

# *Er det piggdekkene som har skylden?*

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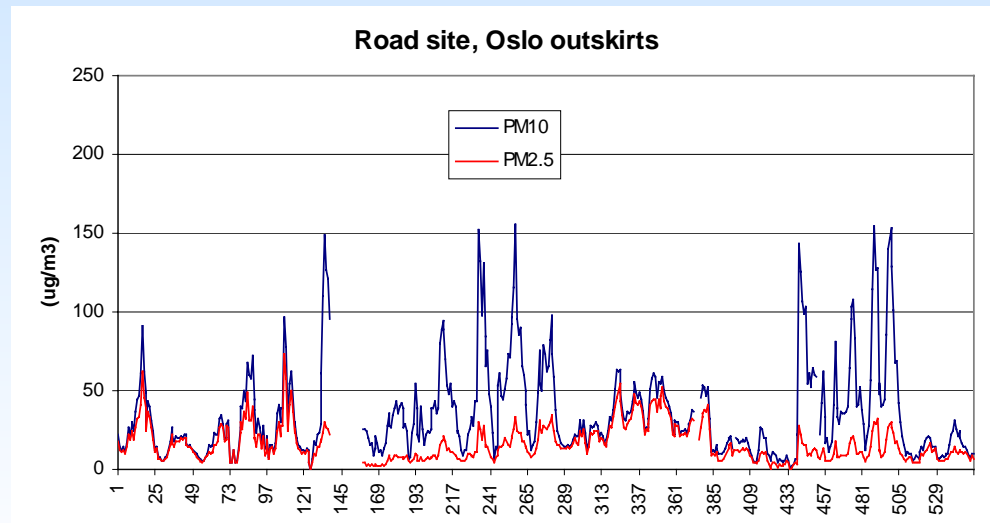
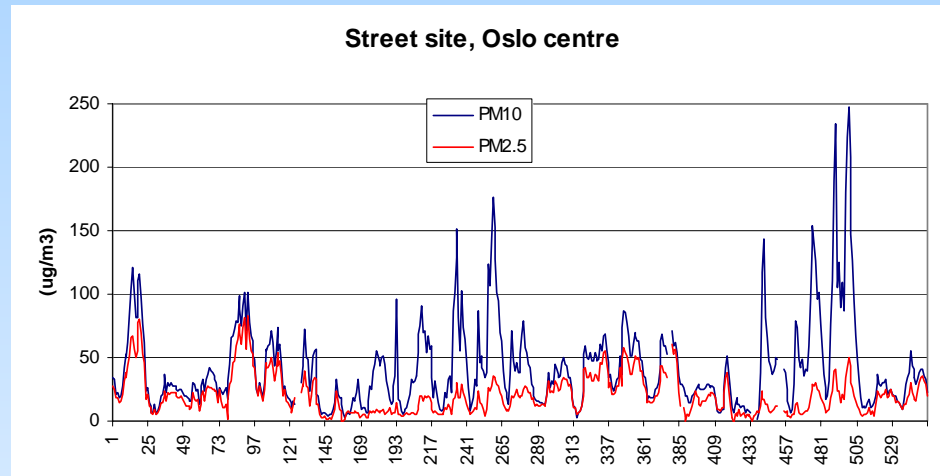
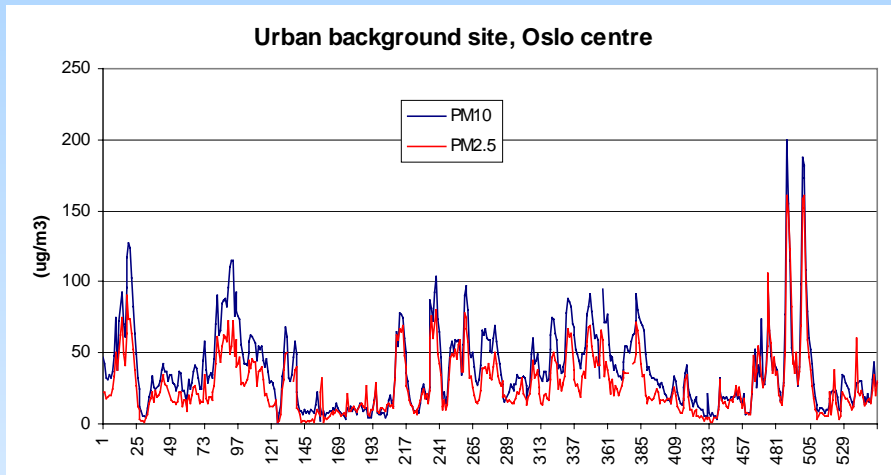
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# Sammendrag fra prosjekter finansiert av:

- ❖ Statens forurensningstilsyn (SFT)
- ❖ Statens vegvesen, Vegdirektoratet
- ❖ NILU

