Monitoring and Informing the Public on Air Quality in the Helsinki Metropolitan Area

Maria Myllynen, Expert on Air Quality, M. Sc.

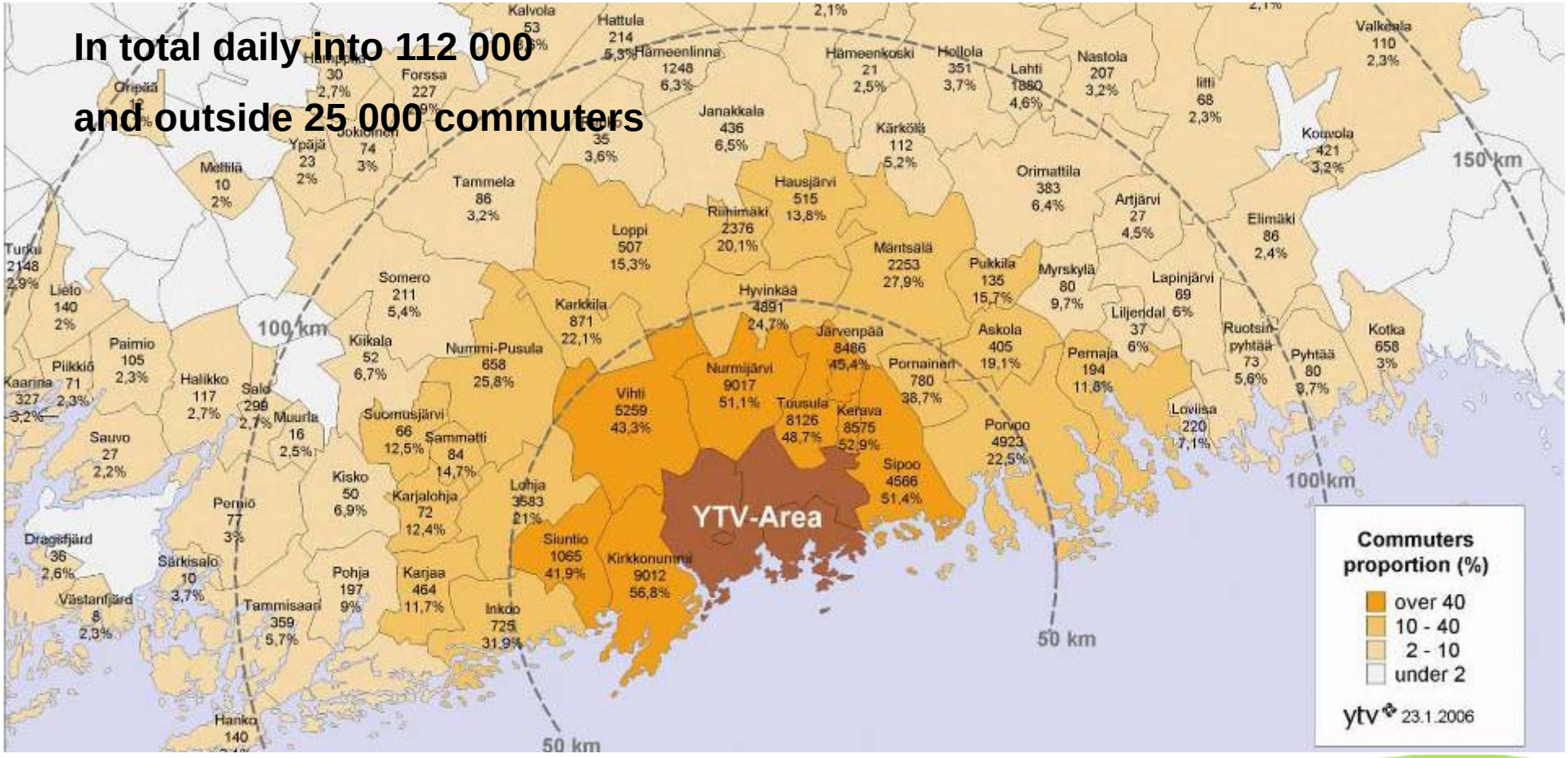
28.8.2007

Helsinki Metropolitan Area

Helsinki Metropolitan Area

In total daily into 112 000

and outside 25 000 commuters



YTV in 2007

The principal duties of the Helsinki Metropolitan Area Council (YTV) comprise

- **Waste management of member municipalities**
- **Regional public transport**
  - **procurement of regional transport services**
  - **member municipalities' co-operation on public transport**
  - **public transport and transport system planning**
  - **fare and ticket system and regional fares**
- **Monitoring, research, planning, as well as training and information services for air-pollution control in member municipalities**
- **Surveys, research, planning and preparatory services for the Metropolitan Area and its municipalities**

YTV Regional and Environmental Information
Air Pollution Control Group

- **Air quality monitoring in the Helsinki metropolitan area**
- **Informing the public on air quality**
- **Air quality research and planning**
- **Air quality communications and education**

Monitoring Air Quality In Helsinki Metropolitan Area

The objectives of air quality assessment and management in the Helsinki metropolitan area

- Informing the public on air quality
- Monitoring the compliance with
  the limit and target values and national guidelines
- Evaluating the effects of air pollutants on health and ecosystems
- Evaluating the effects of abatement measures
- Enhancing air pollution control in city and transport planning
- Providing good quality air quality data for research purposes

Legislative basis for air quality assessment

Environmental pollution control act.

- **Municipalities are obliged to be aware of the state of the environment in their territory and take measures whenever the limit values are exceeded**
- **Companies are obliged to be aware of the effects of emissions on the environment. Environmental permits often require air quality monitoring (combined monitoring)**

EU directives regulate air quality monitoring

- **reference methods**
- **quality control**
- **number and type of monitoring sites…**

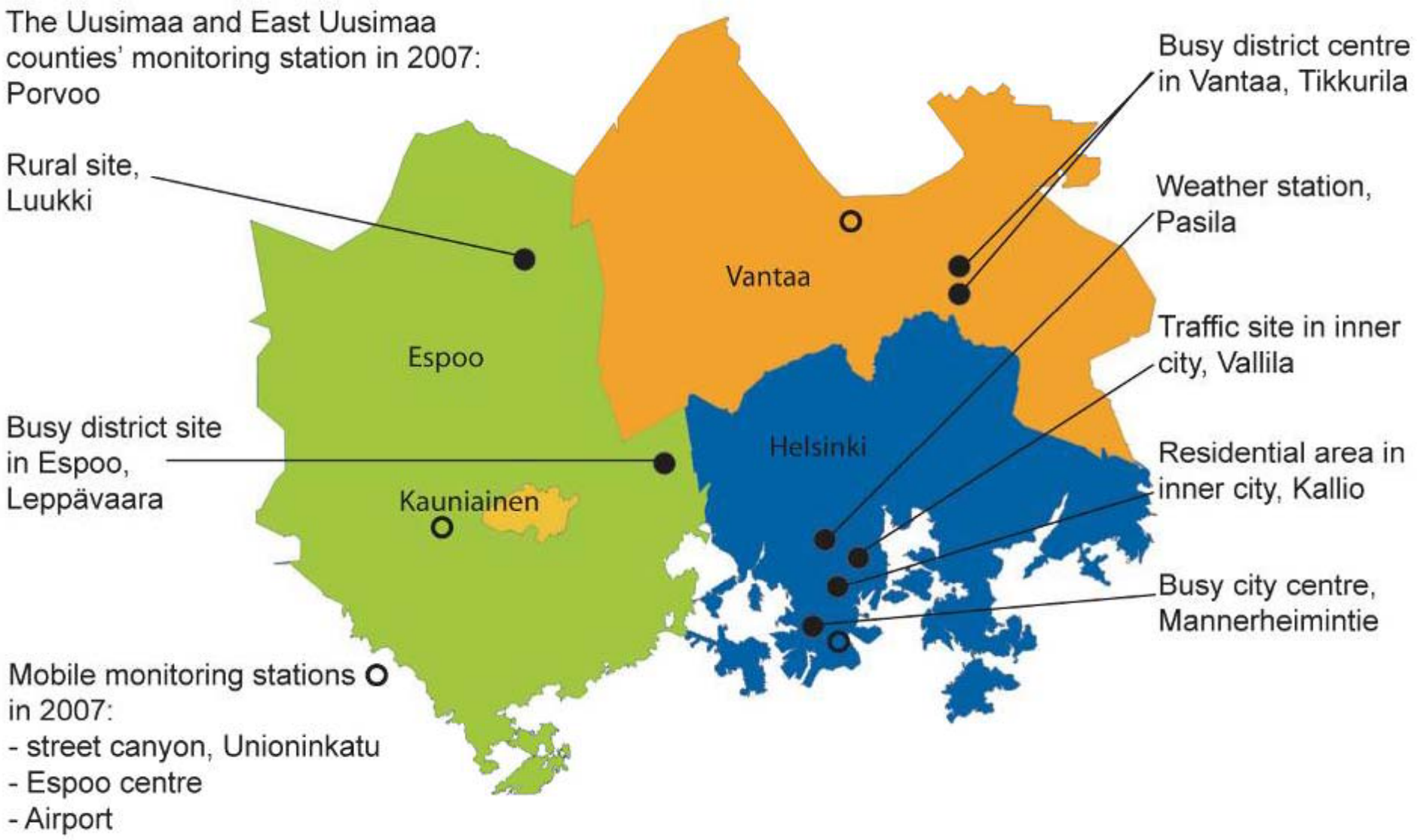
Air quality assessment

YTV area is defined as agglomeration, monitoring zone

1. Continuous monitoring

- **six fixed multicomponent stations**
- **three mobile units**
- **meteorological station**
- **passive sampling**

