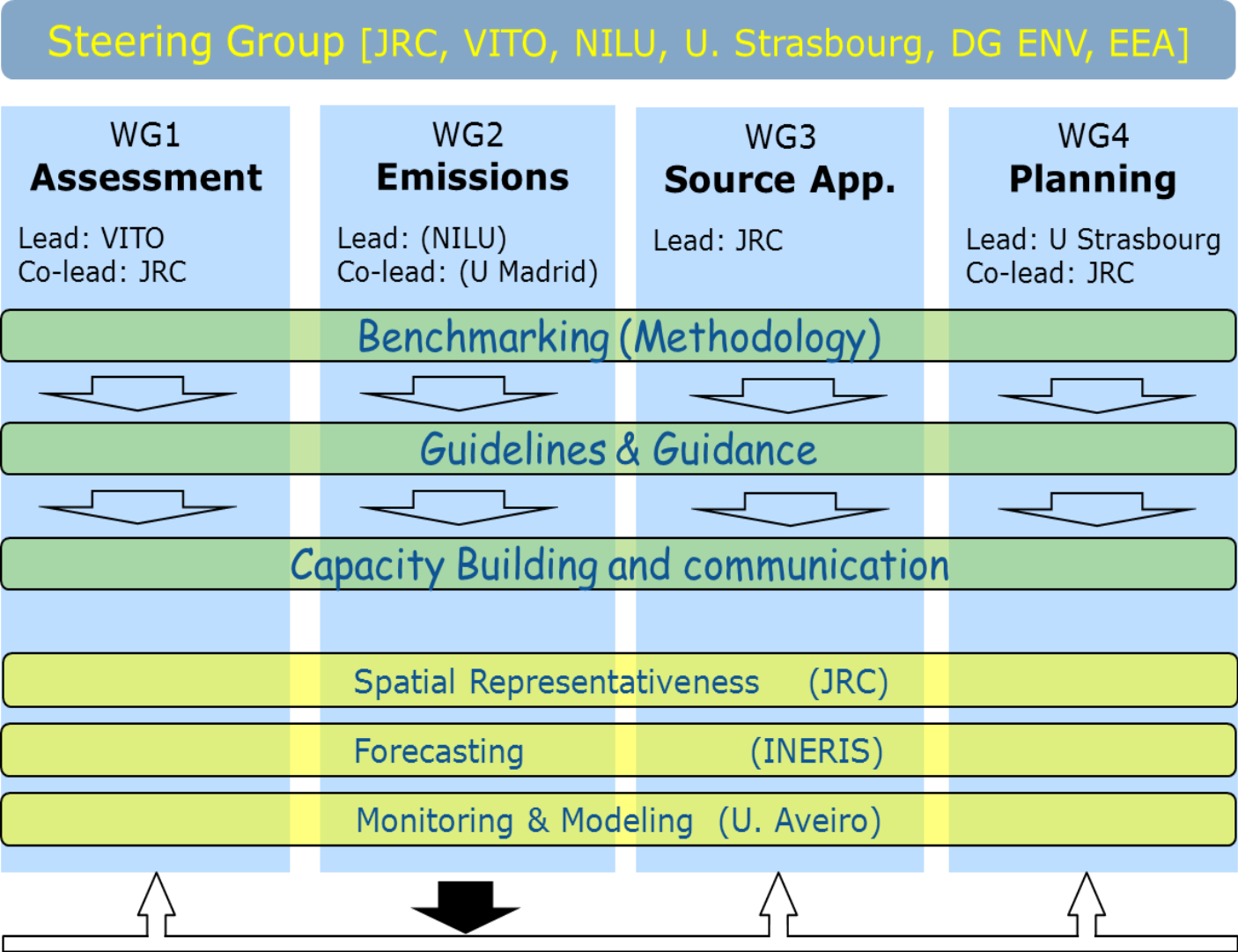
Will it happen?

Proposed actions:

- Emissions are not mentioned in the AQD and the need to work to increase the quality of emission inputs needs to be identified

- Promote guidance initiatives for the compilation of emission data for AQ models under the directives

- Support competence building initiatives to secure the consistency of detailed bottom-up emission inventories with those compiled for regulatory purposes at local, national and European scale

*....from SG3 perspective this a major accomplishment*

TNO innovation for life

Fairmode work plan 2014-2016

Steering Group [JRC, VITO, NILU, U. Strasbourg, DG ENV, EEA]

WG1 **Assessment**	WG2 **Emissions**	WG3 **Source App.**	WG4 **Planning**
Lead: VITO Co-lead: JRC	Lead: (NILU) Co-lead: (U Madrid)	Lead: JRC	Lead: U Strasbourg Co-lead: JRC

Benchmarking (Methodology)

Guidelines & Guidance

Capacity Building and communication

Spatial Representativeness   (JRC)

Forecasting   (INERIS)

Monitoring & Modeling (U. Aveiro)

New work plan based on
Lessons learned from SG3 Questionnaire

A list of 30 selected people was prepared and contacted, including national focal points from 15 countries

12 answers: Belgium, Finland, France, Germany, Ireland, Netherlands, Portugal, Spain (2), and UK (3)
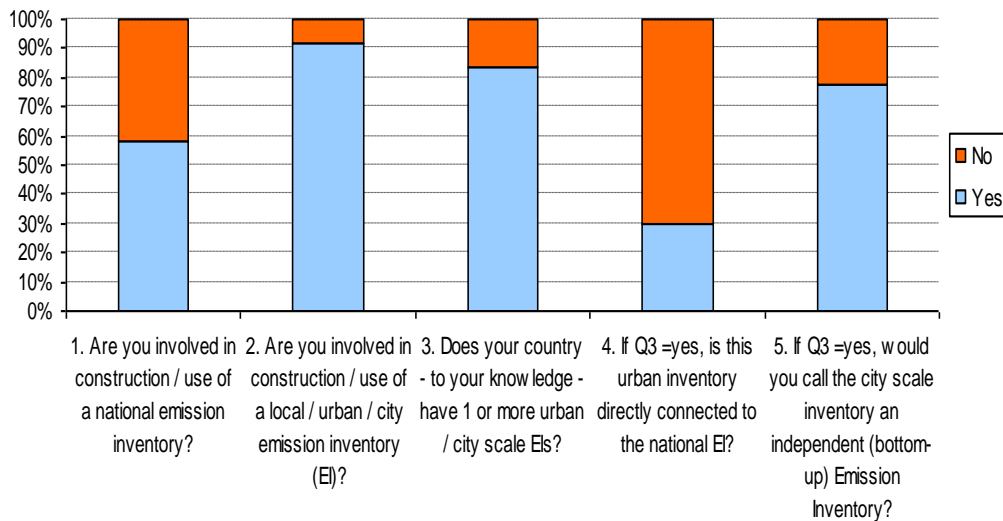
1. Urban emission inventories are generally not consistent with national inventories (70% reported non-links)