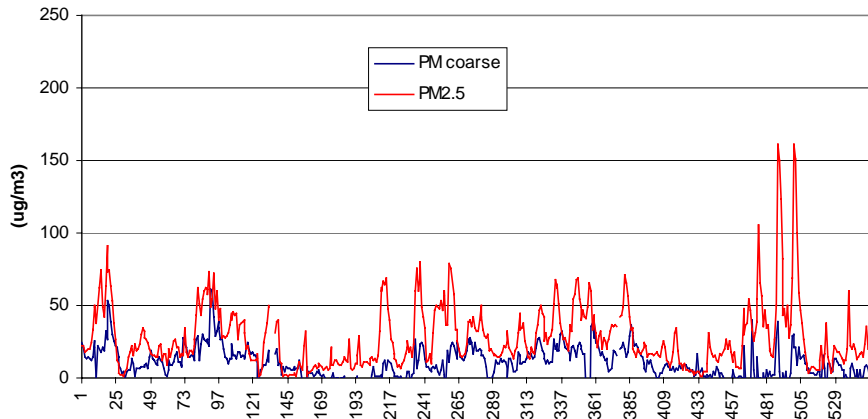
# PM10 and PM2.5 målt i Oslo

## Eksempel periode: Jan. - Febr. 1999

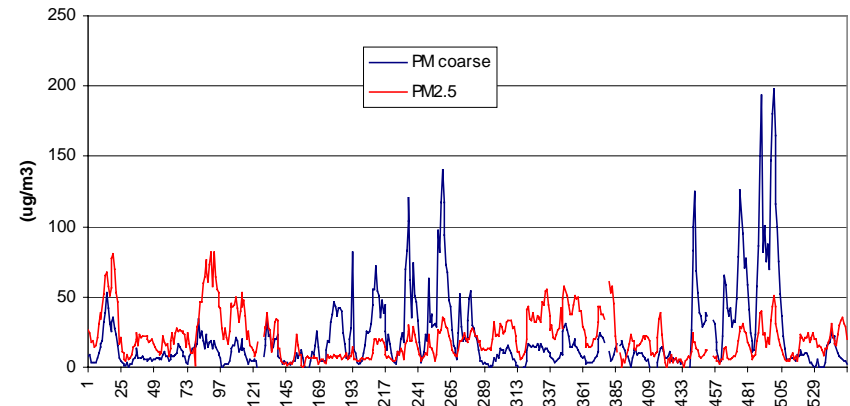


# PM grov og PM2.5 målt i Oslo Jan. - Feb. 1999

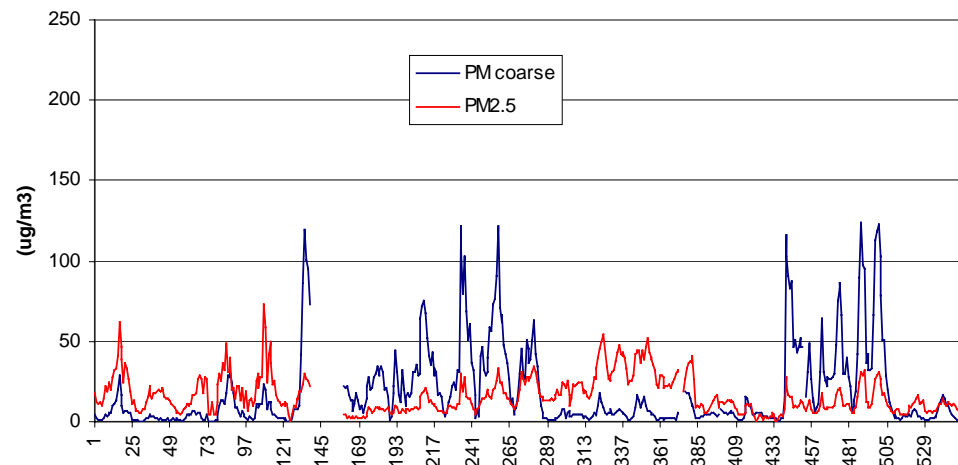
Urban background site, Oslo centre



Street site, Oslo centre

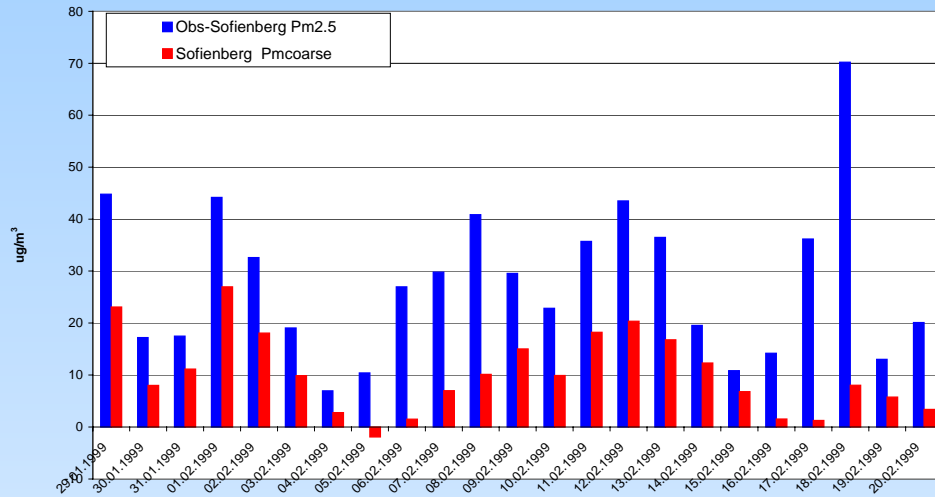


Road site, Oslo outskirts

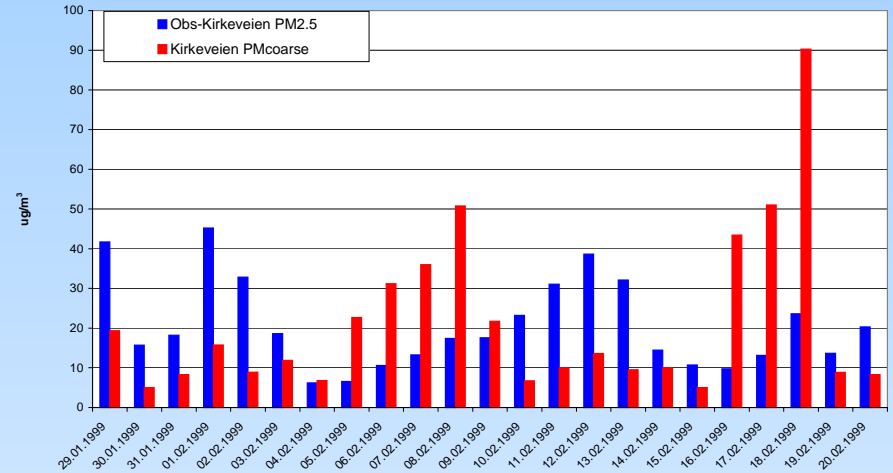


# PM grov og fin, Oslo, døgnaverdier

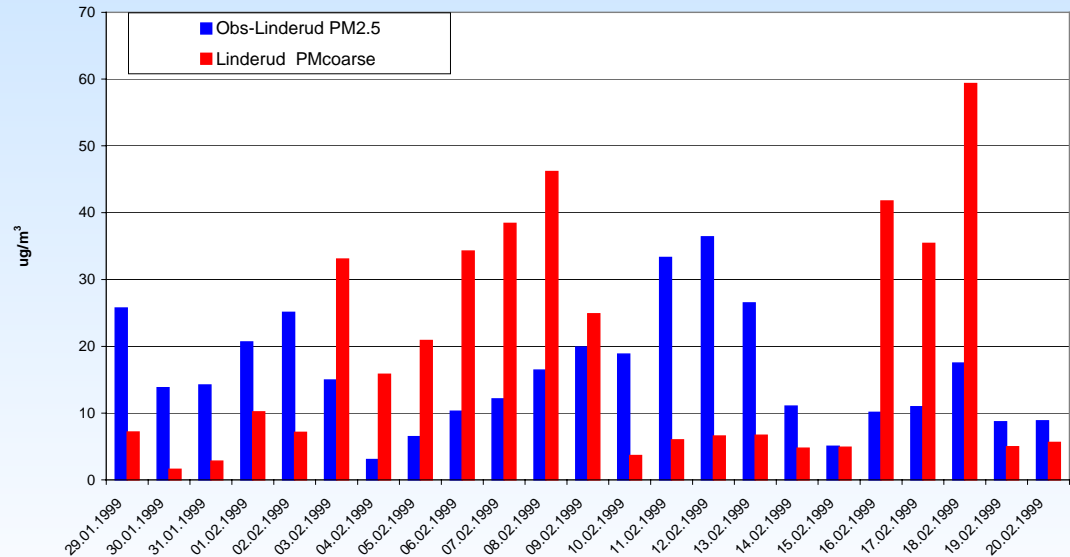
24-hour PM Values, Oslo, urban background site