YTV's air quality monitoring stations



Background stations

- **Kallio, Helsinki**

urban background

- **Luukki, Espoo**

regional background

Air quality monitoring station in Helsinki city centre, Mannerheimintie

Air quality monitoring station in Leppävaara (Espoo, district centre)

Street canyon measurements in Helsinki 2003 –2007

- Runeberginkatu 2004

- Töölöntulli 2006

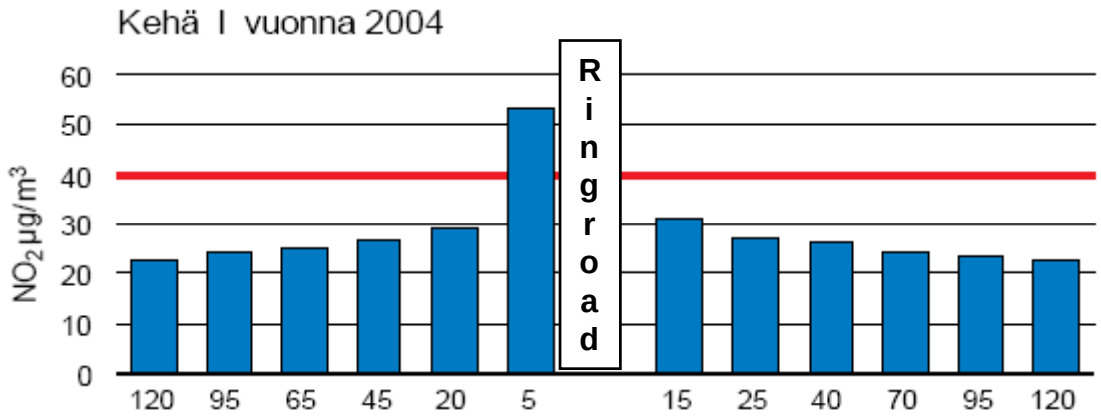
Passive samplers for NO2

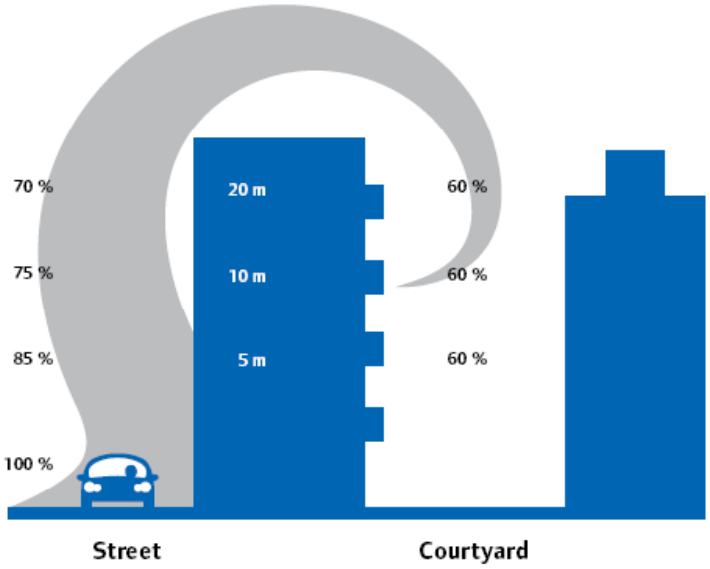
Components

- Sulphur dioxide (1976-)
- Nitrogen oxides (NO and NO_2) (1986-)
- Carbon monoxide (1988-)
- Ozone (1988-)
- Benzene and other VOC (2003-)
- Total suspended particulates (1978-)
- Thoracic particles (1988-)
- Fine particles(1997-)
- Lead (1978-)
- Other heavy metals (2000-)
- Polyaromatic hydrocarbons (2005-)
- Meteorological parameters:

Wind speed, direction, Relative humidity, Pressure, Temperature, Precipitation, Radiation

Passive samplers for NO2 (also VOC)
- in the vicinity of busy ring road and street canyon





- **Samplers indicate that the concentrations are at background level**

  in the distance of 100 m

- **In street canyon:**

  at roof level and courtyards

  the air is usually clenaner than at street level

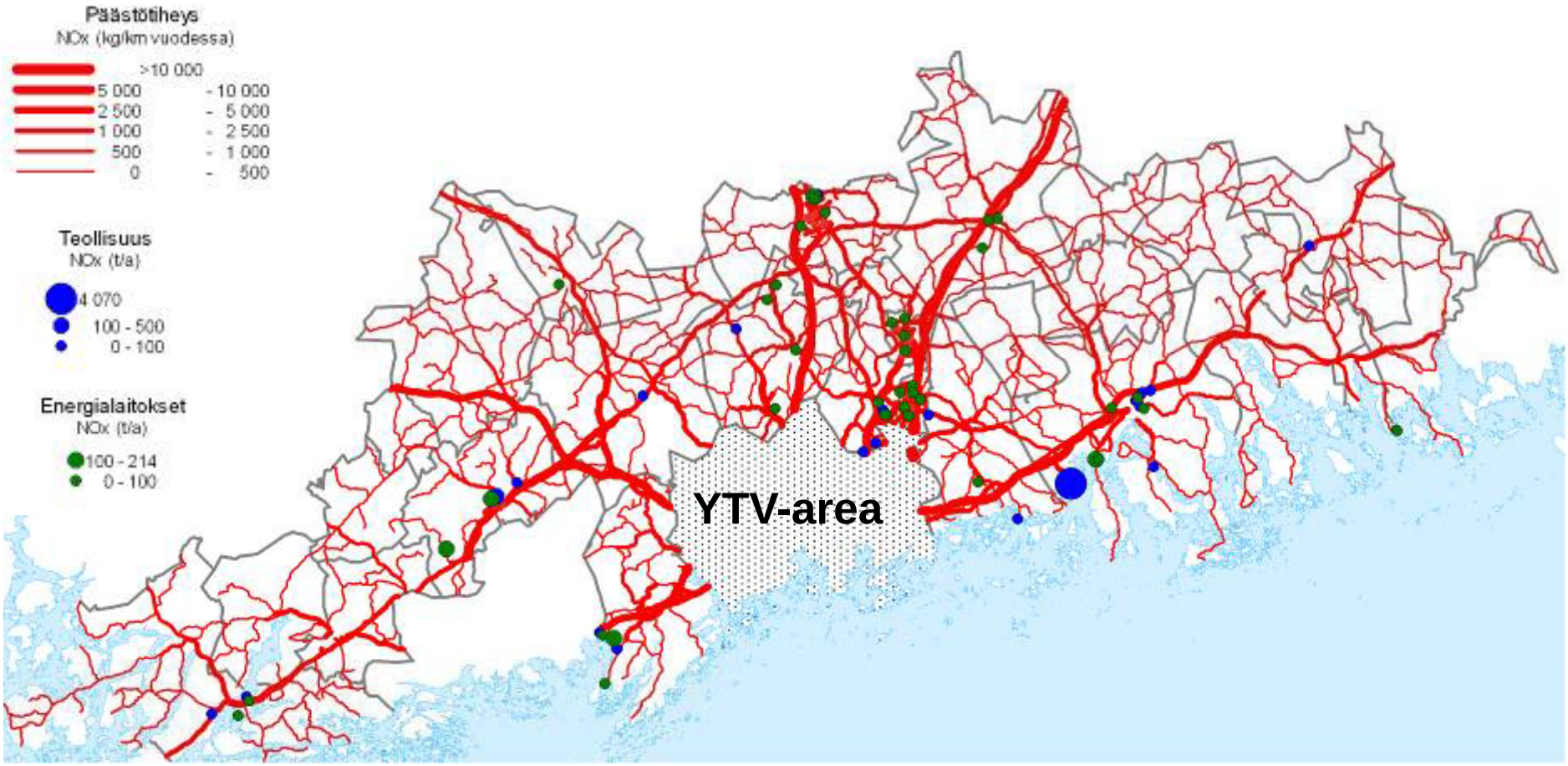
Other air quality assessment methods

2. Emission inventories
- **traffic**
- **energy production**
- **area sources**
- **ships and aircrafts**

3. Modelling
- **in cooperation with the Finnish meteorological institute**

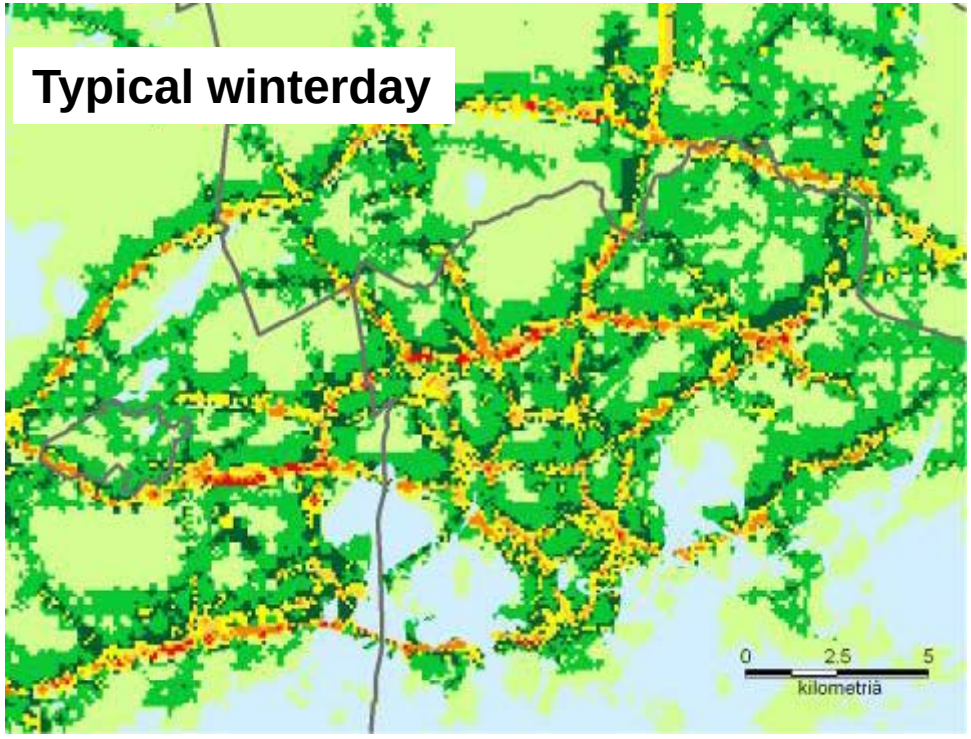
4. Bioindicator monitoring
- **100 sample plots in the area**
- **epiphytes**
- **nutrient content in pine needles**