2. Urban inventories focus mostly on the traffic sector

3. Urban inventories generally use bottom-up approaches for Traffic sector, for others sectors downscaling from top-down inventories is used to 1-5 km²

4. No direct link between emissions and scenarios

Urban Emissions workplan

	2014	2015	2016
	Traffic emissions methodologies review	Benchmarking **Traffic** emissions	GHG and AQ emissions from **traffic**
	Link to TFEIP	Link to MACC emission work	Link to ICLEI
	Determination of good practices for traffic emissions	Differences between national and urban traffic inventories	Guidance on traffic emissions methodology

Using national EIs and spatial distribution proxies we make a down-scaled emission ~~~

MACC / MEGAPOLI 2005 PM10 total

	< 2.5
	2.5 - 5
	5. - 10
	10. - 20
	20. - 40
	40. - 80
	80. - 160
	160. - 320
	> 320.

London

Rhine-Ruhr

Île-de-France including Paris
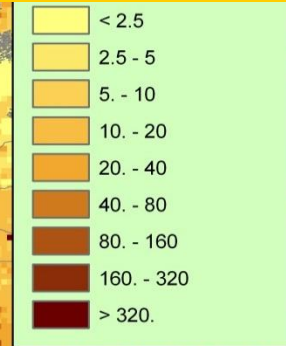
Po Valley

Cases: Paris & London – both ~15% of the national population in these cities

ALTERNATIVE APPROACH: bottom-up emission models, with information on the vehicle stock, traffic volume and vehicle emission factors

Aldersfordeling lette kjøretøy

Antall personbiler. 1945-2008[1]
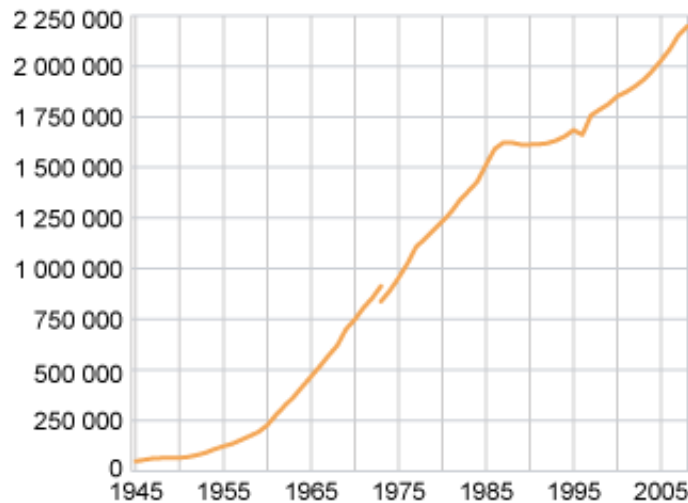
[1] Fram til 1973 omfatter tallene både biler med påmontert skilt per 31. desember og biler som var avskiltet i løpet av året. Fra og med 1973 omfatter tallene bare biler med påmontert skilt per 31. desember.
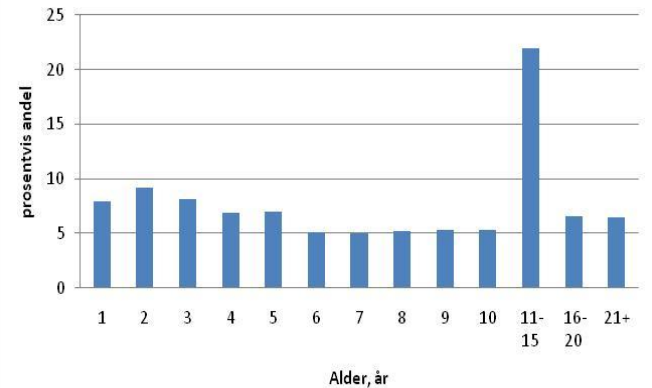
Aldersfordeling tunge kjøretøy

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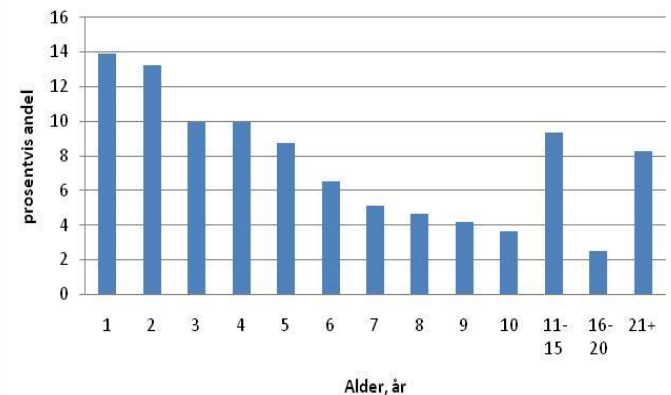
EF: Large emission differences

Model	Motor type	CO_2 (g/km)	NO_x (mg/km)	NO_2 (mg/km)	HP
Toyota Prius	Gasoline/EL Hybrid	89	6	0,6	136
VW Golf 1,4 TSI aut	Gasoline	138	25	2,5	122
Audi A3 2,0 TDI aut	Diesel	143	142	71,5	140
BMW 118 d aut	Diesel	140	158	79	143
SmartForTwo	Diesel	86	160	79	54

NO_2 conservativte share 10% for gasoline, 50% for diesel.