24-hour PM Values, Oslo, street site



24-hour PM Values, Oslo, road site



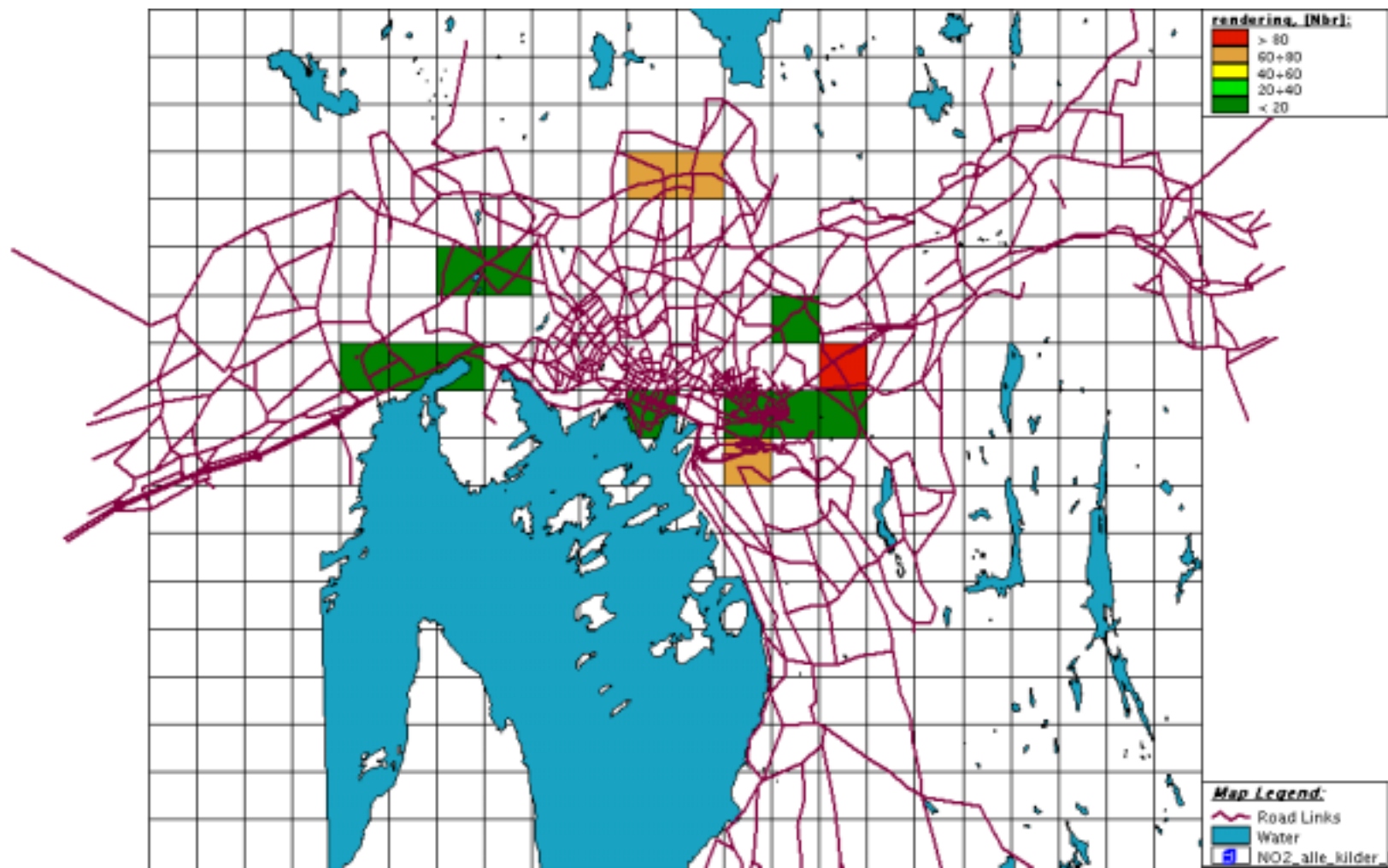
Oslo

# Antall personer som bor på steder med overskridelse av grenseverdier, 2001

Antall innbyggere: 507 467		
<b>PM<sub>10</sub></b>	Number of exceedances above the limit level:	215 455
<b>NO<sub>2</sub></b>	Number of exceedances above the limit level:	370

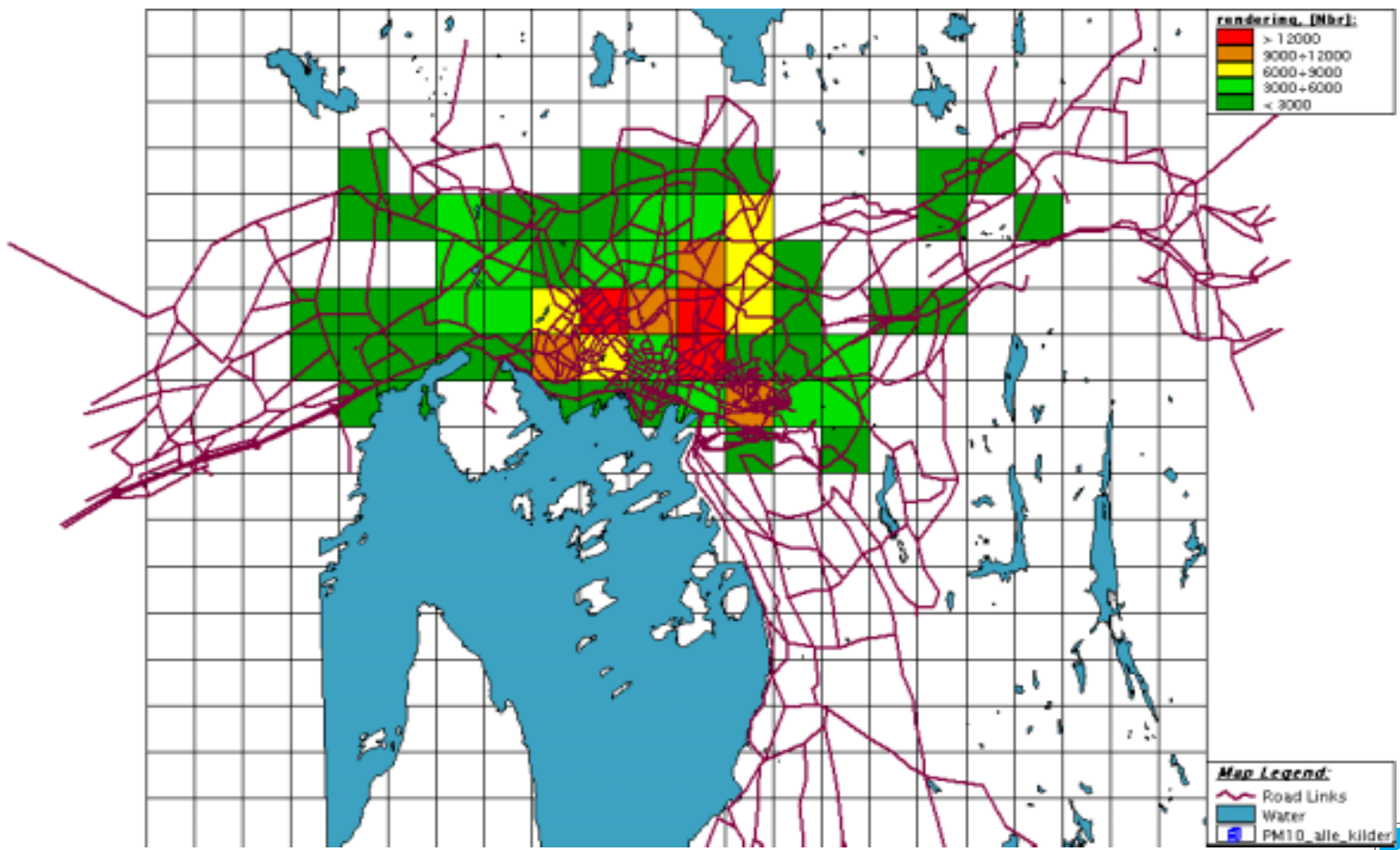
Oslo

# NO<sub>2</sub>: Antall personer eksponert over grenseverdi, ved bolig, 2001



Oslo

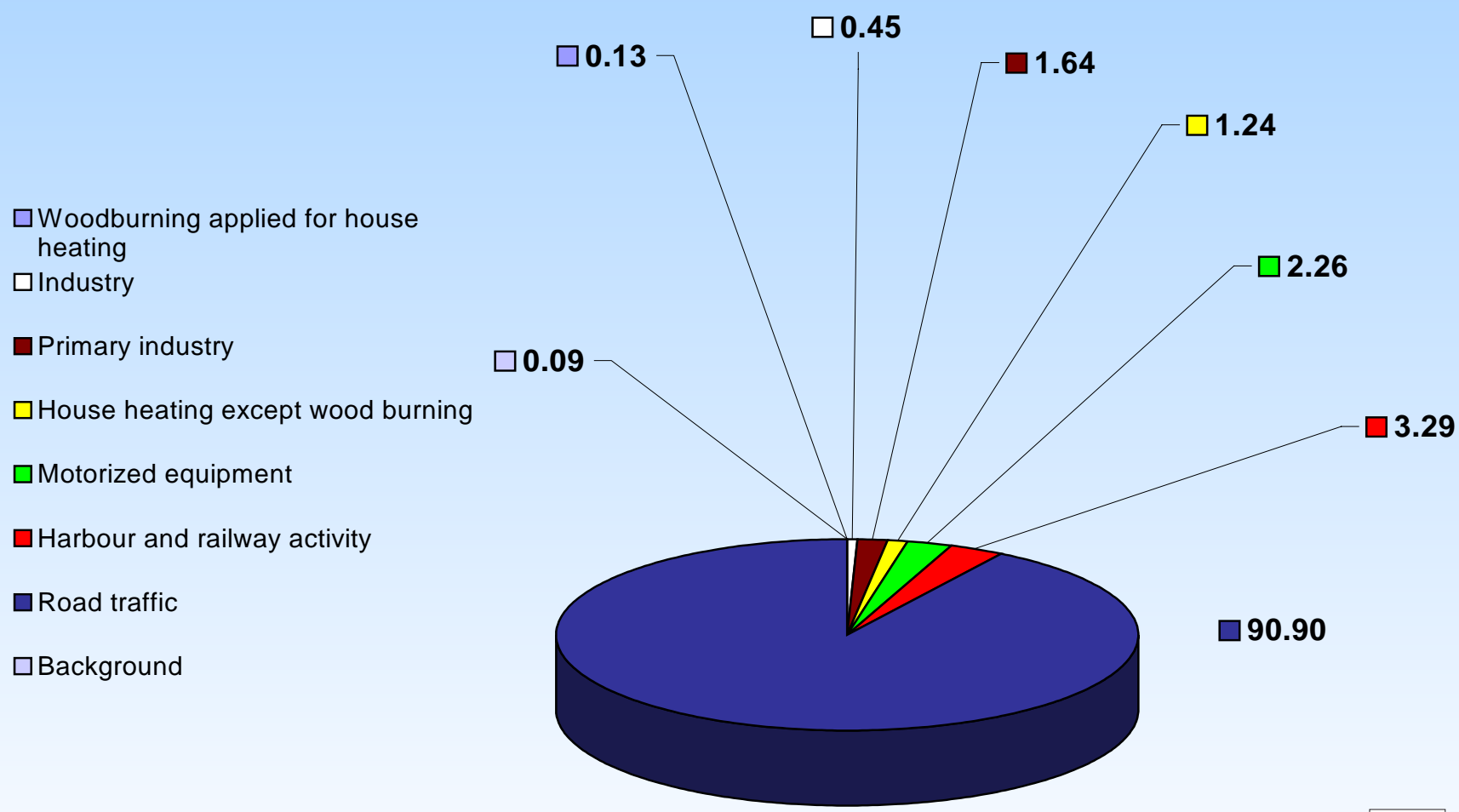
# PM<sub>10</sub>: Antall personer eksponert over grenseverdi, ved bolig, 2001