NOx emissions, Traffic and point sources

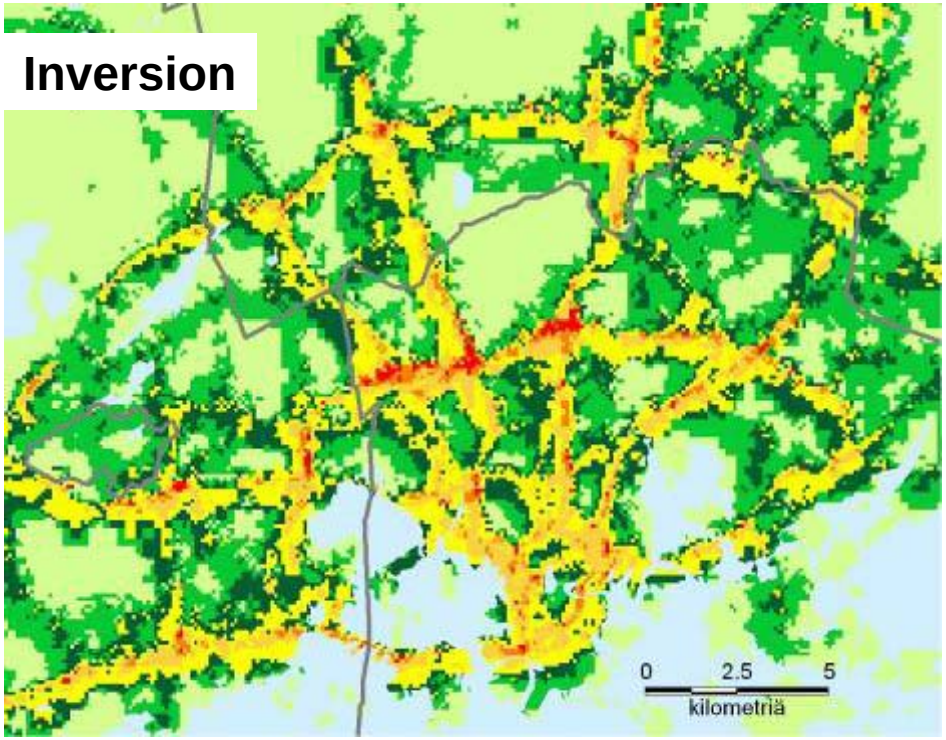


Counties of Uusimaa and East-Uusimaa

The concentrations of NO2 during the morning rush hour

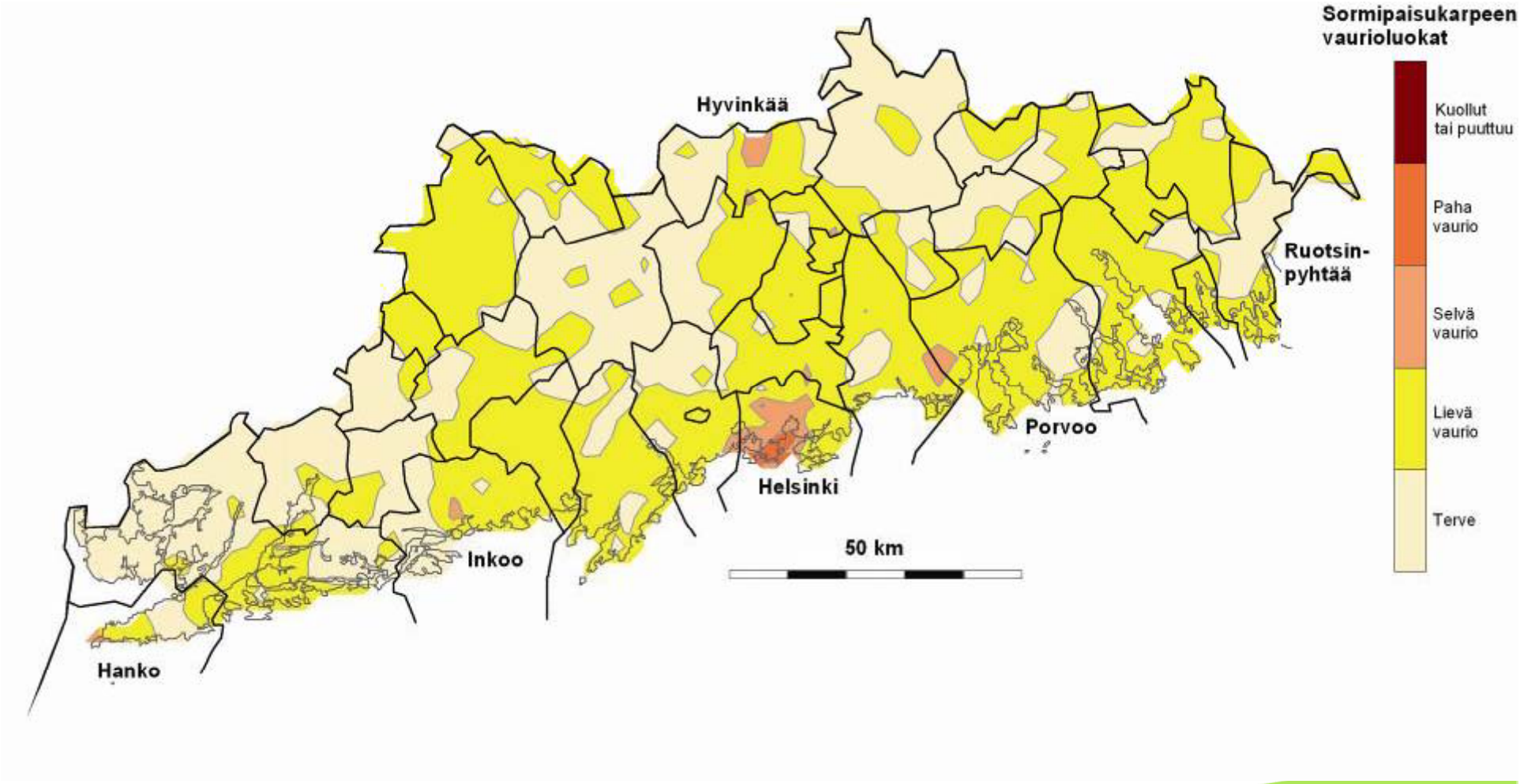


© Helsinki KMO 051/2006 © Teema YTV 2006



© Helsinki KMO 051/2006 © Teema YTV 2006

Damages of Hypogymnia physodes



Air quality in the region

Air Quality in the YTV-region:

- The population, traffic volumes, and energy production are increasing in the Helsinki metropolitan area.
- Air quality is on the average fairly good
- The concentrations of several pollutants are below the limit or target values (SO_2, CO, benzene, heavy metals)

Main sources affecting the concentrations:

- Primary emissions from traffic: $PM_{2.5}$, NO_x, PAH
- Secondary emissions from traffic, e.g. street dust: PM_{10}
- Small scale wood burning: $PM_{2.5}$, PAH, benzene
- Long range transport: $PM_{2.5}$, O_3
- Ship traffic: SO_2, NO_x, PM (effects on air quality near the harbours, effects partly unknown at present)
- Energy production: SO_2, NO_x, PM (has a small effect on air quality on the street level to high stacks)

Problems:

Thoracic particles

Concentrations are high, especially in spring

The 24 h limit value is exceeded along the busiest streets

Fine particles

Adverse health effects have been observed at the fairly low levels typical for the Helsinki area