NO_2 emissions:
- Hybrid vs Gasoline, a factor of 4
- Gasoline vs Diesel, a factor of 30
- Hybrid vs Diesel, a factor of 125

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Emission factors
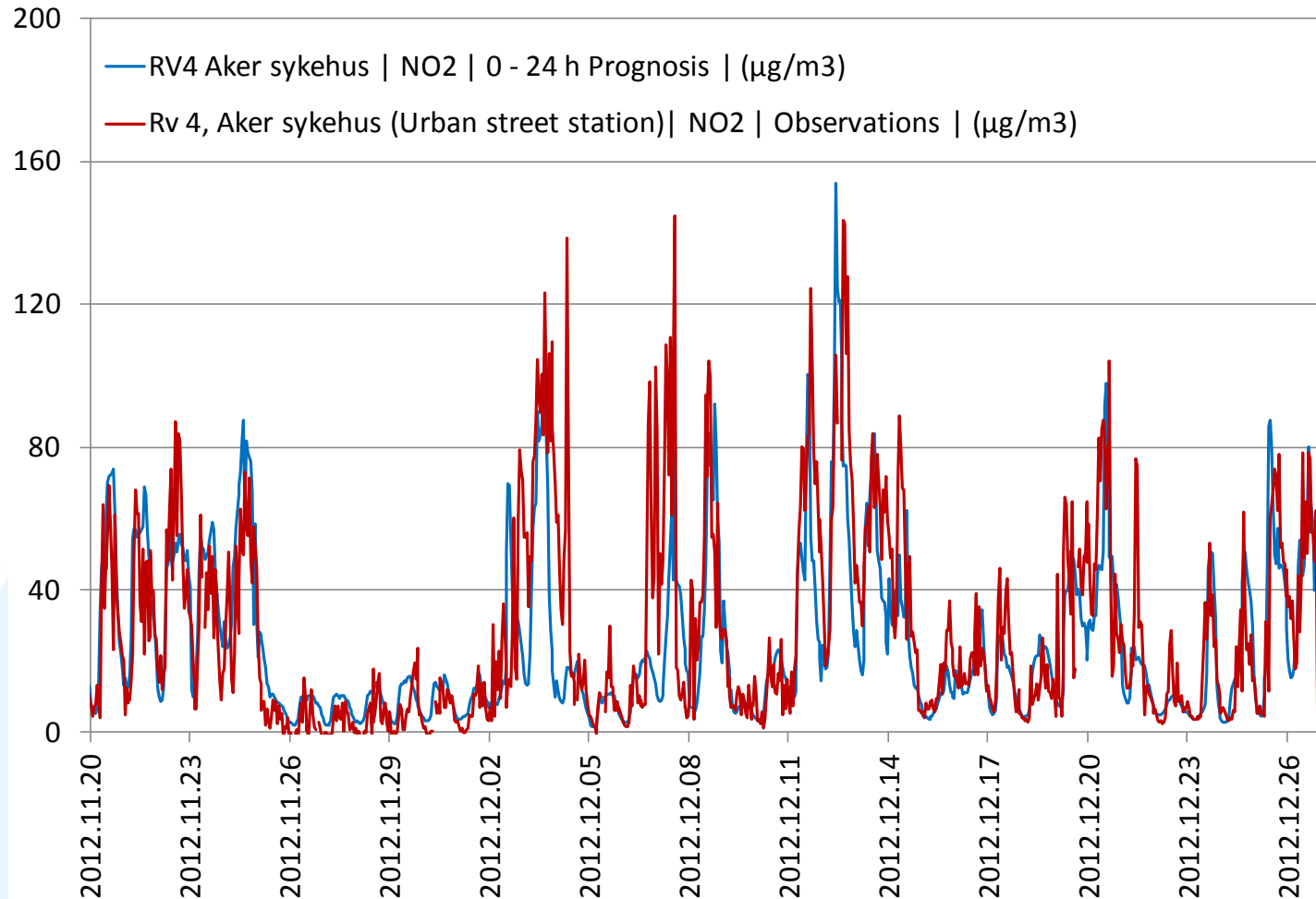## Difference between EDC tests and actual driving conditions for diesel cars

Laboratory tests at statutory and urban driving conditions at + 23 C
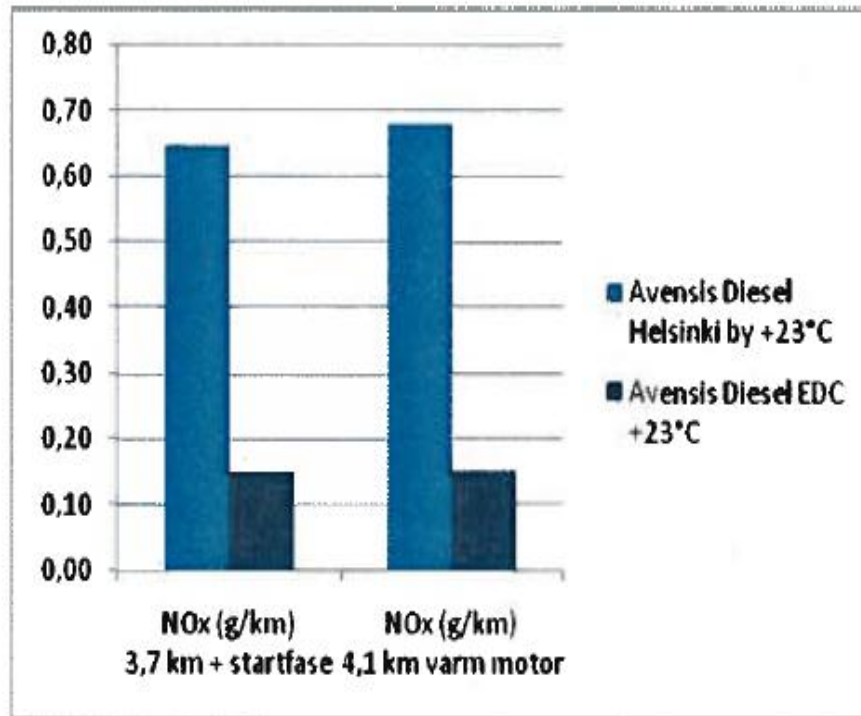
Laboratory tests with actual urban driving conditions at -7 C

*Hagman, 2011; Alvarez et al, 2008*

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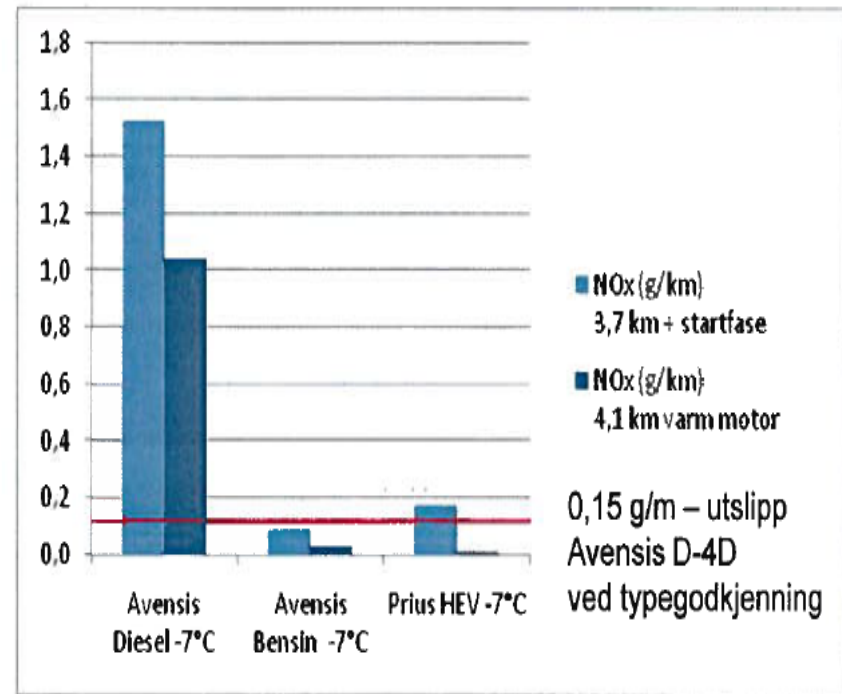
Evaluation of the NO$_2$ Prognosis