# Oslo Kilde-bidrag til overskridelser av NO<sub>2</sub>,

2001

Et utvalgt km<sup>2</sup>-grid, hele perioden



## Kilde-bidrag til overskridelse av PM10, 2001

Utvalgt km<sup>2</sup>-rute, hele perioden

■ Woodburning applied for house heating

■ Industry

■ Primary industry

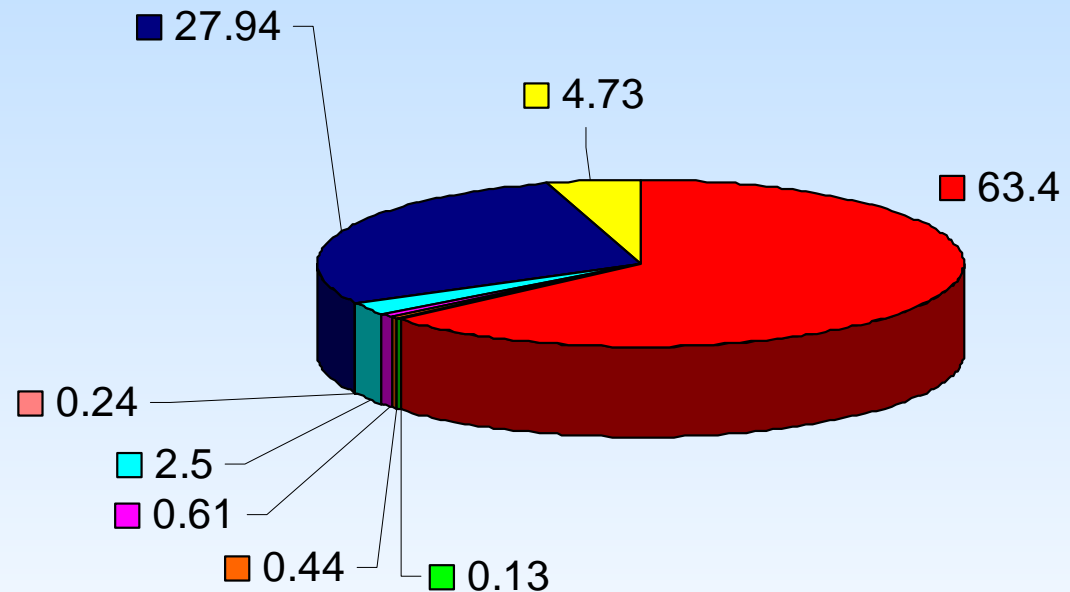
■ House heating except wood burning

■ Motorized equipment