Ozone

Fairly high average concentrations

No smog episodes of very high concentrations observed

Long term objectives are exceeded

Nitrogen dioxide

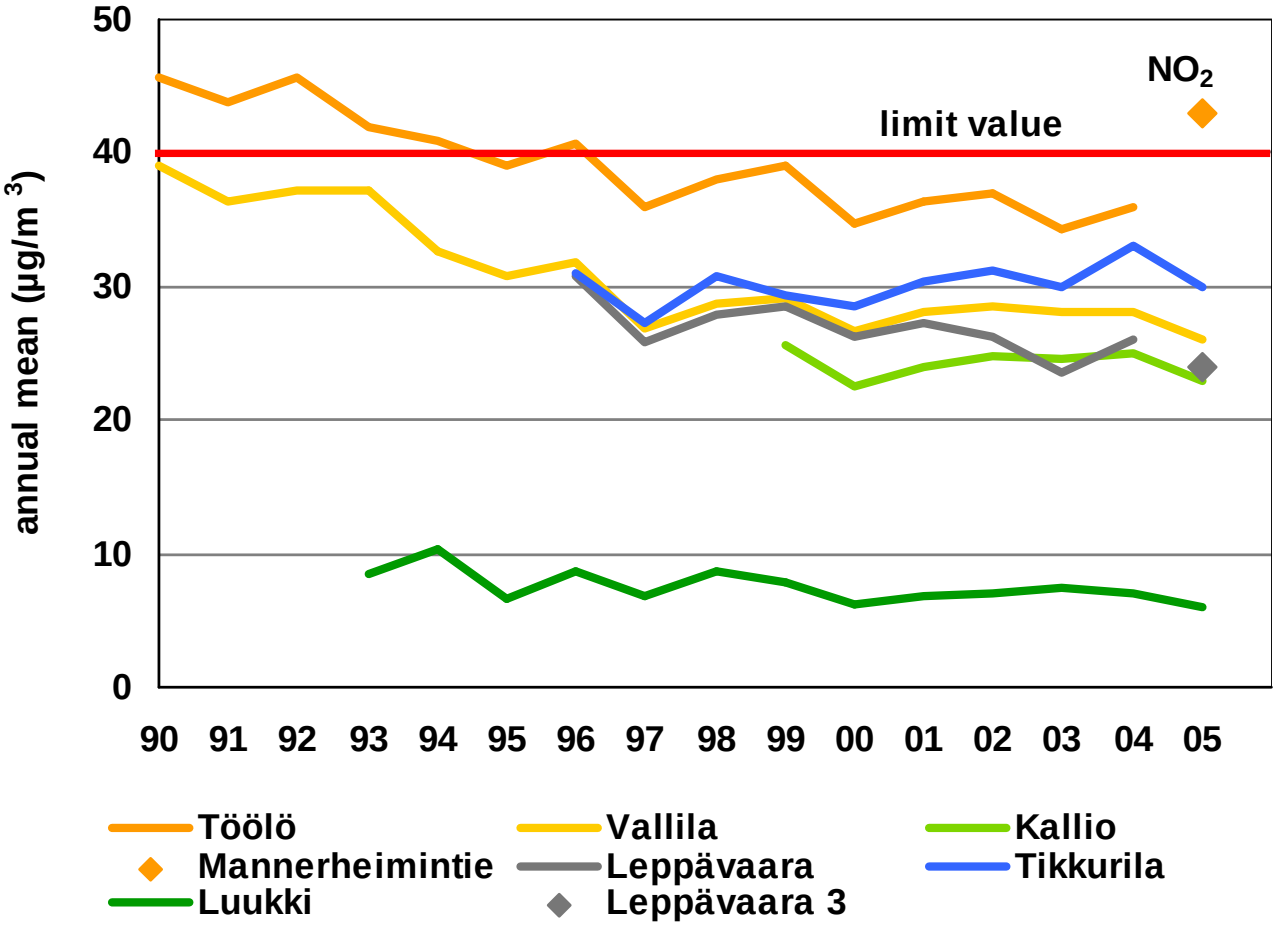
The annual limit value is exceeded along the busiest streets, especially in street canyons

Benzo(a)pyrene

Inadequate data on the concentrations

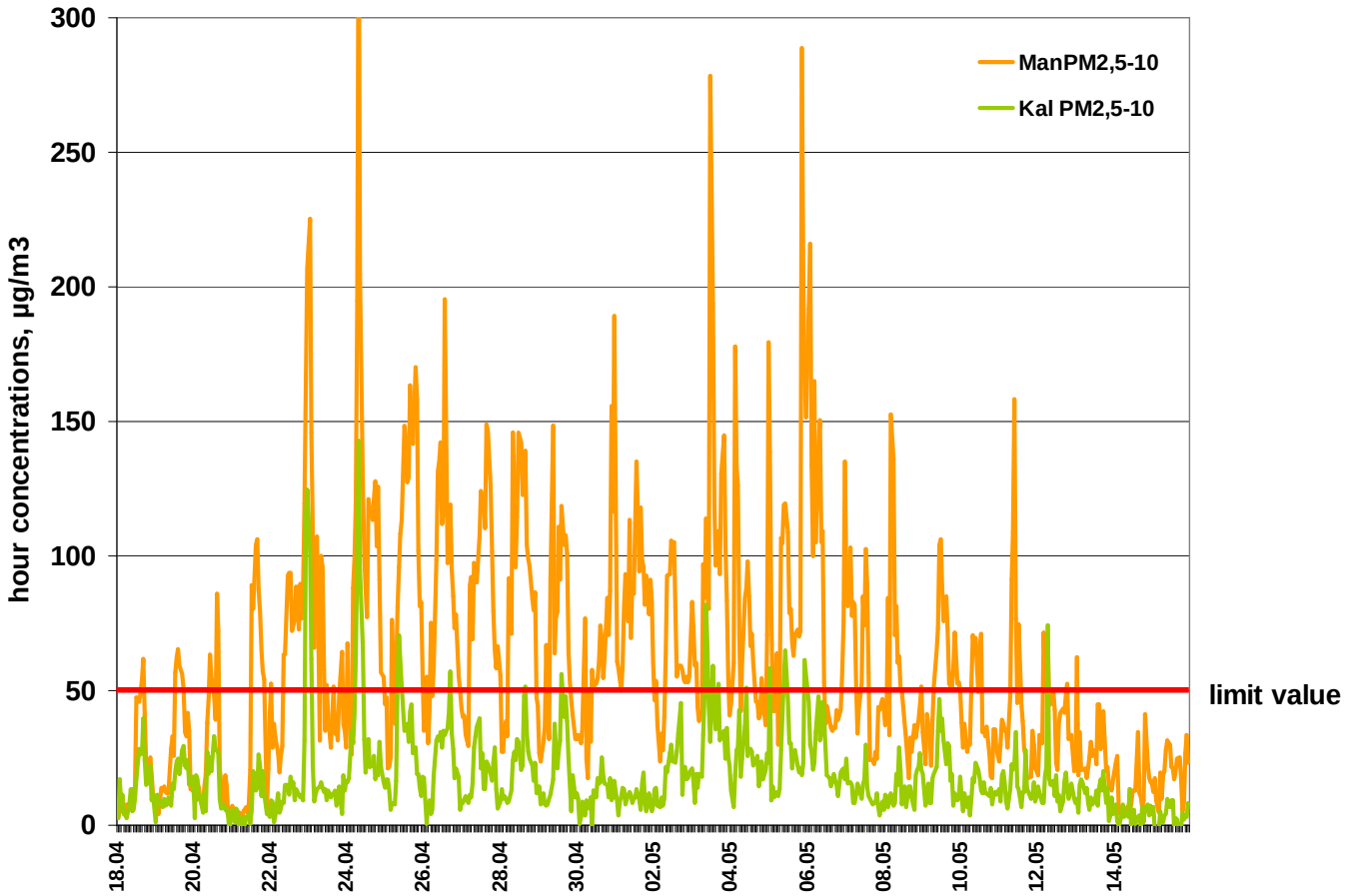
The target value maybe exceeded

The trends in nitrogen dioxide (NO_2) concentrations

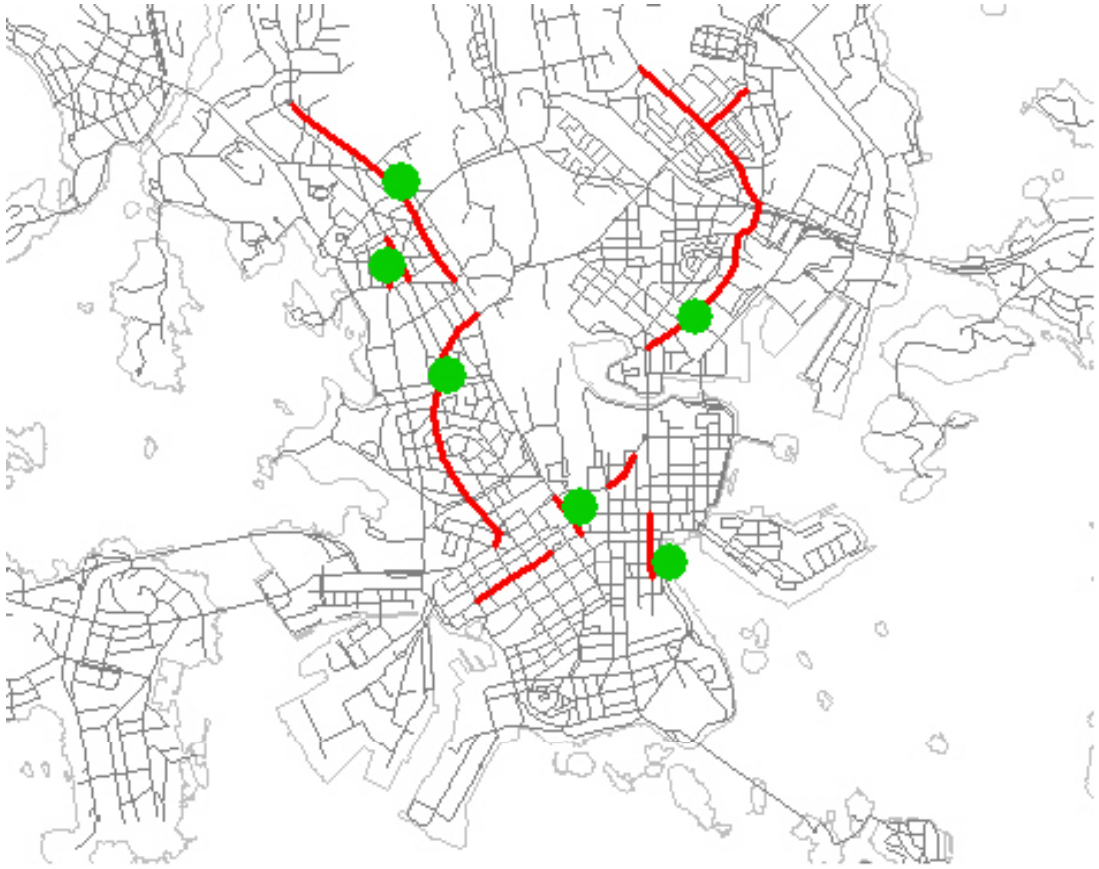


Spring dust episode in March-April

Spring dust episode 2006, coarse particles



The limit value for PM10 is likely to be exceeded in Helsinki along 8 km of canyon-like street sections