Bias   = 3.5 %
Correlation = 0.64

Comparison of the 2 approaches in Paris

- The emission authority in Paris is AirParif (http://www.airparif.asso.fr/).
- Emission inventory for the Ile-de-France region incl. Paris
- To keep consistency we take over complete Ile-de-France region
- Compare local bottom-up inventory to European down-scaled inventory per sector
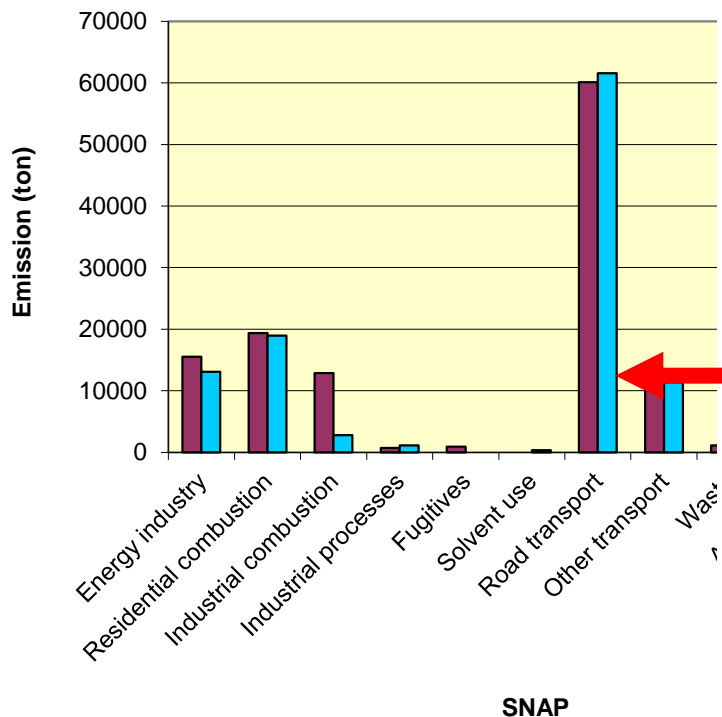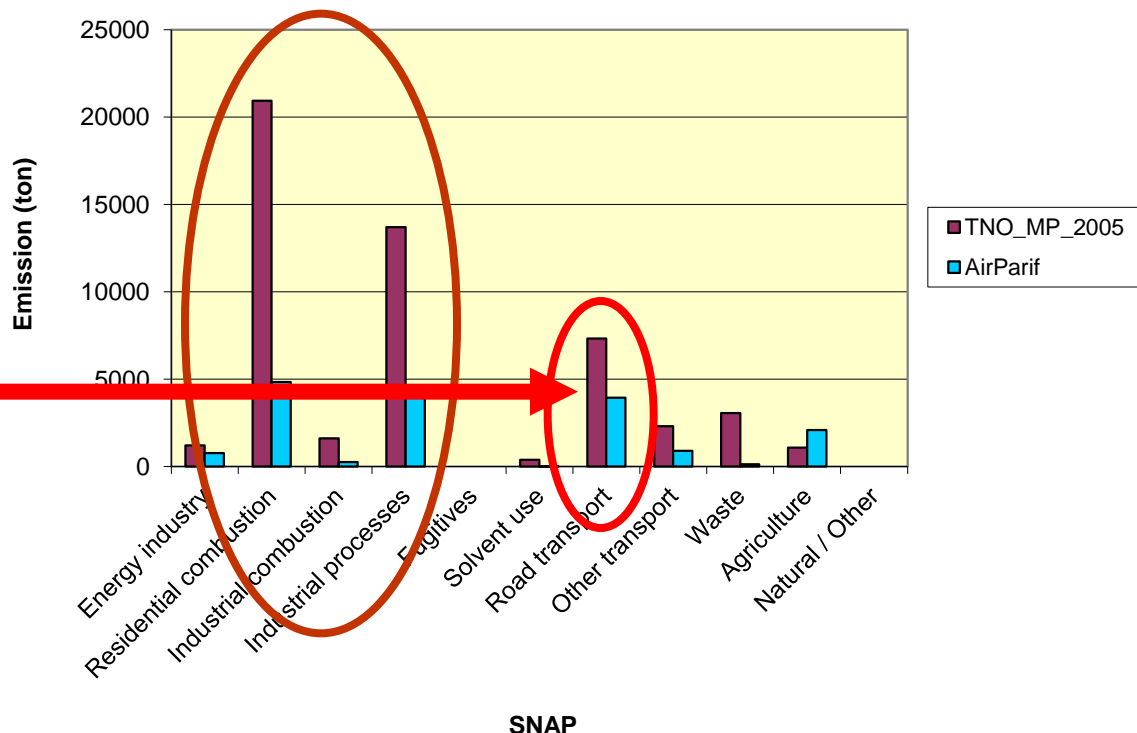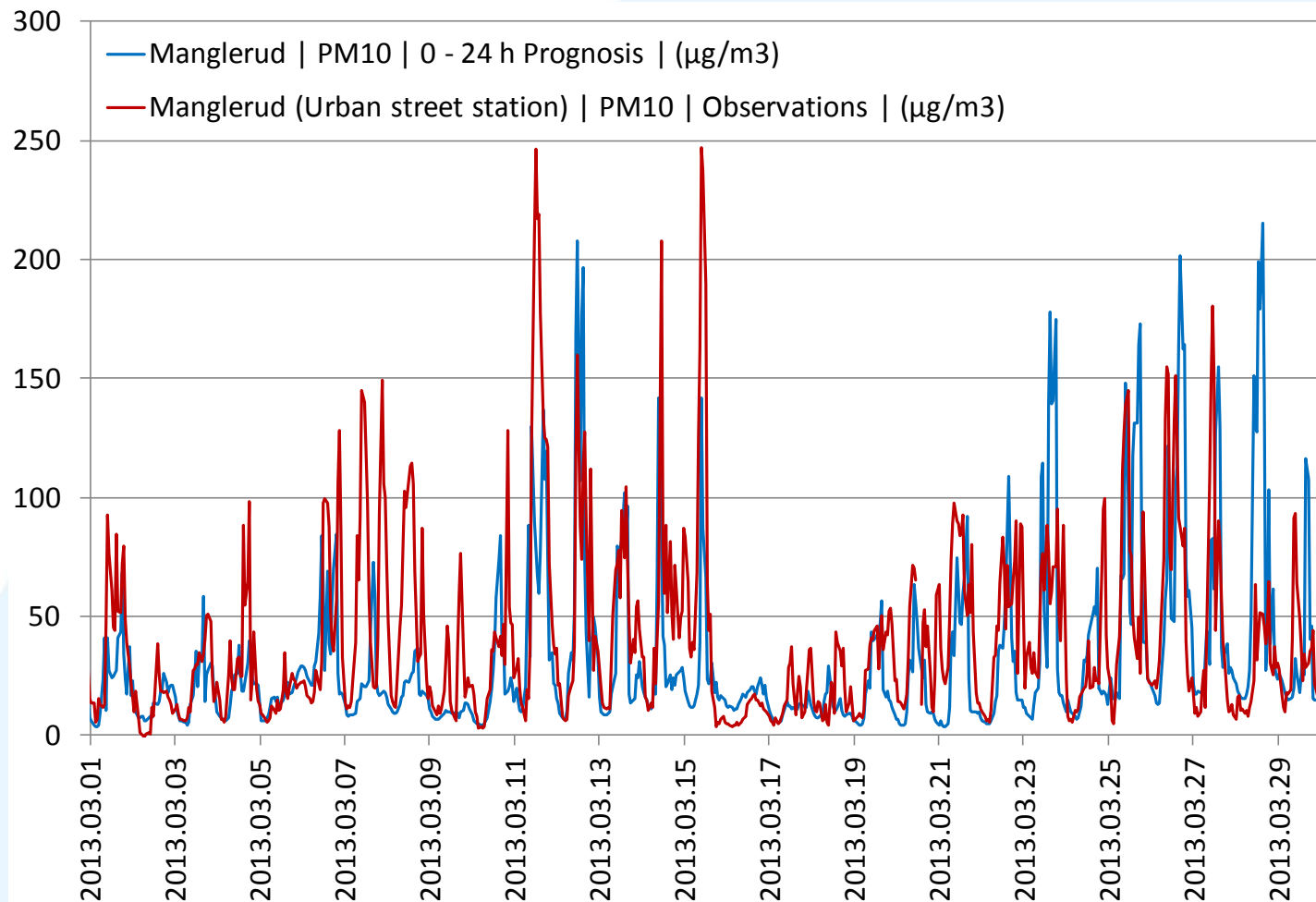
Evaluation of the PM$_{10}$ Prognosis