■ Harbour and railway activity

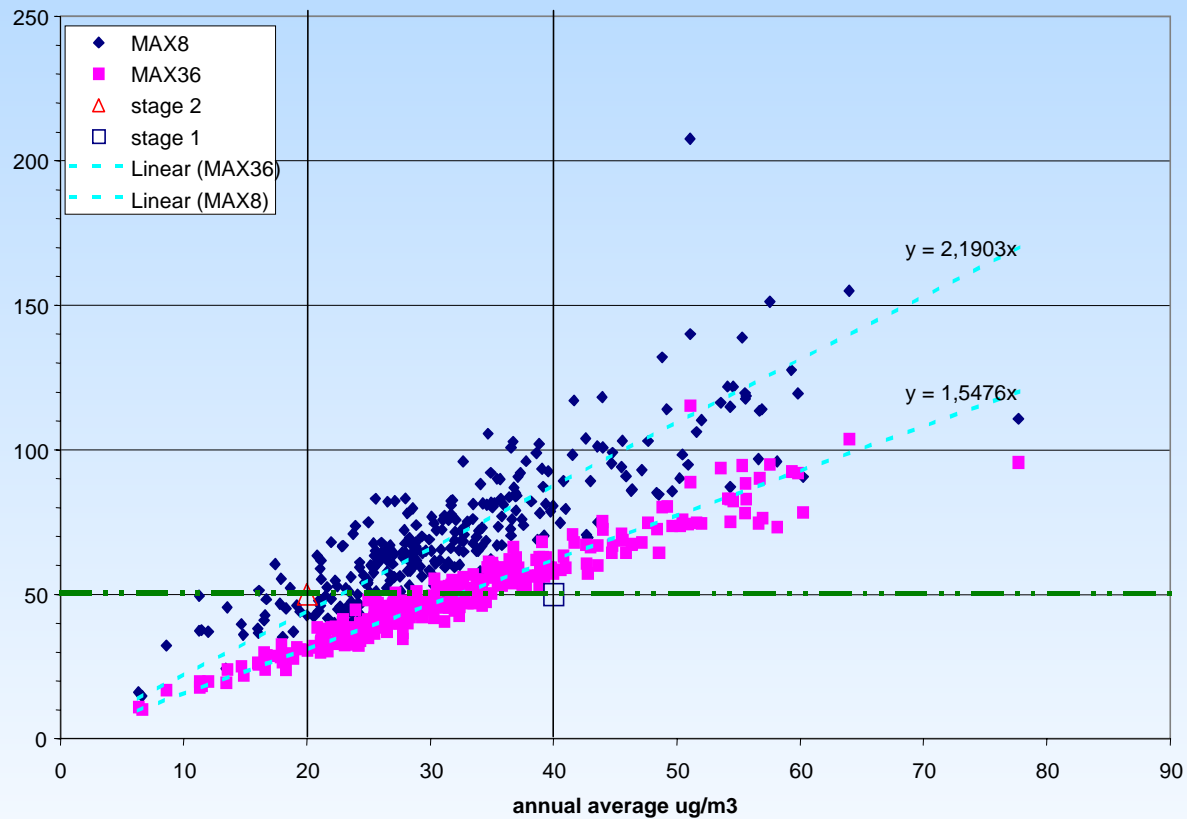
■ Road traffic

■ Background



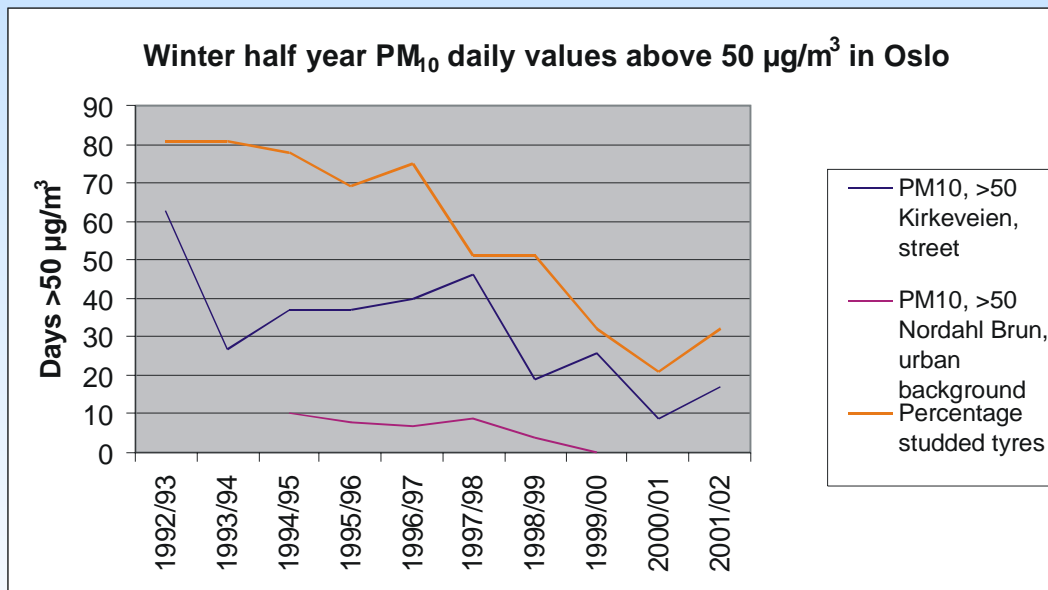
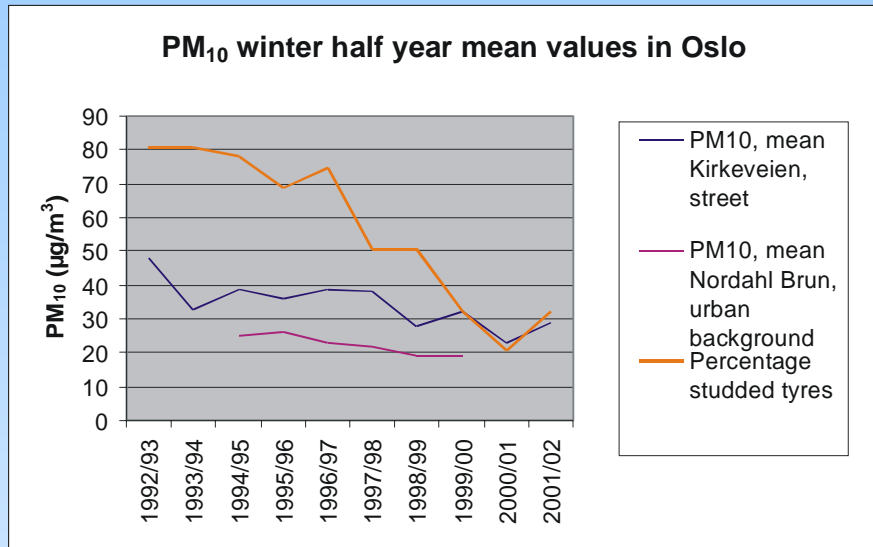
# PM10 2001 Distribution of concentrations at stations

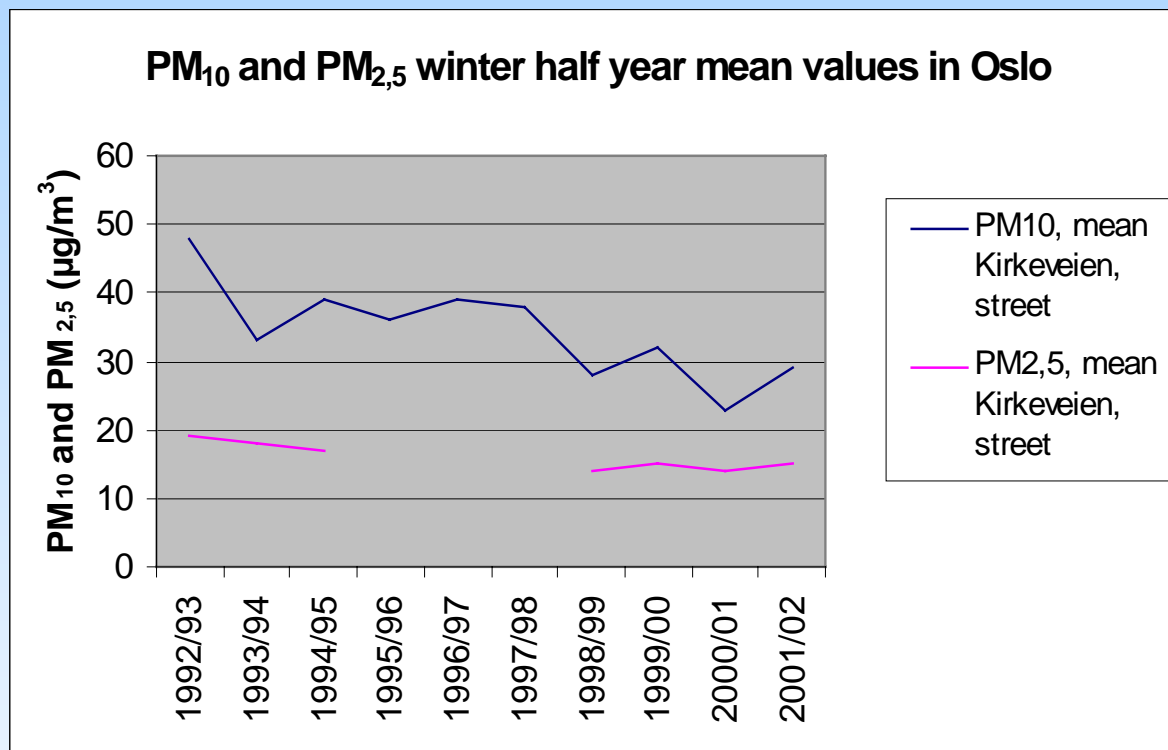
## Street stations



❖ Hva er effekten av å redusere  
piggdekk-andelen i Oslo??