The limit value can be exceeded

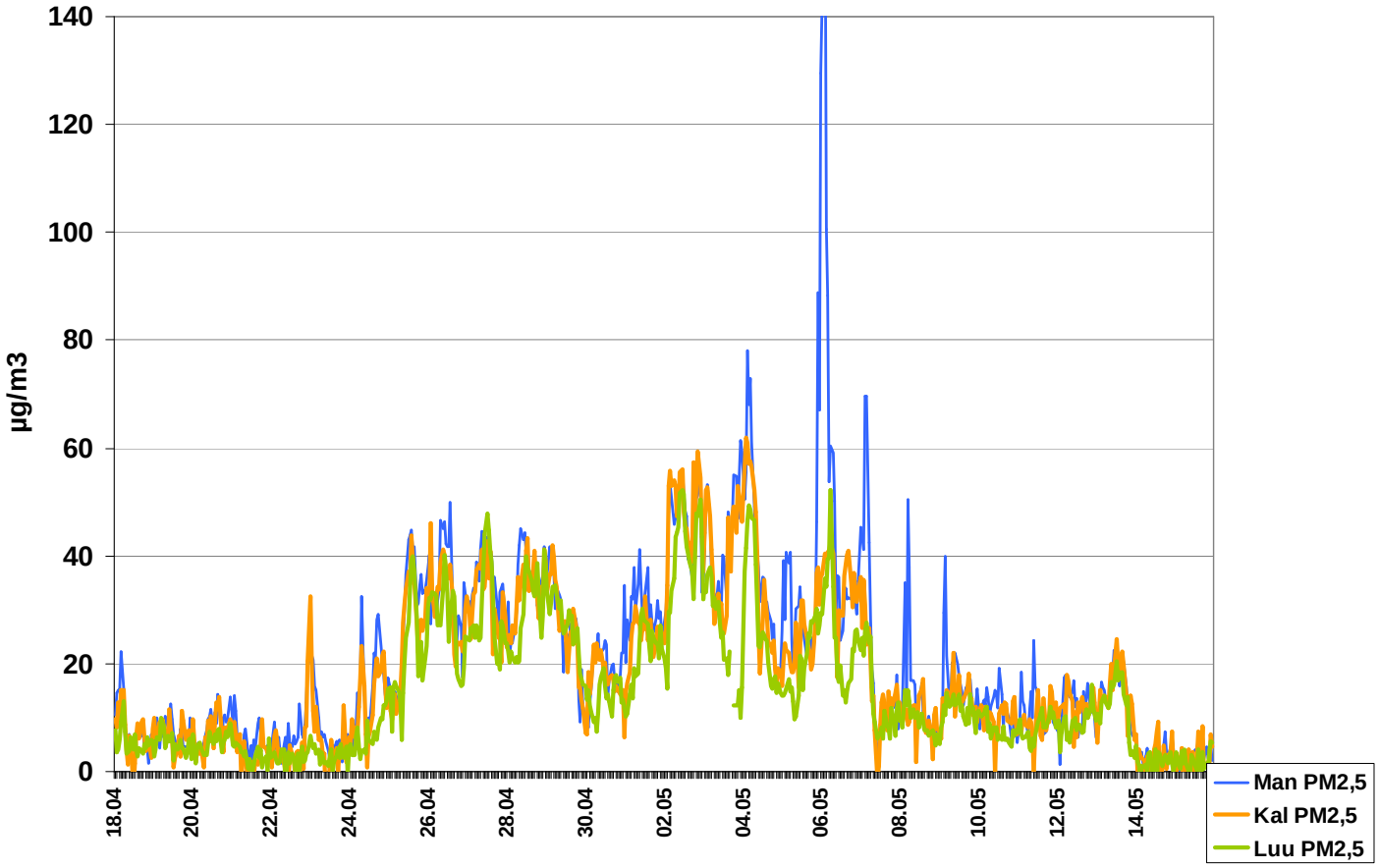
in narrow street canyons with traffic volumes exceeding