Bias   = -0.3 %
Correlation = 0.55

Emission processes: NORTRIP model concept
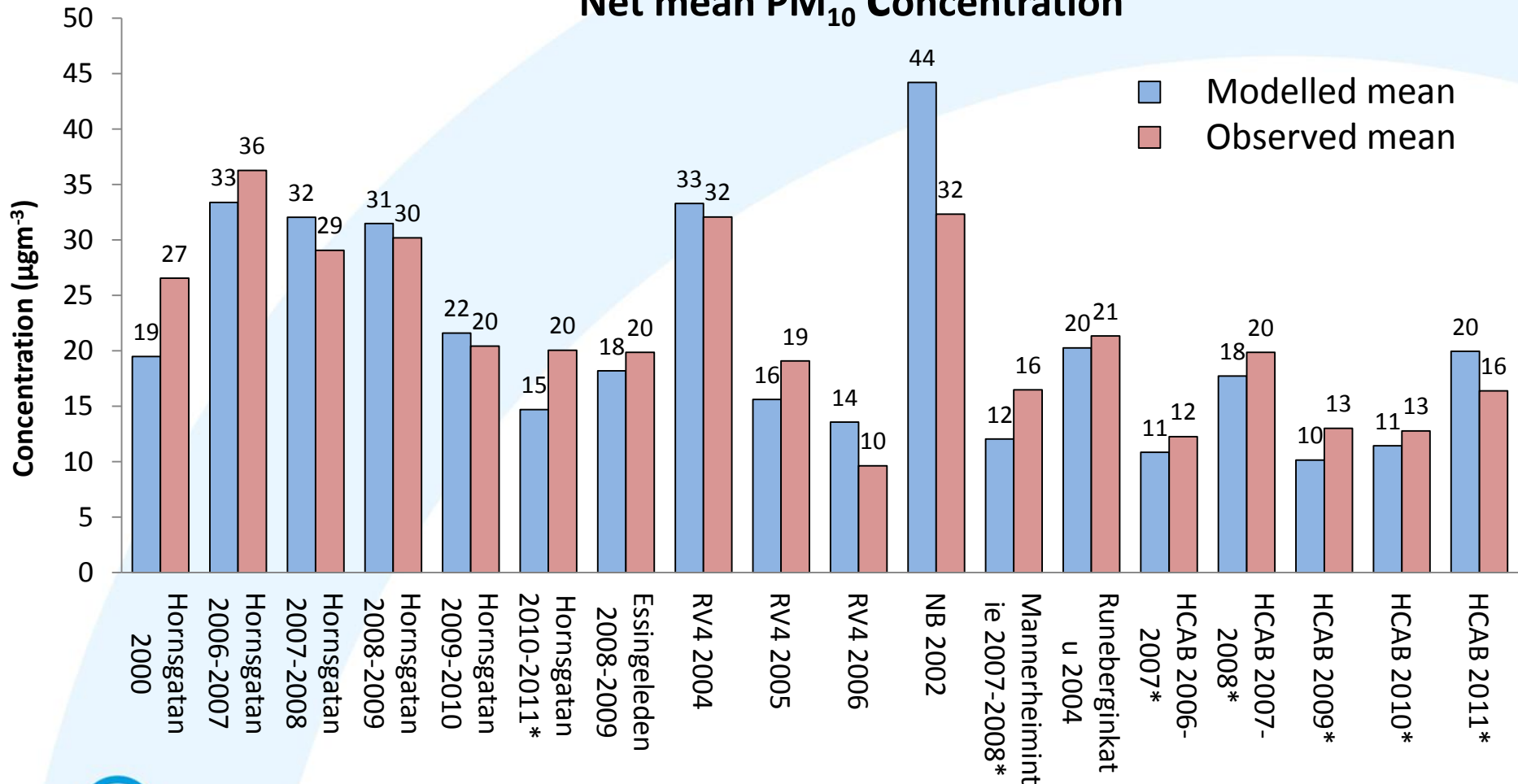