# Trends i PM<sub>10</sub> og andel piggdekk



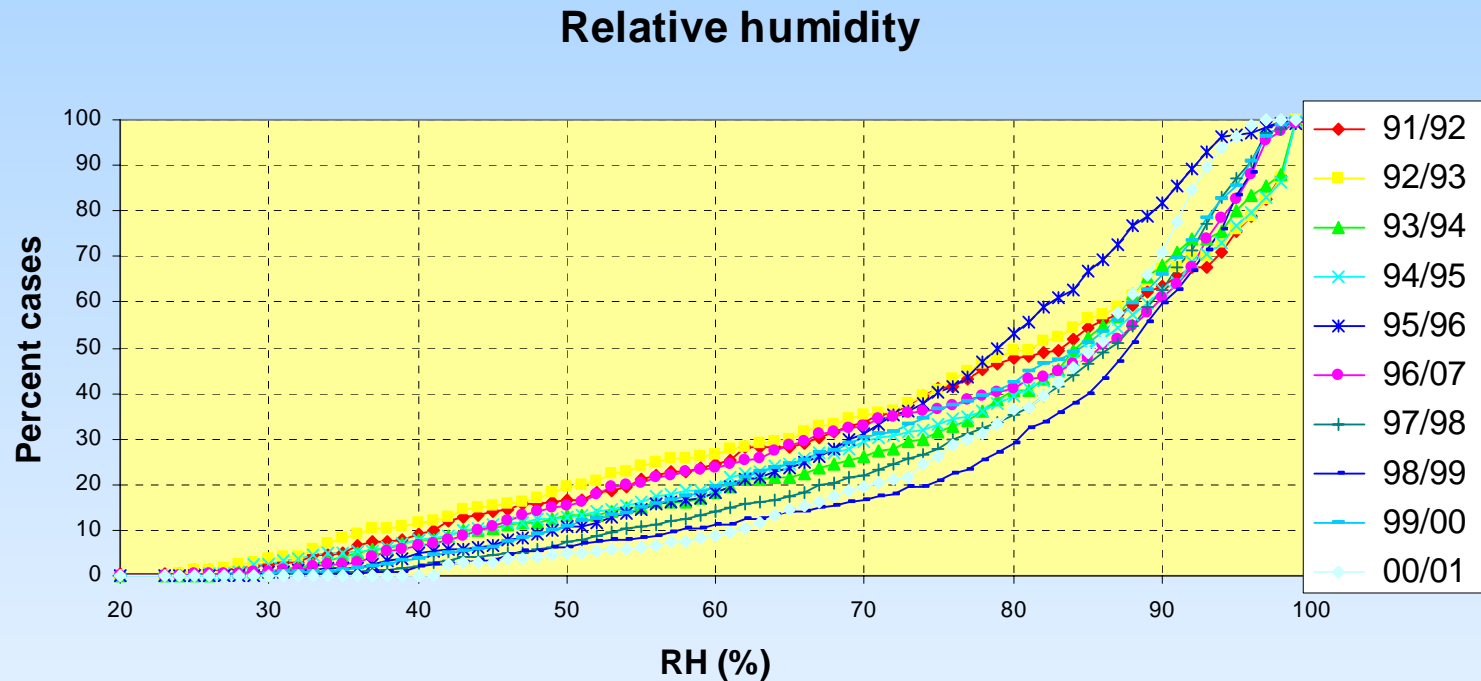


Source: NILU

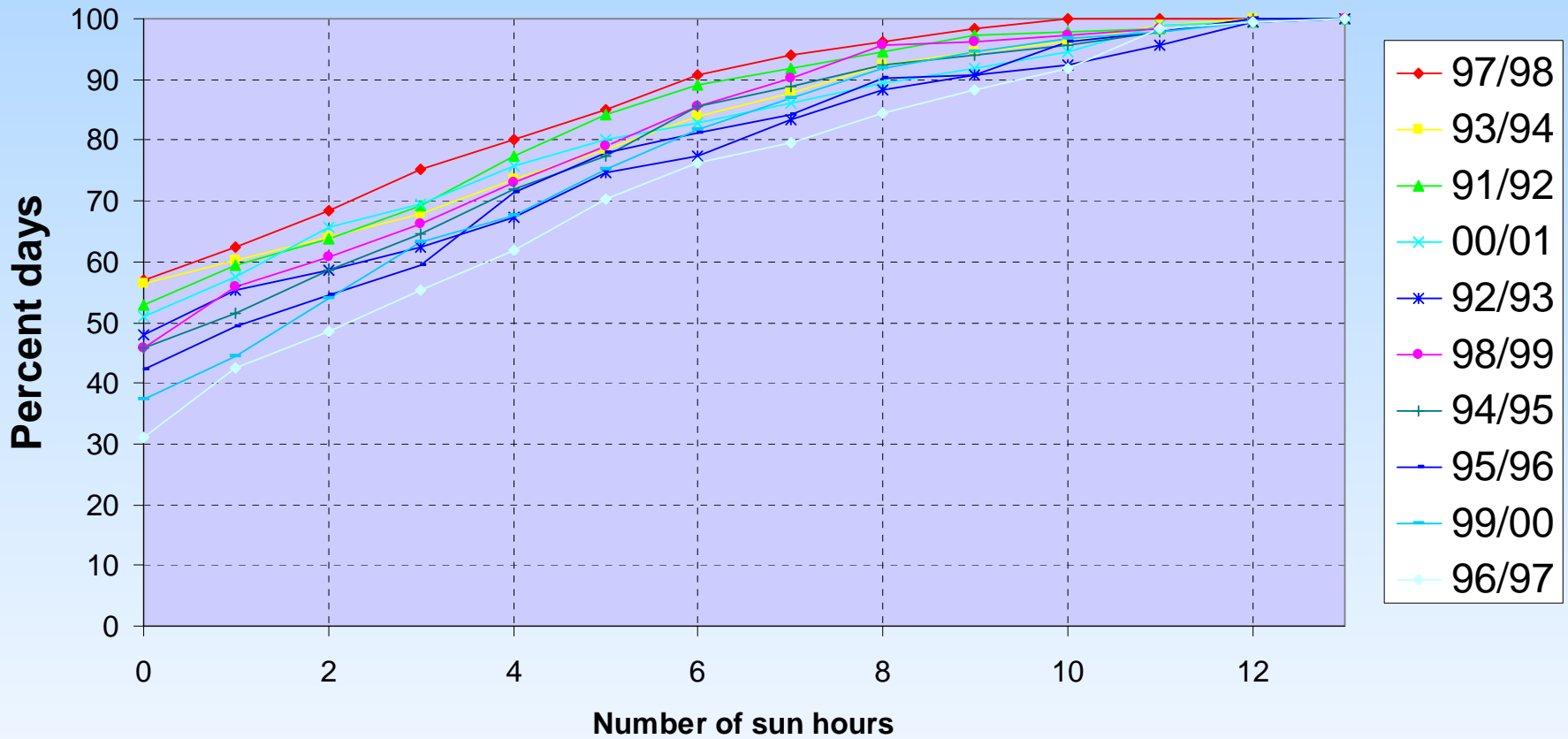
# Hva hendte i Oslo 1991-2002

- ❖ Changes in traffic (ca. 10% more through tollstations, increased speed, volume heavy traffic stable(?), Improved road network)
- ❖ Technological development (leading to reduced emissions)
- ❖ Changes in emissions from other sources (no data)
- ❖ Weather not the same
- ❖ Reduced percent light vehicles with studded tyres

# Surface dryness determines the resuspension rate



# Vinter season sunshine



# Simple method

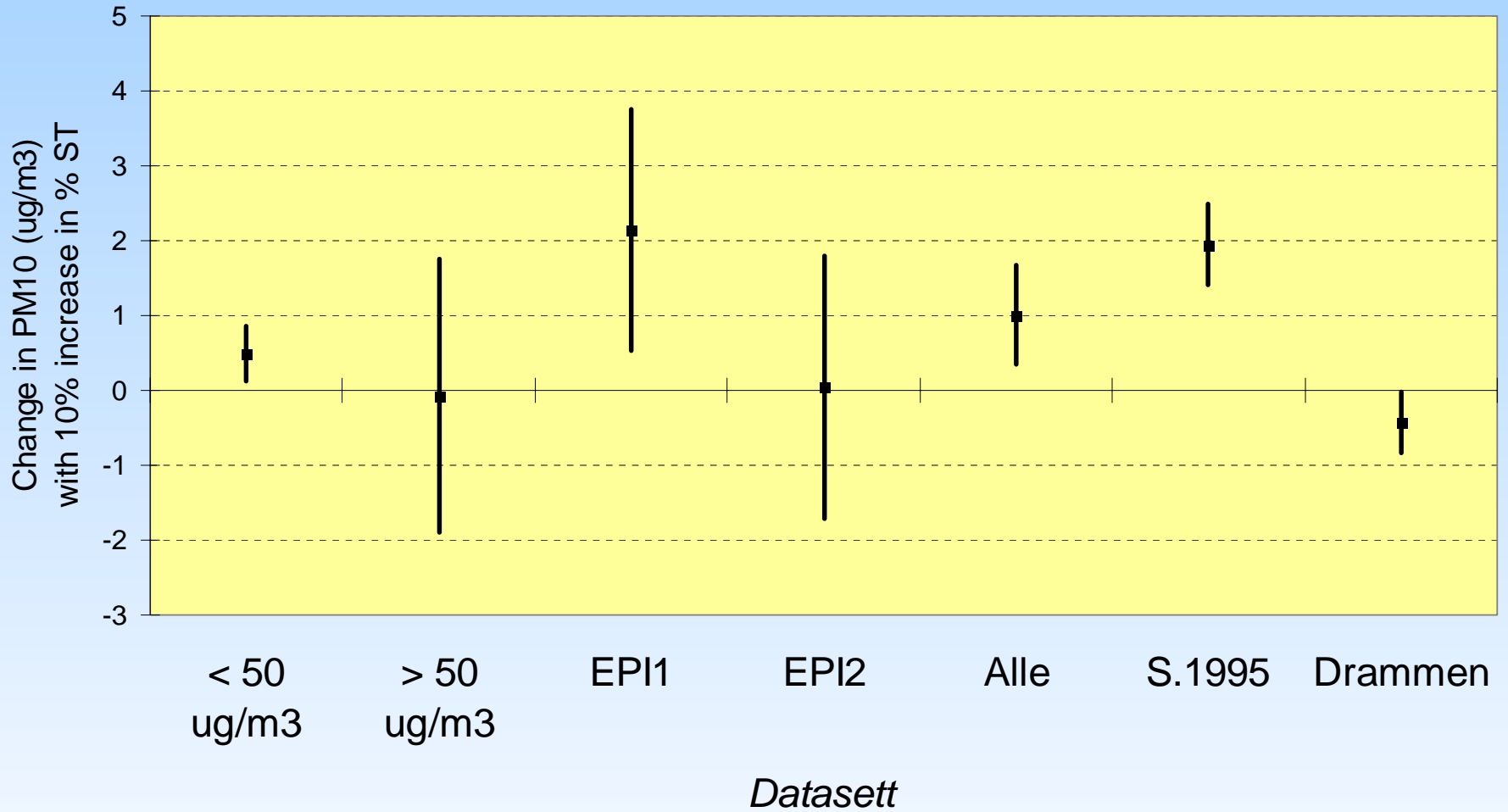
- ❖ (Multiple linear regression, SPSS Inc.)
- ❖ Two-stages model:
  - (1) account for meteorology
  - (2) treat residual – look for dependencies
- ❖ Alternative: Allow for unspecified additive changes between years (dummies for year instead for %studded tyres)