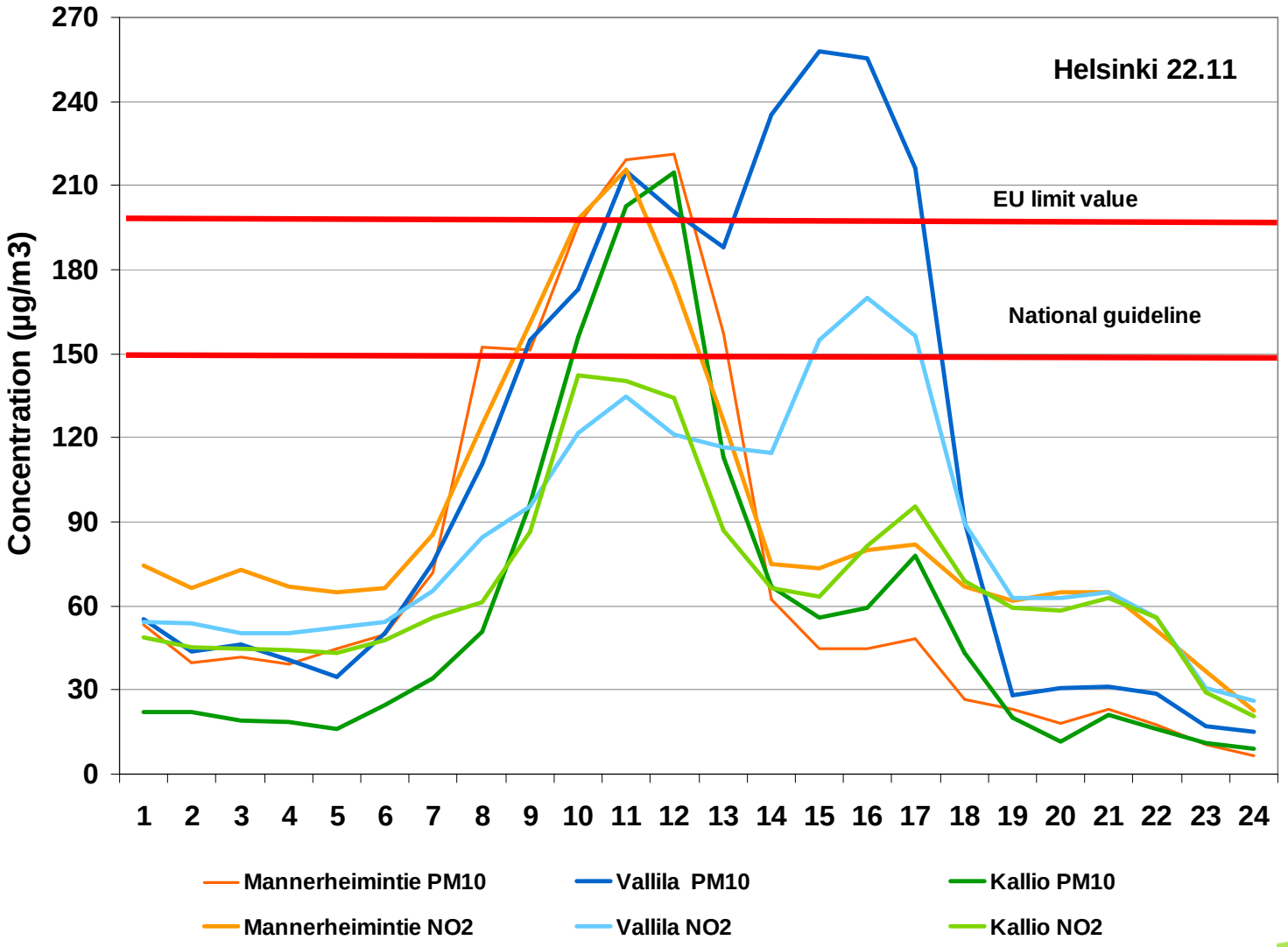
10 000 veh/ per day

in wide street canyons with traffic volumes exceeding 15,000 veh/per day

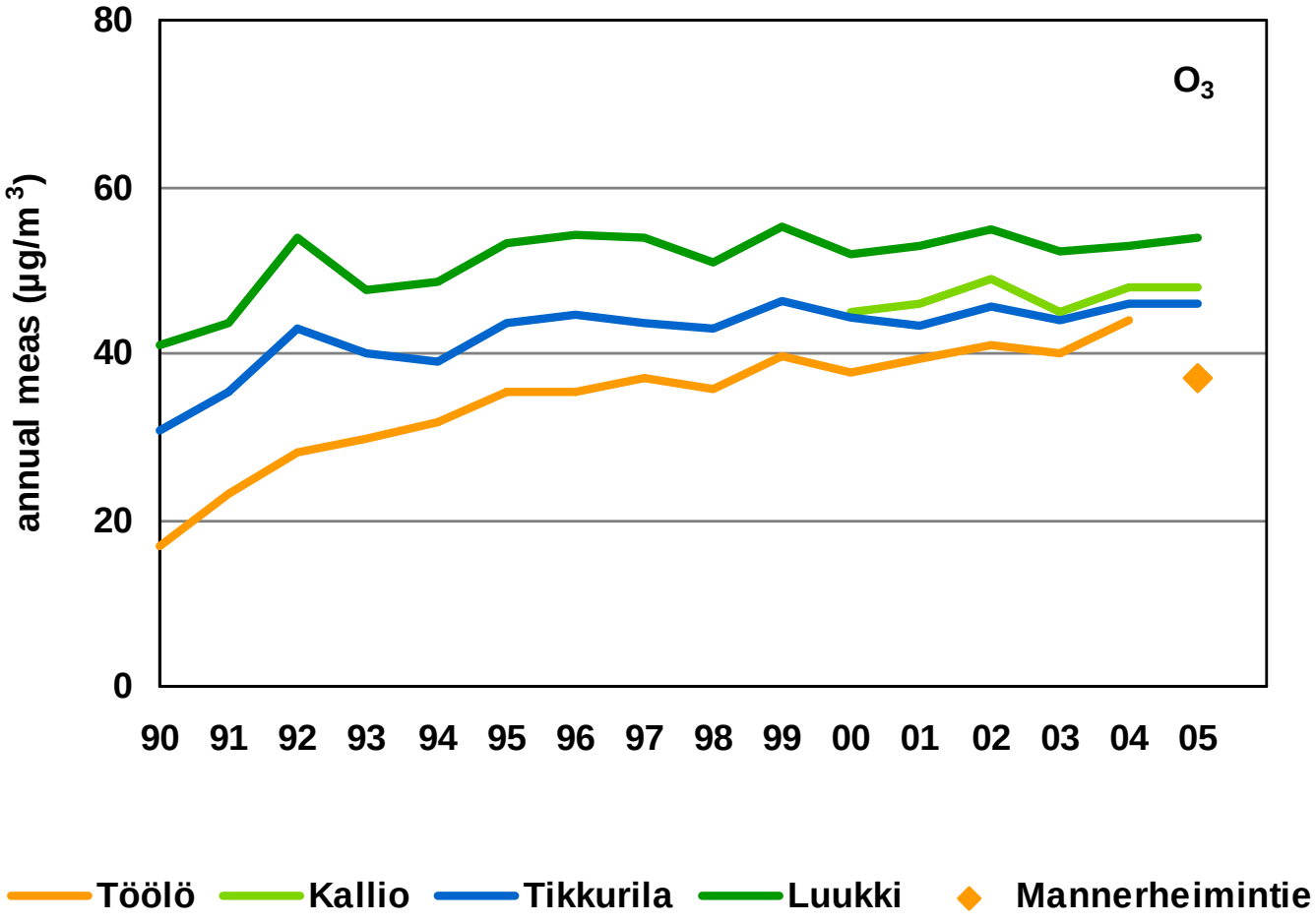
Episodes of long range transported particles

Episode of long range transported particles

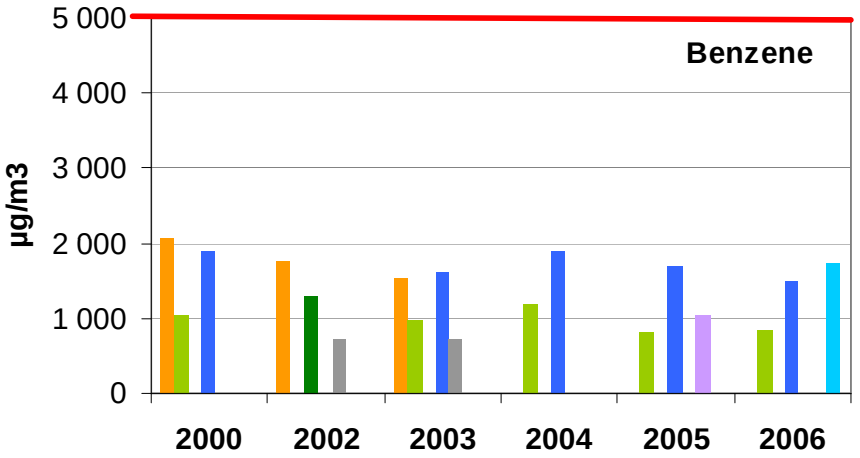


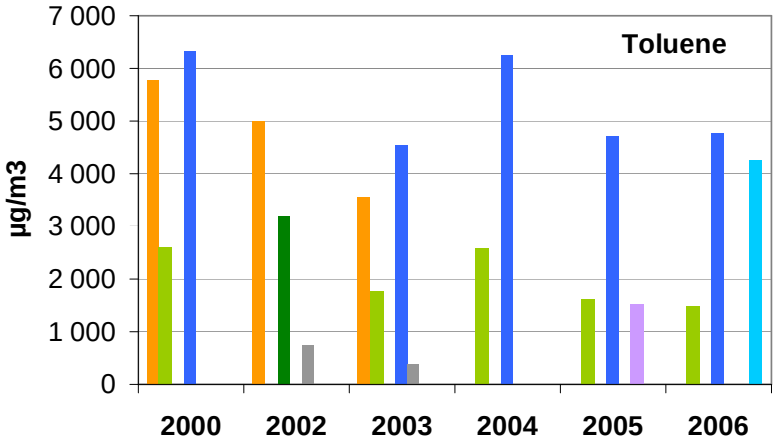

Helsinki 22.11
EU limit value
National guideline
Concentration (µg/m3)
270
240
210
180
150
120
90
60
30
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Mannerheimintie PM10
Vallila PM10
Kallio PM10
Mannerheimintie NO2
Vallila NO2
Kallio NO2

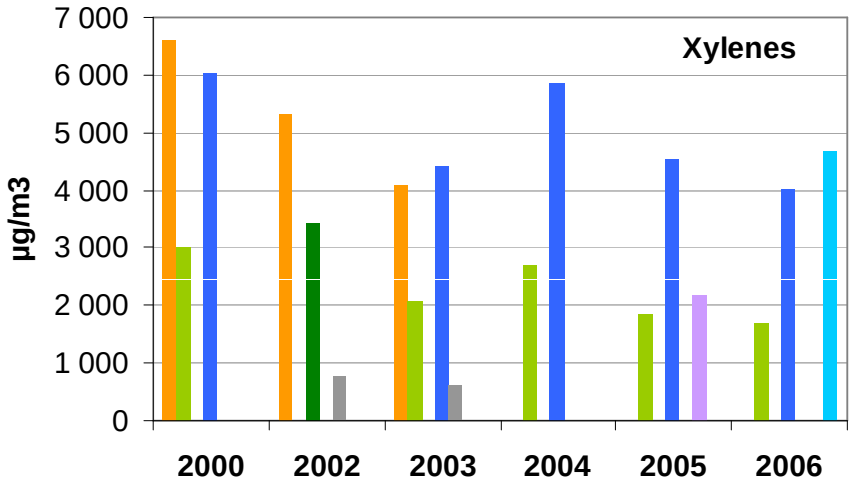
The trends in ozone concentrations



Benzene and VOC-concentrations in the Helsinki metropolitan area in 2002 - 2005







- City centre
- City background
- Busy traffic site, Espoo
- Busy traffic site, Vantaa
- Regional background
- Wood combustion
- Street canyon

The concentrations of heavy metals are low compared to the limit and target values

Annual average concentrations analysed from TSP samples at different monitoring sites in the Helsinki metropolitan area in 2000 – 2005

Lead: **5 – 10 ng/m^3 (limit value is 500 ng/m^3)**

Arsenic: **0,7 – 1,7 ng/m^3 (target value is 6 ng/m^3)**

Cadmium: **0,1 – 0,2 ng/m^3 (target value is 5 ng/m^3)**

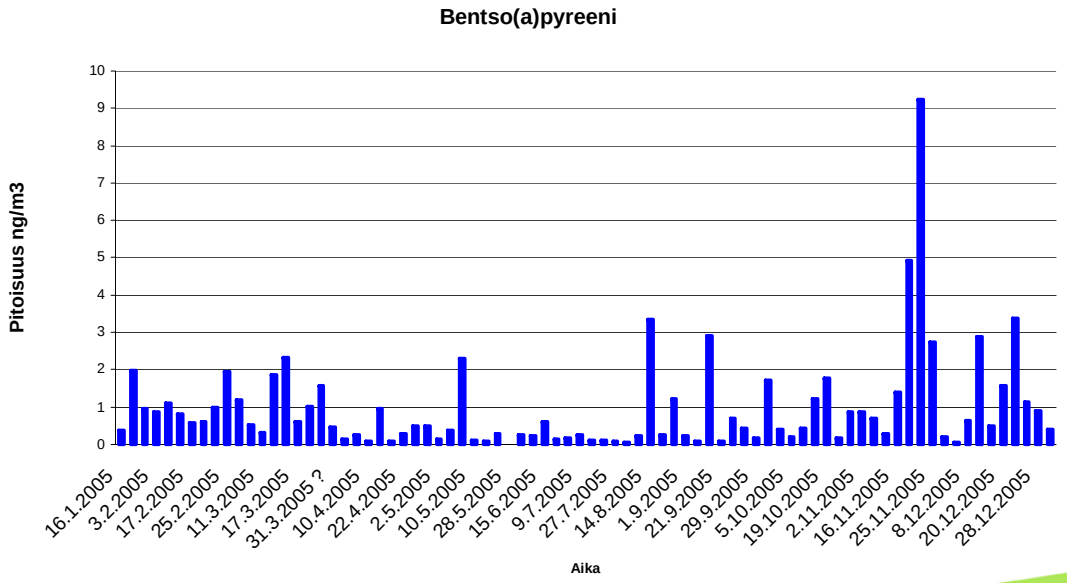
Nickel: **1,7 – 4,3 ng/m^3 (targe value is 20 ng/m^3)**

PAH monitoring

The target value for benzo(a)pyrene (one of the PAHs) is 1 ng/m^3.