Denby et al., 2013
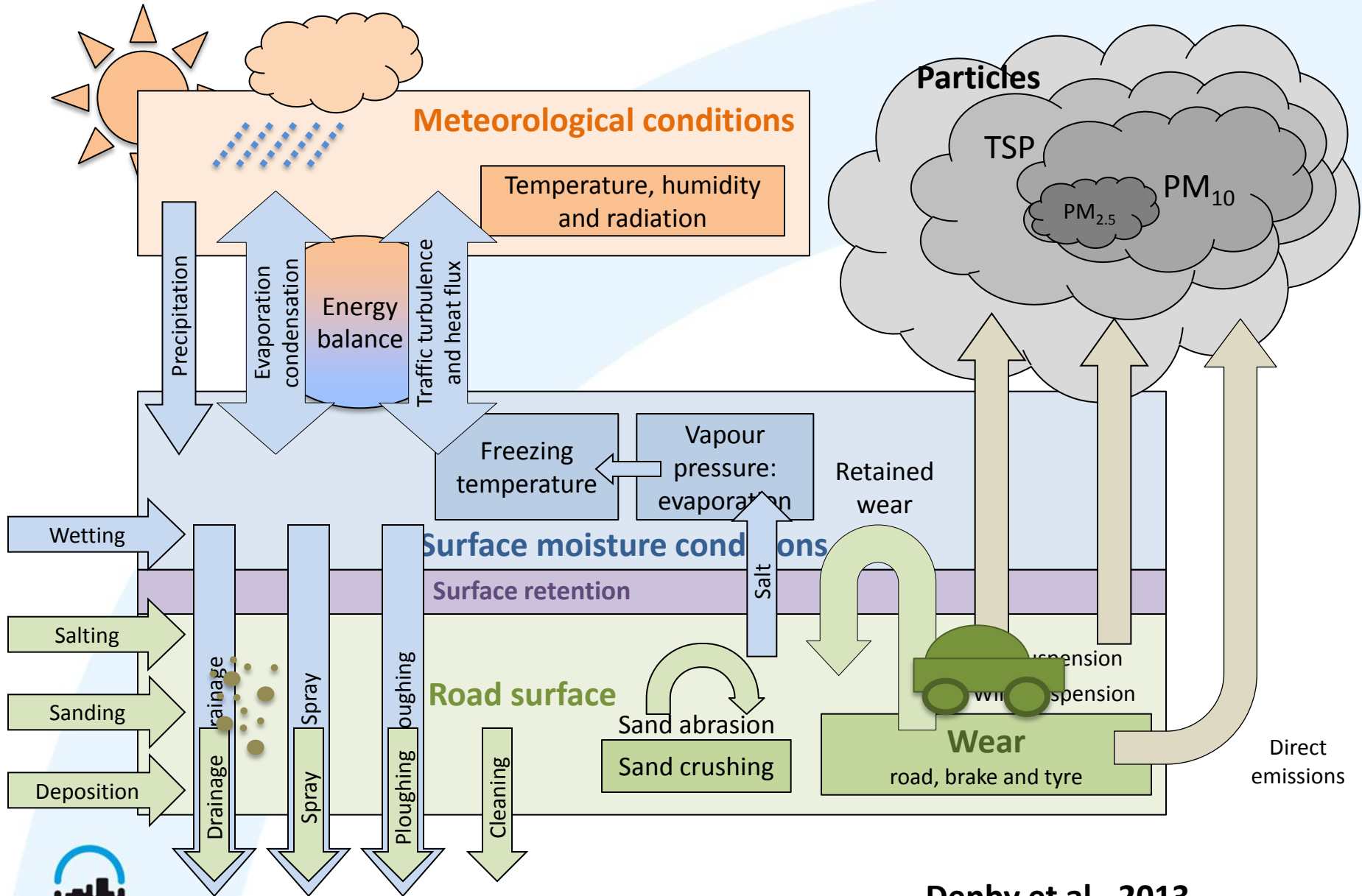
Summary: Daily mean correlation (R²), with and without moisture modelling