# Partitioning of the dataset

## All data

- ❖ Data after 1995 (better meteorology)
- ❖ Homogenous episodes
  - Low wind days, no precipitation (EPI 1)
  - Days with good dispersion (EPI 2)
- ❖ High/low days
  - Days  $>50 \mu\text{g}/\text{m}^3$  at one station or more ( $>50 \mu\text{g}/\text{m}^3$ )
  - Days  $<50 \mu\text{g}/\text{m}^3$  at all stations ( $<50 \mu\text{g}/\text{m}^3$ )

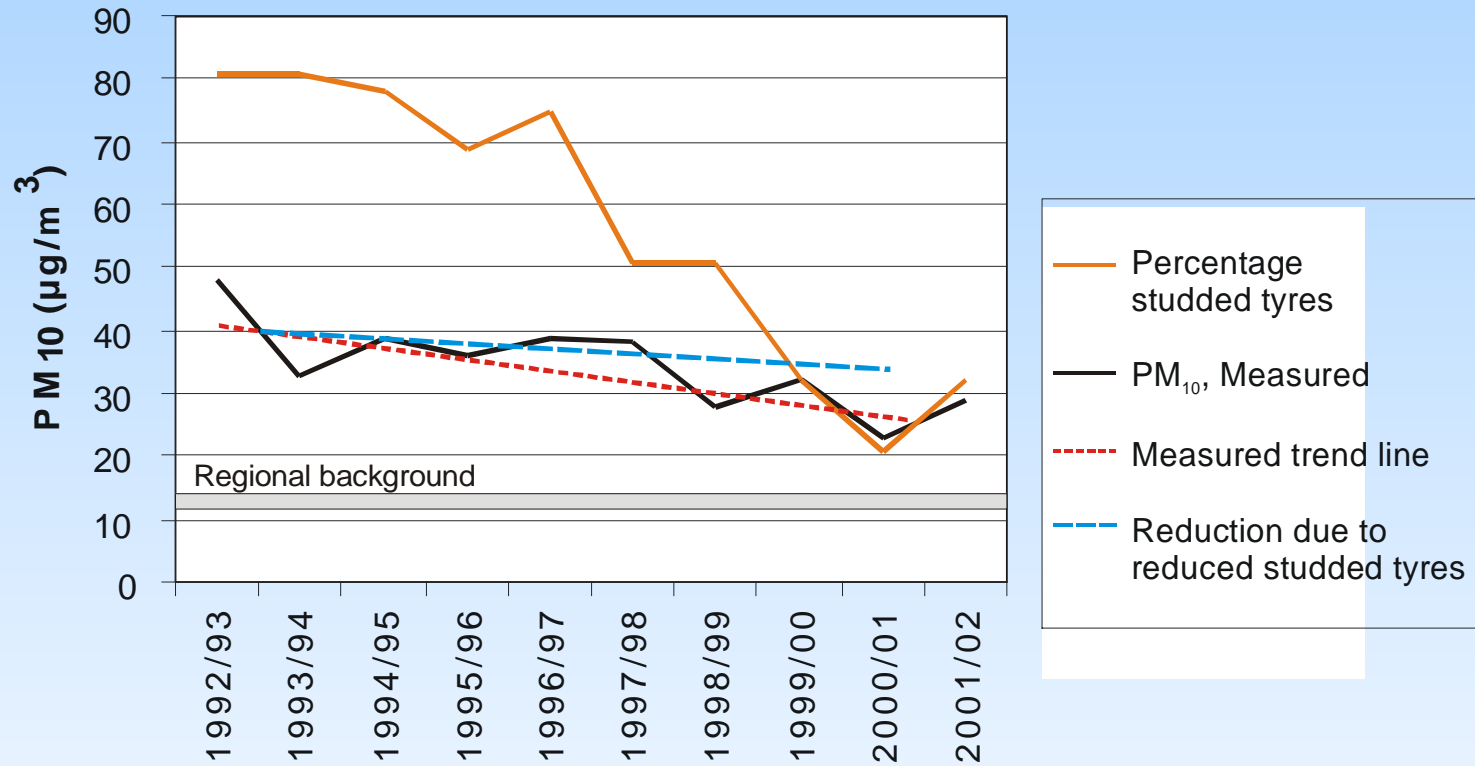
# Results



## ❖ Konklusjon:

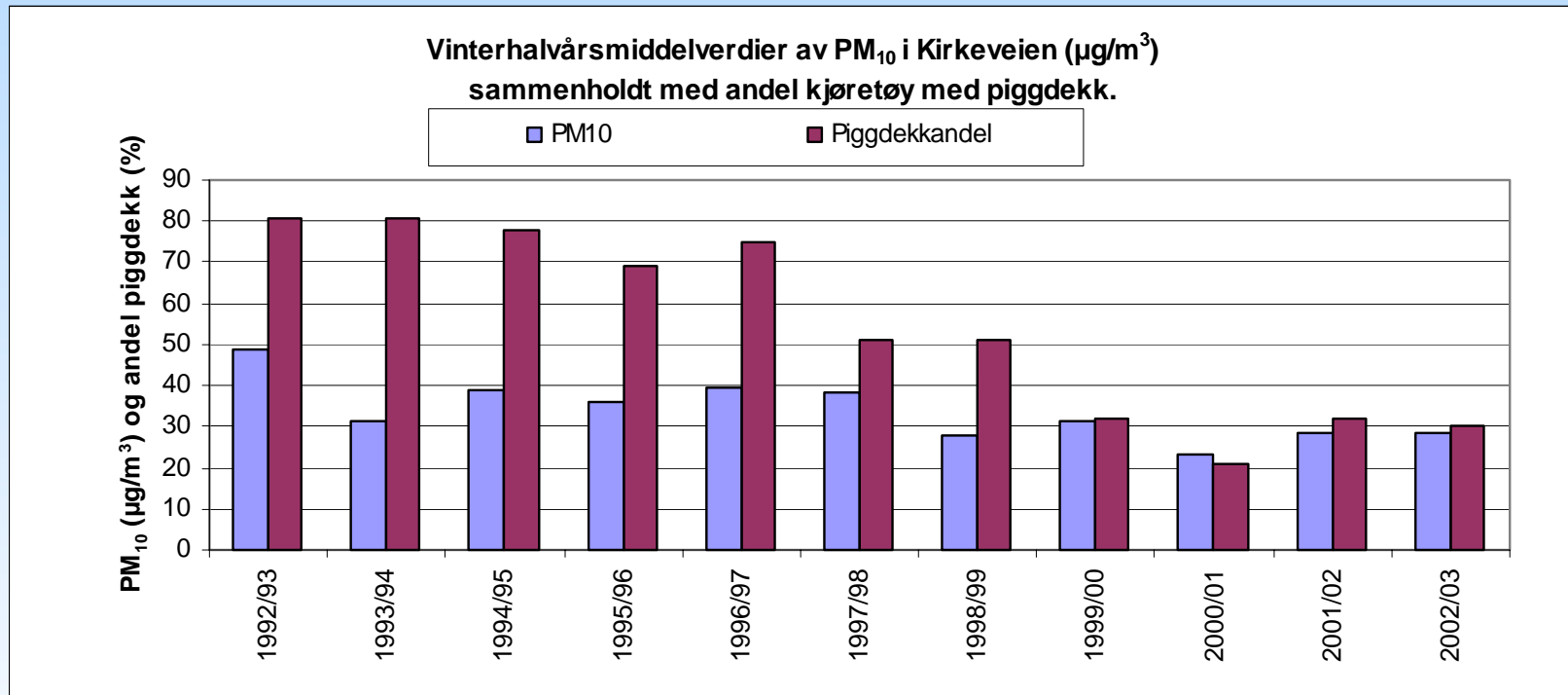
- ❖ PM10-konsentrasjonen i Kirkeveien (vintermiddelverdi) avtar ca 1-2 ug/m<sup>3</sup> per 10% reduksjon i piggdekkandel.