The PAH measurements that were made in 2005 indicate that the target value may be exceeded e.g. in the areas of small scale wood burning.

Regular monitoring of benzo(a)pyrene with reference method was started in 2007 at the urban background monitoring site and at the traffic site in a street canyon in Helsinki.



Informing the public on air quality

Informing the public on air quality (1)

- **Requirements of the EU AQ directives implemented in National legislation/ Law of Environmental Protection**
- **The media is interested in ambient air quality**
- **Citizens are interested on air quality and its health effects**
- **The concentrations and air quality indices realtime, the forecasts for authorities**

Informing the public on air quality (2)

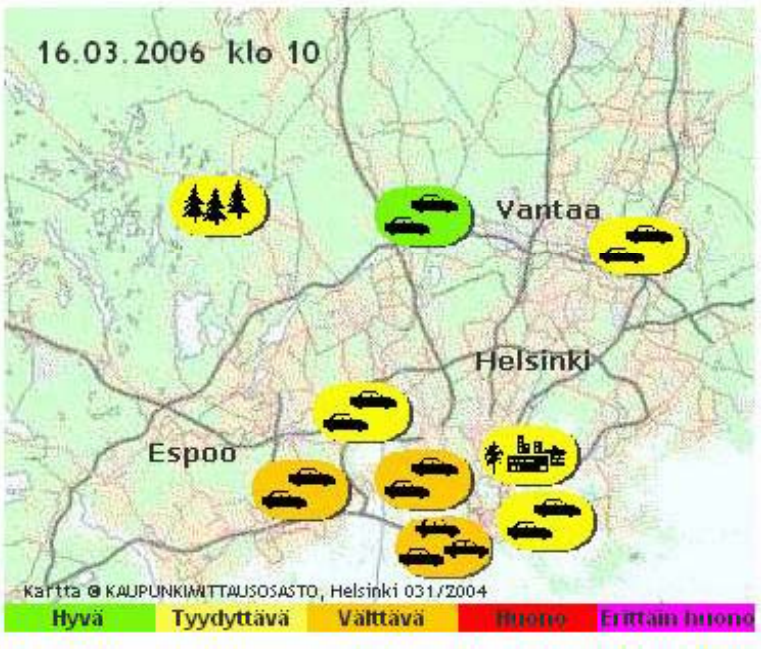
General public and sensitive subgroups

- **information on the state of the environment**
- **information on health effects**

Information may affect:

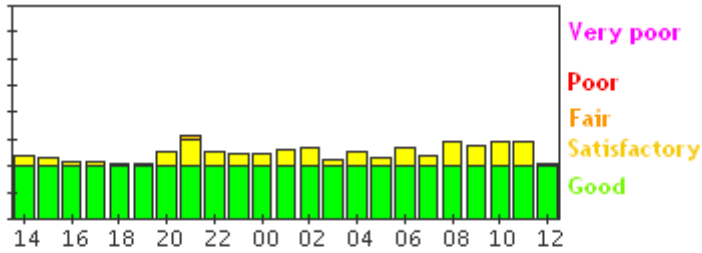
- **on behaviour to reduce exposure**
- **on choices in using different transport modes**
- **choices for dwelling areas**
- **use of medication**

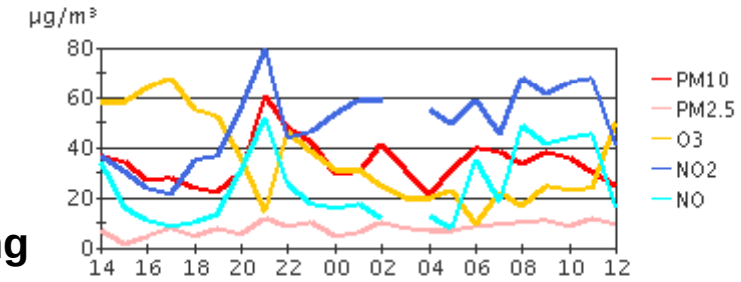
Informing the public on air quality: www.ytv.fi



Busy traffic site, Helsinki city centre

Air quality index and concentrations (µg/m^3) of pollutants at the busy traffic site of Helsinki city centre are presented (unvalidated hourly average values for the last 24 hours).





Edited reports on air quality in the morning

Exceedances of the PM10 limit value level

Informing the public on air quality (3)

Real-time

- www.ytv.fi/english/air
- reports every morning to TV
- radio, Internet, newspapers
- A special notice is published daily

mobi.ytv.fi

Episodes:

- PM10 limit value level (50 µg/m3)
- O3 information threshold
- NO2
- Smoke, PM2.5
- Action plans for NO2, PM10, PM2.5
- Air quality is poor according to AQI

Informing the public on air quality (4)

weekly

- **in local newspapers**

seasonal reports

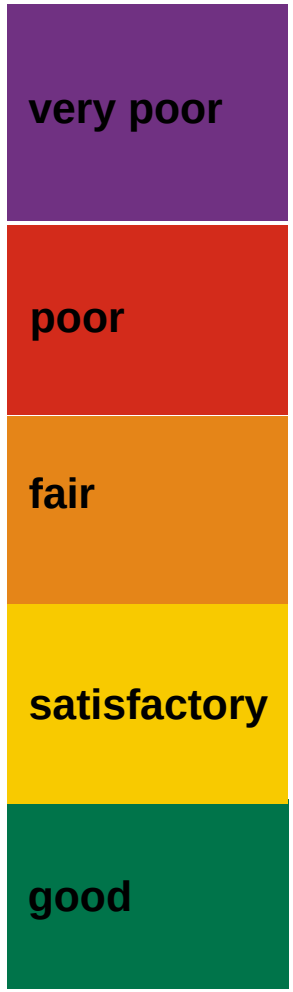
- **printed and pdf**
- **bulletin to newspapers**
- **informing the municipalities by email**

yearly

- **Annual reports (printed, pdf and bulletin)**
- **5 year report**

Finland's Air Quality Index

- Provides daily air quality information in a simple form
- Based on:
  - National AQ guidelines and EU limit values
  - Impacts on human health, nature and materials
- SO2, NO2, PM10, PM2.5, CO, O3 are taken into account
- Each component receives its own hourly index value. The highest of these is chosen for the Index of the site in question.



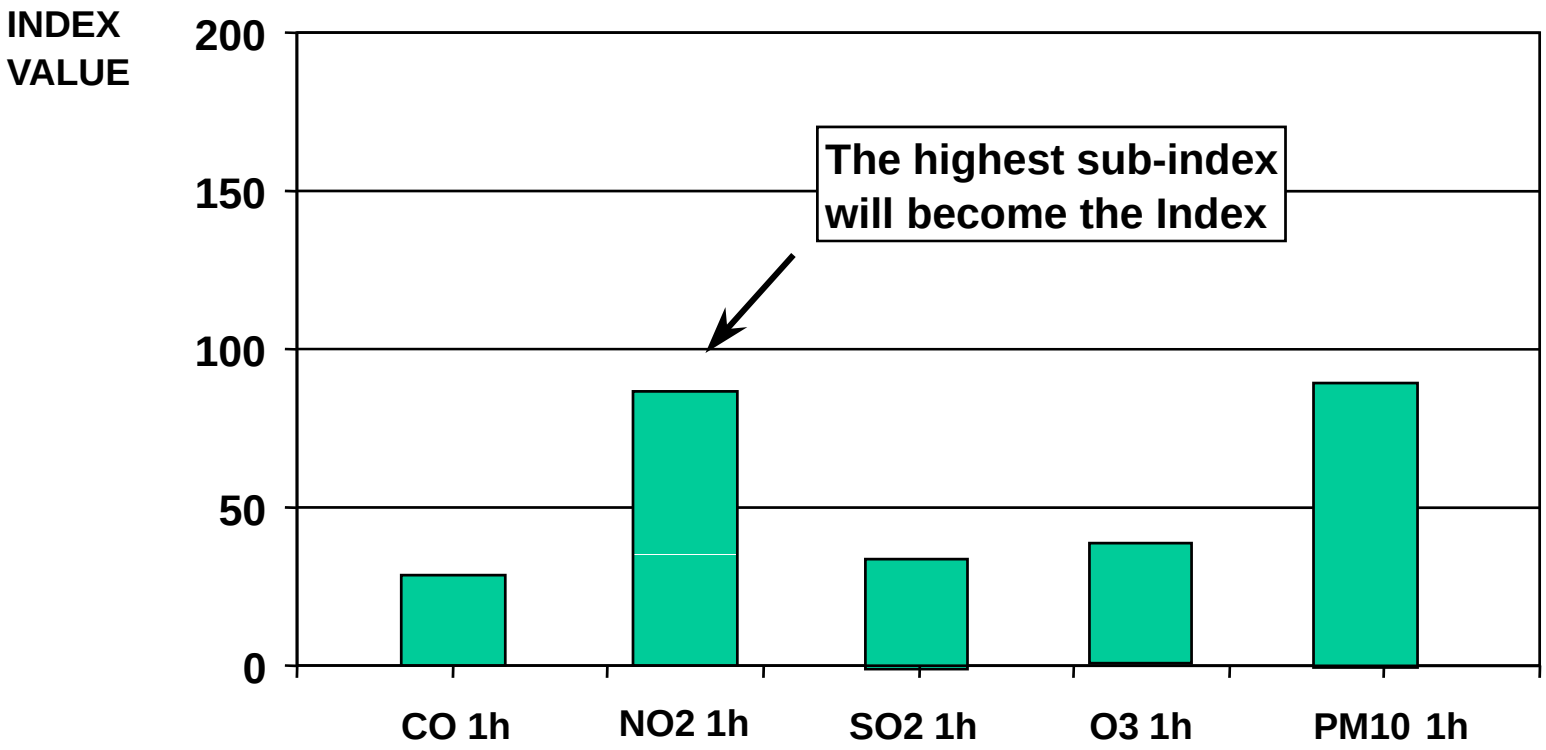
Air Quality Index is developed to simplify the concentrations and effects