Net daily mean PM_{10} correlation
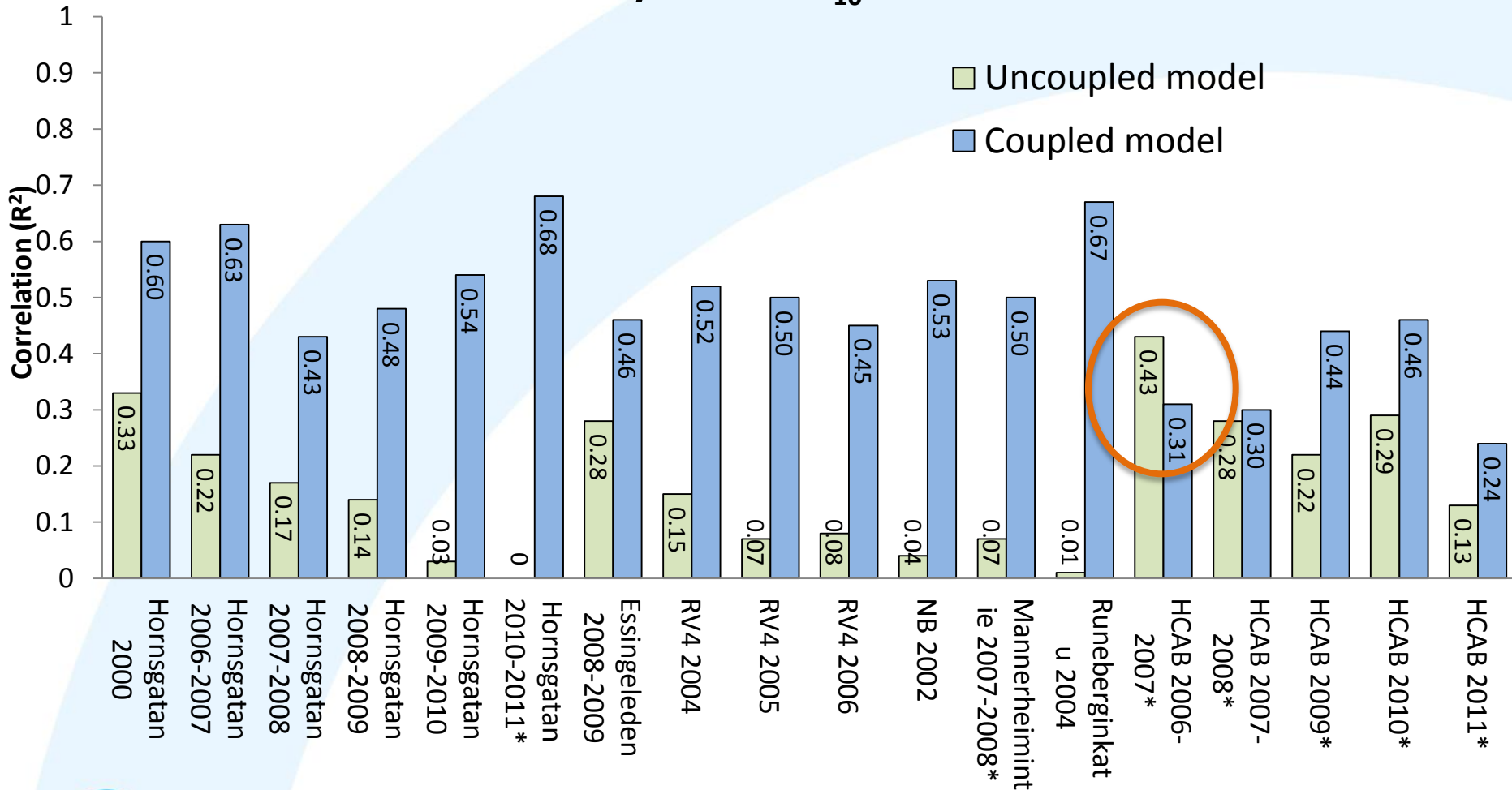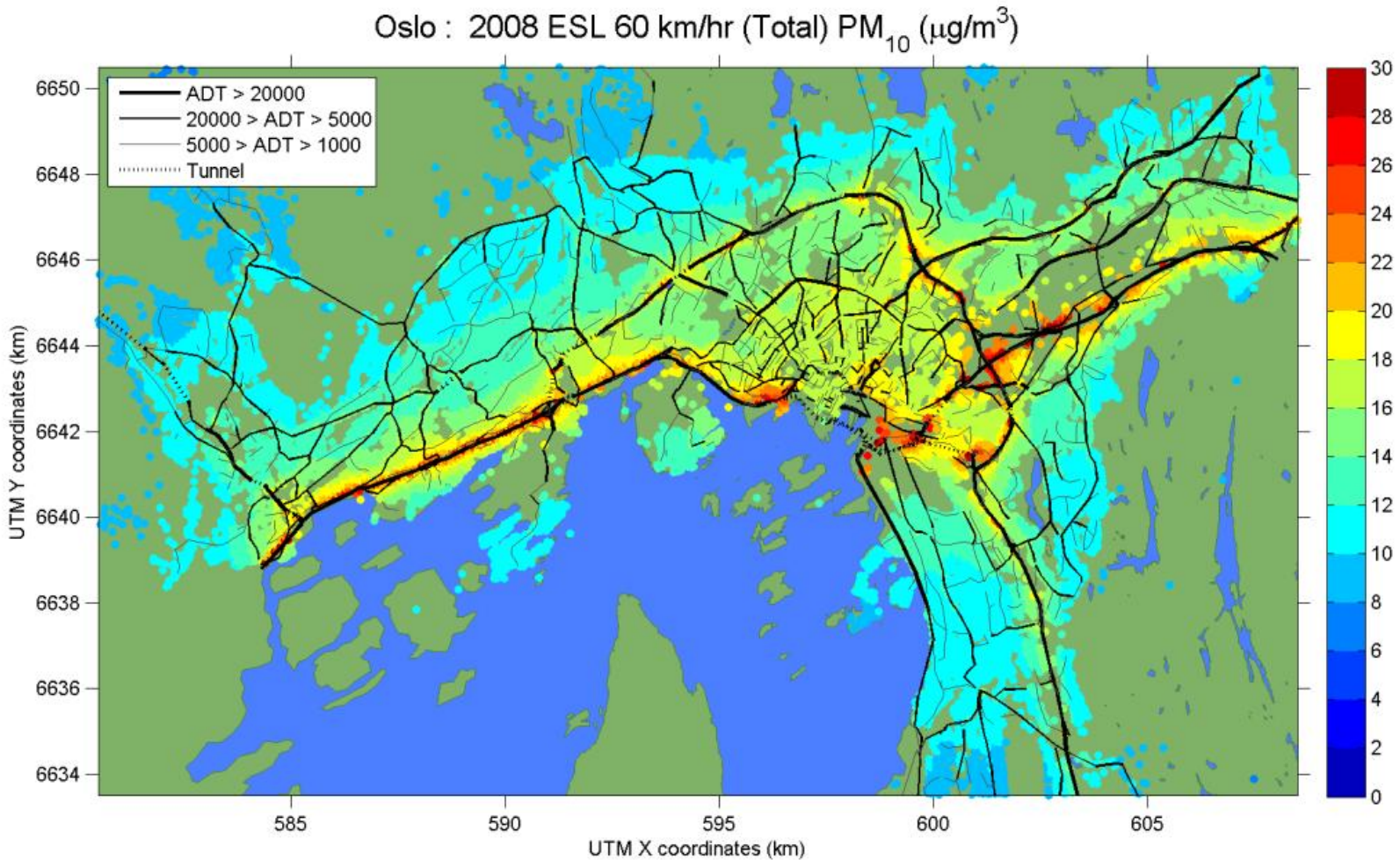
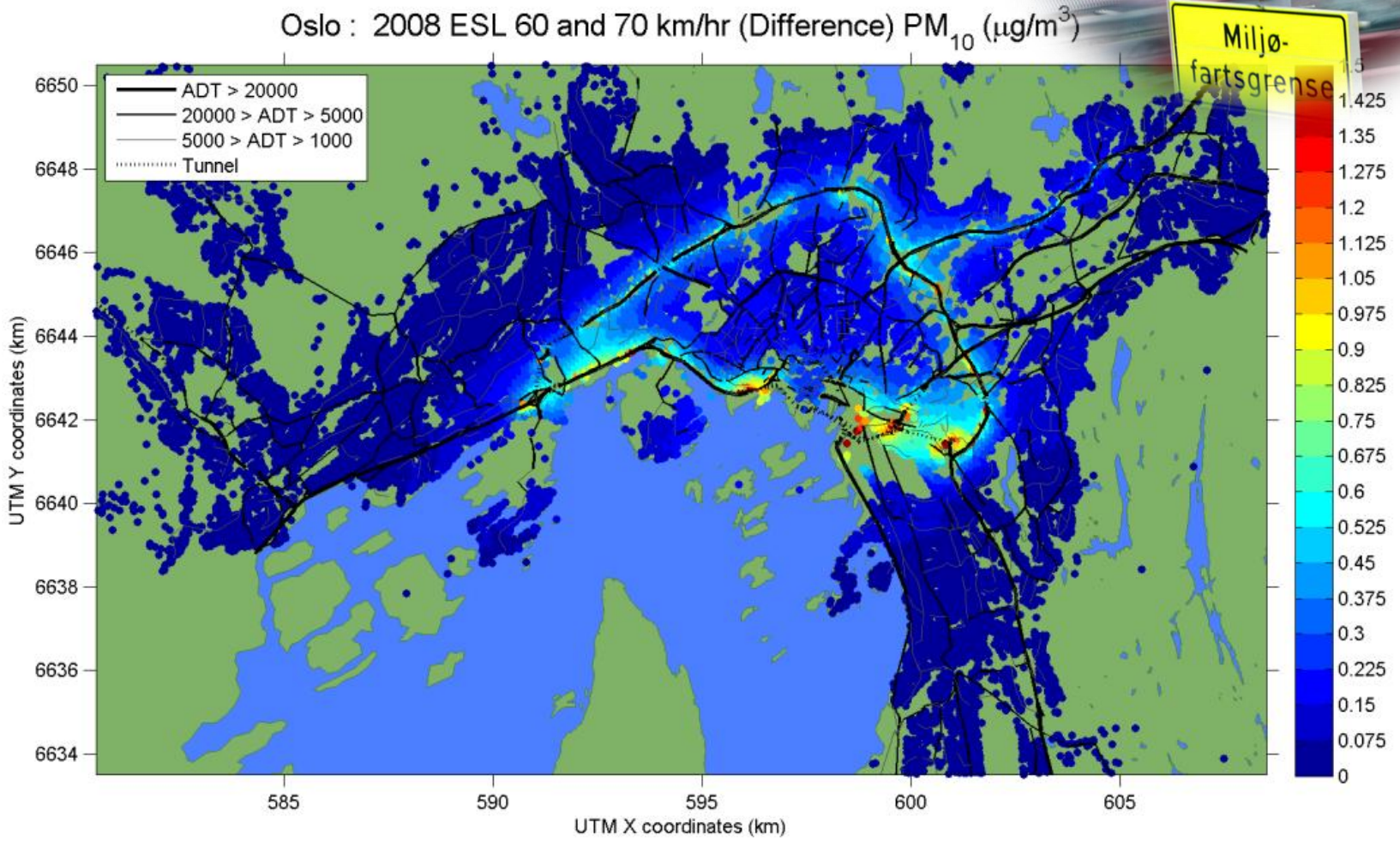**NORTRIP model:** Mean concentrations, 18 datasets