# Estimert reduksjon i PM10 på gatestasjon (Kirkeveien) på grunn av redusert andel piggdekk



# Piggdekkandelen har økt igjen siden 2001: Hva skjer så?

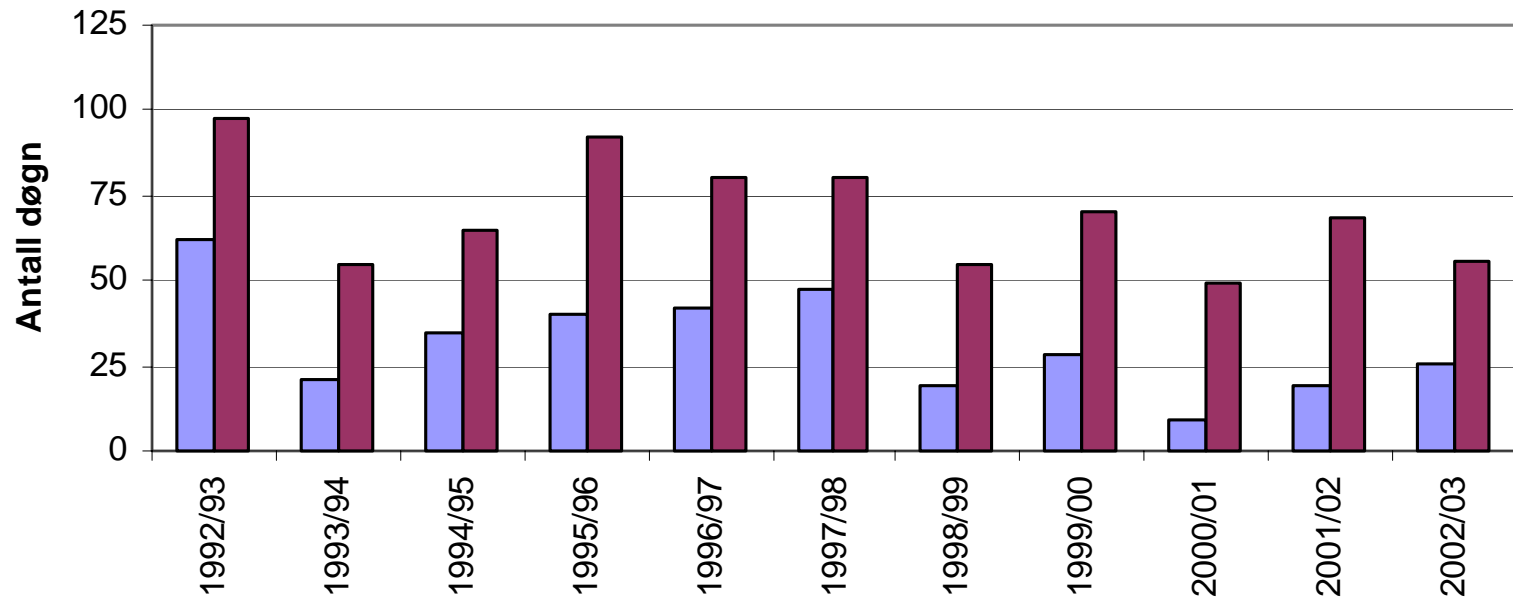
Vintermiddelerdi

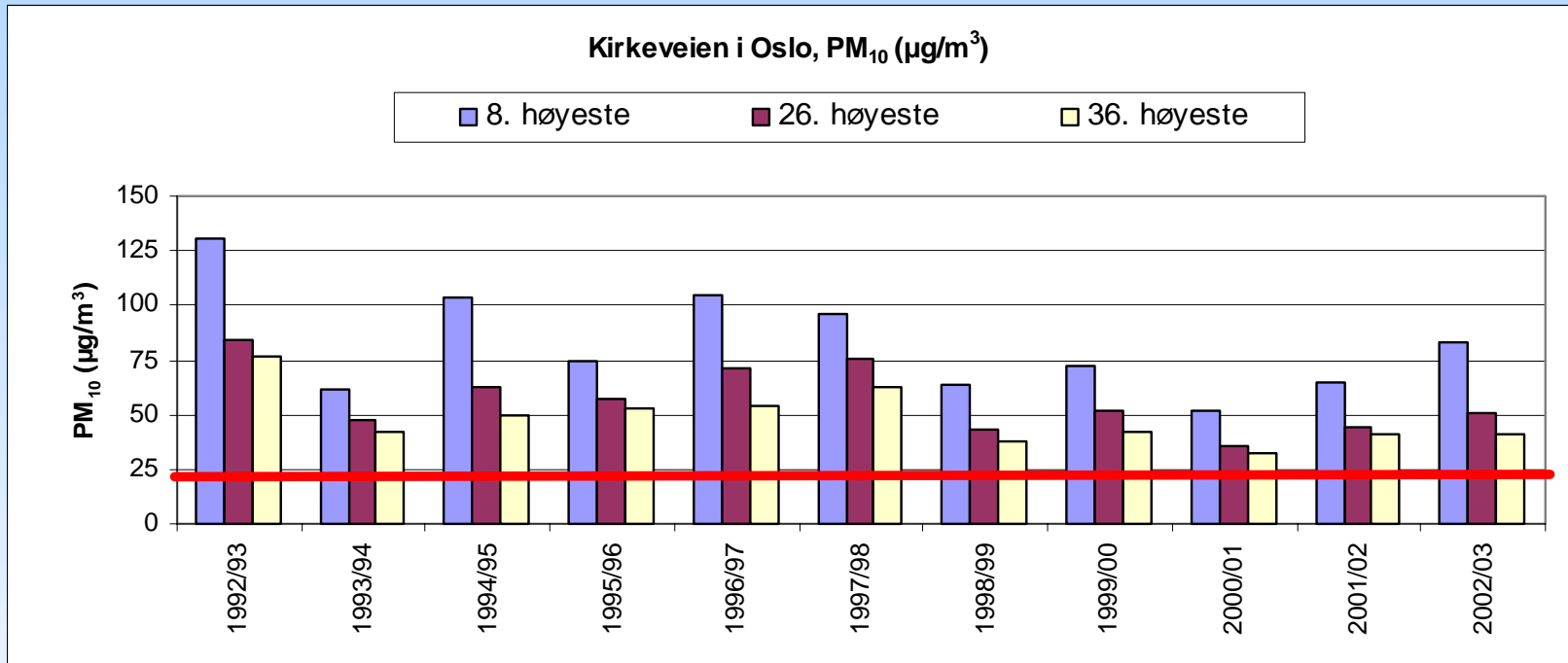


### Kirkeveien i Oslo, PM<sub>10</sub> (µg/m<sup>3</sup>)

Antall > 50

Antall > 30





- ❖ Er det piggdekkene som har skylden?
- ❖ Ja, for det meste av grovfraksjonen, selv om piggdekkandelen er så liten som 20-40%
- ❖ Nei, ikke til PM2.5, men piggdekk-avslitt støv gir et bidrag også her.

# Friksjon - sikkerhet - ulykker

- ❖ Salting God effekt ved temp. ned til ca  $-7\text{ }^{\circ}\text{C}$
- ❖ Sandning: en kilde til PM
- ❖ en viss andel piggdekk er nødvendig:  
  
friksjonsdekkene gir glatt vegbane  
på snødekte veier
- ❖ Ulykkes-frekvens ??

# Andre tiltak

- ❖ Veirenhold: en viss, kortvarig effekt (generelt resultat)

- ❖ Fukt - film:  $MgCl_2$

Studie i Trondheim:

- påføring ved tørr vegbane, 2 ganger per uke
- kan redusere antall dager over grenseverdien.

- ❖ Hastighets - reduksjon:

- akutt-tiltak en gang i Oslo (2001), 80-60 km/h
- planlagt studie i Oslo: permanent lavere hastighet på en innfartsvei (denne vinteren).

- ❖ Belegningstype

Takk for  
oppmerksomheten!

[www.nilu.no](http://www.nilu.no)

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