AIR QUALITY	HEALTH IMPACTS	OTHER LONG TERM IMPACTS
Good	No health effects	Mild environmental impacts
Satisfactory	Very unlikely effects	
Fair	Unlikely effects	Clear impacts on vegetation, material impacts
Poor	Adverse effects possible on sensitive individuals	
Very poor	Adverse effects possible on sensitive subpopulation	

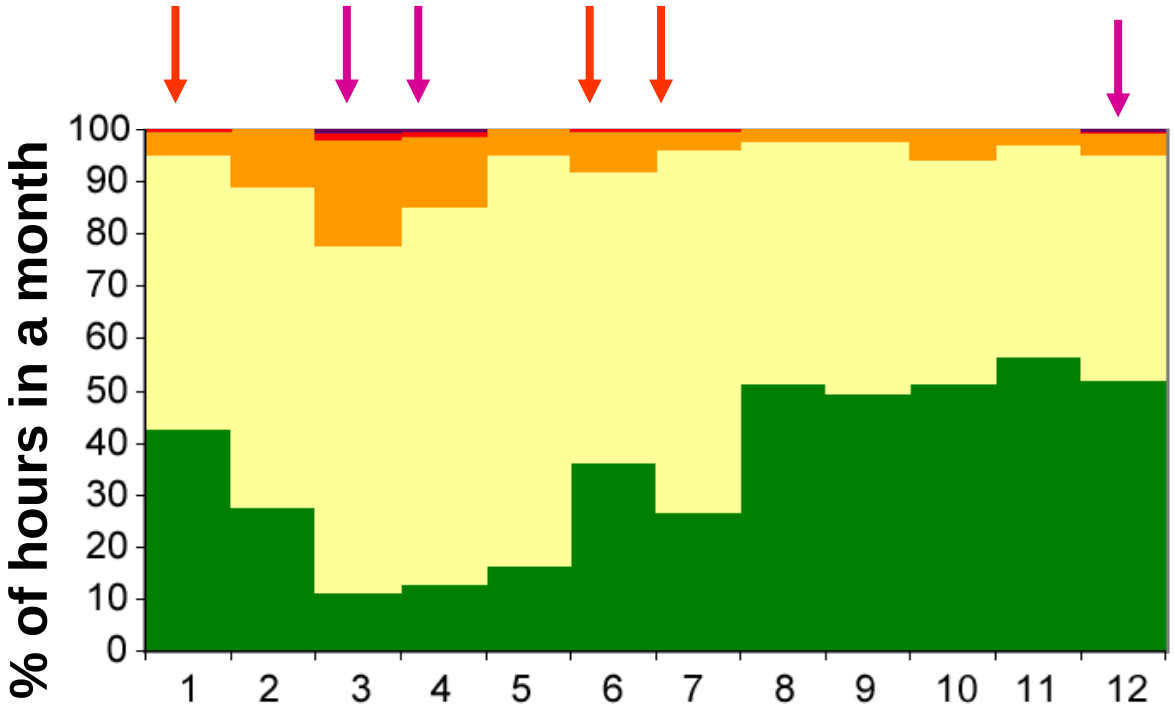
Indeksi	CO1h	NO2 1h	SO2 1h	O3 1h	PM10 1h	TRS 1h
50	4	40	20	60	20	5
75	8	70	80	120	70	10
100	20	150	250	150	140	20
150	30	200	350	180	210	50
	mg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3

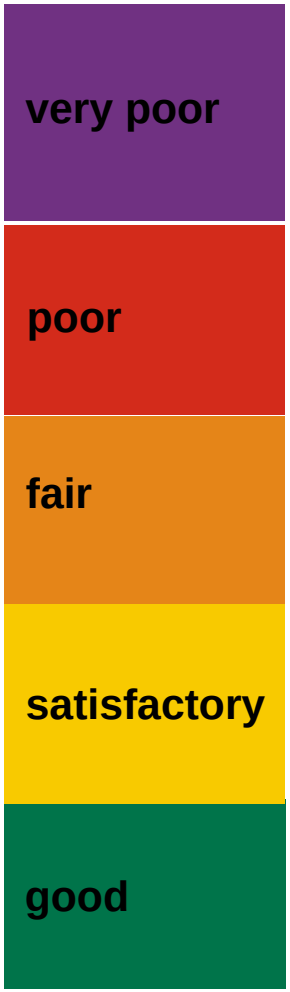
good 0-50
satisfactory 51-75
fair 76-100
poor 101-150
very poor 151-

The construction of air quality index



Air quality is satisfactory in traffic sites





in spring months dust weakens air quality to fair, poor or very poor

· in other months the traffic emissions are weakening air quality to fair or poor

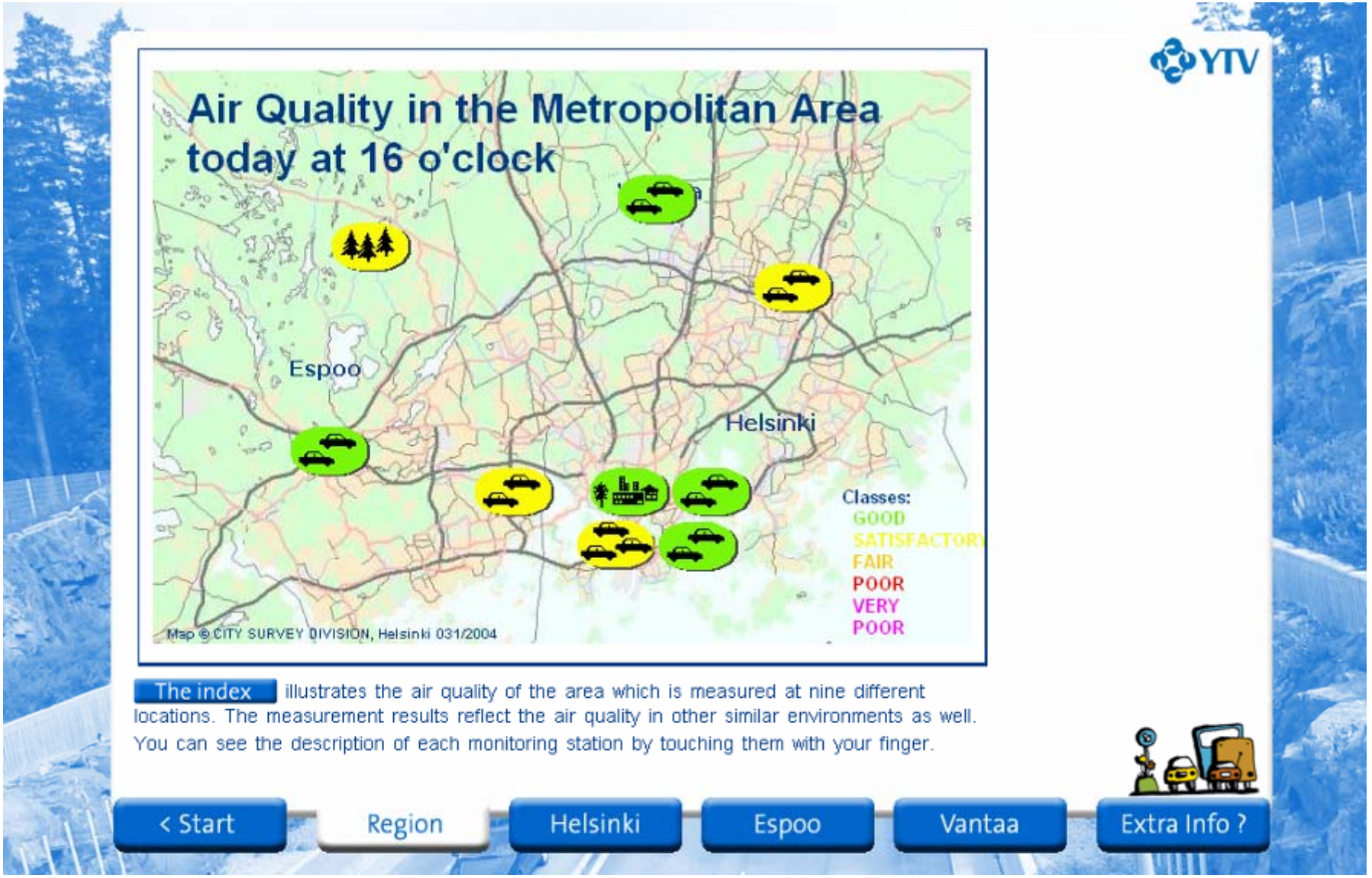
Educational material

Brochures
- **in co-operation with**
- **Ministry of Environment**
- **Finnish Meteorological Institute**
- **Pulmonary Association**

Web pages in Finnish science centre and Nature house Villa Elfvik

Displays

Campaigns
- **In town without my car –day**
- **Environmental fairs**


Air Quality in the Metropolitan Area
today at 16 o'clock
Espoo
Helsinki
Classes:
GOOD
SATISFACTORY
FAIR
POOR
VERY
POOR
Map © CITY SURVEY DIVISION, Helsinki 031/2004
The index illustrates the air quality of the area which is measured at nine different locations. The measurement results reflect the air quality in other similar environments as well. You can see the description of each monitoring station by touching them with your finger.
< Start
Region
Helsinki
Espoo
Vantaa
Extra Info ?

Thanks for your attention!
- Air is clean in Helsinki!