Net mean PM$_{10}$ Concentration

Impact of speed on annual mean PM$_{10}$ in Oslo

Environmental speed limit of 60 km/hr

Oslo : 2008 ESL 60 km/hr (Total) PM$_{10}$ (μg/m^3)

Impact of speed on annual mean PM$_{10}$ in Oslo

Change from 60 to 70 km/hr

Oslo : 2008 ESL 60 and 70 km/hr (Difference) PM$_{10}$ ($\mu g/m^3$)

Request to participants

- First step: share your methodology!

- 2014
  - Identification of current (good) practices for traffic emissions
  - Preparation of **benchmarking** activities in 2015
    - ➢ Select cities
    - ➢ Share activity data
    - ➢ Share views on indicators

Request to participants

- Select benchmarking cities

- Air City Pilot
- CITY Delta
- CITEAIR
- TRANSPHORM
- Covenant of Mayors (CoM)

Antwerp, Berlin, Madrid, Malmö, Paris, Plovdiv, Vienna, Vilnius, Milan, Ploieşti, Prague, Dublin, Oslo, Rotterdam …

Request to participants

- Common evaluation methodology for traffic emissions
- Common tools for evaluation of different methodologies
- Identify useful indicators for testing emissions
- Common databases with activity data
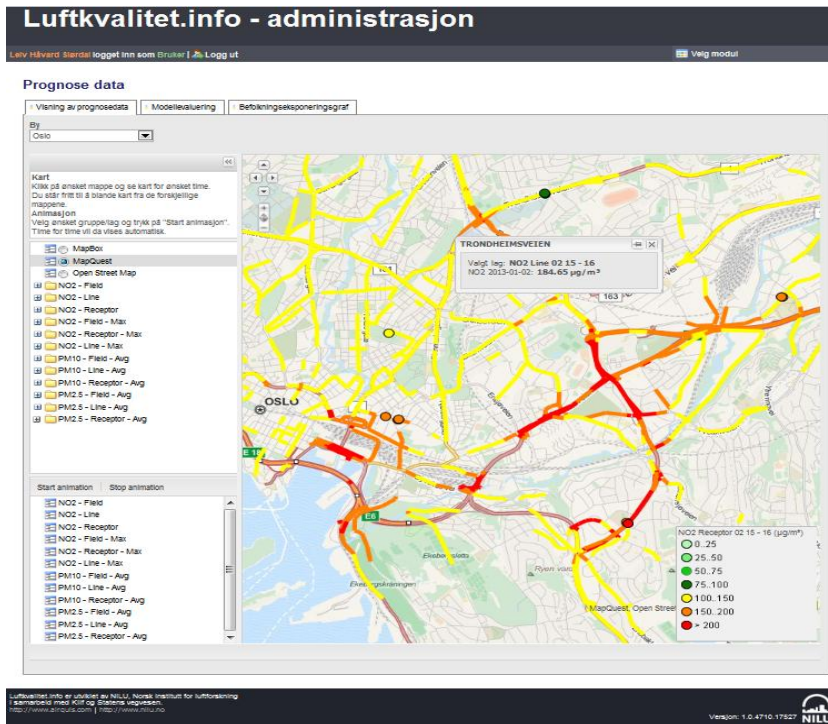
NOx/PM10 ratio Road transport	
France _national	9.8
Paris_downscaled	8.2
Paris_Bottom-up	15.6
UK _national	16.3
London_downscaled	13.8
London_Bottom-up	13.5

Questions for discussion

- What is the preferred form for guidance on urban scale emission compilation?

- How to deal with inconsistencies between national, regional and urban emissions?

- How should we best organize FAIRMODE emission benchmarking activities?

The best way to combat air pollution

is to control its sources

Understanding urban emissions is key

to the implementation of the Air Quality Directives