

# Air emission inventories and scenarios in Finland

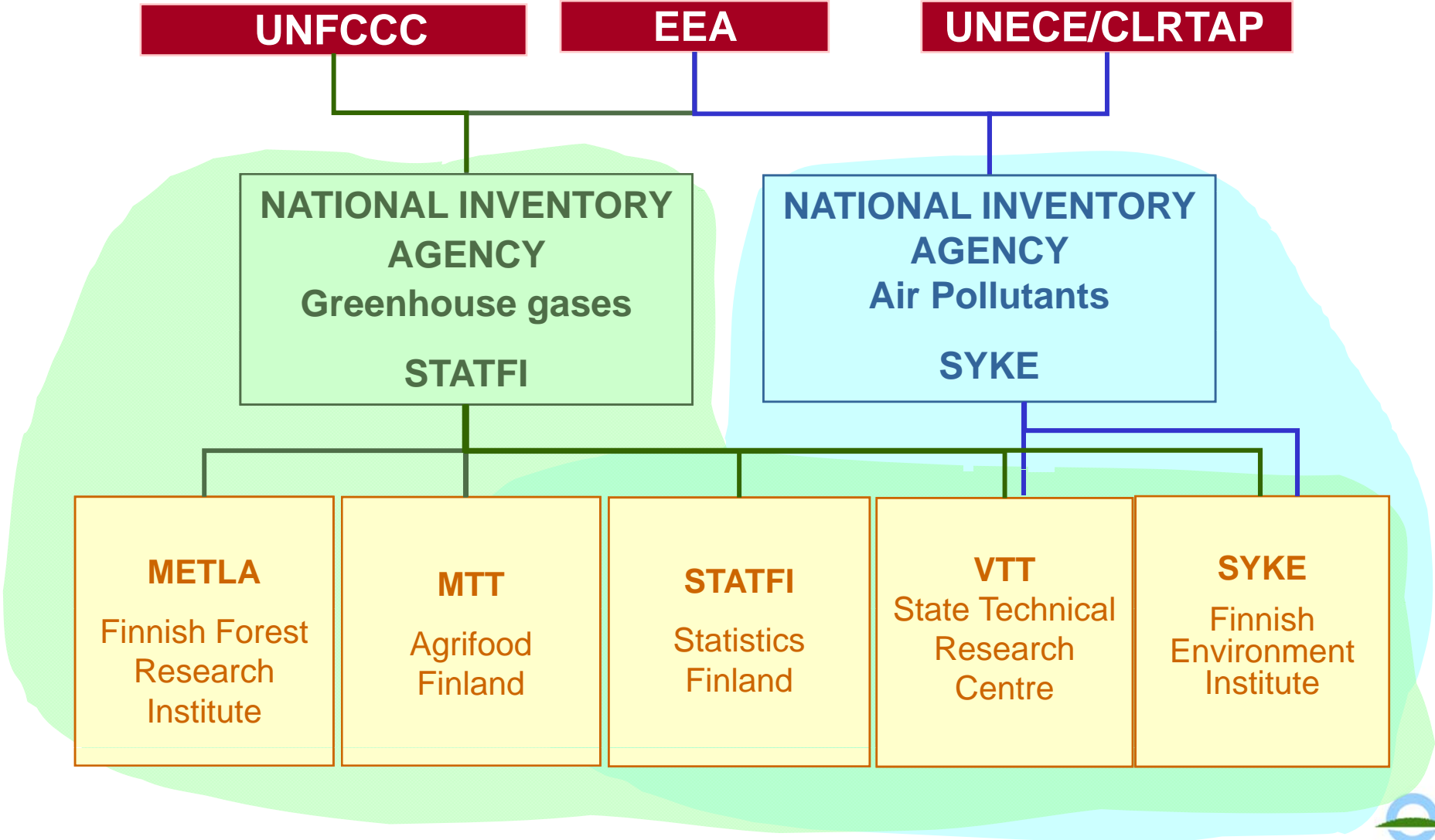
Finnish Environment Institute  
Kristina Saarinen



S Y K E

# **AIR EMISSION INVENTORIES**

# THE NATIONAL AIR EMISSION INVENTORY SYSTEM IN FINLAND



# ORGANISATION OF INVENTORIES IN FINLAND

## CLOSE COOPERATION

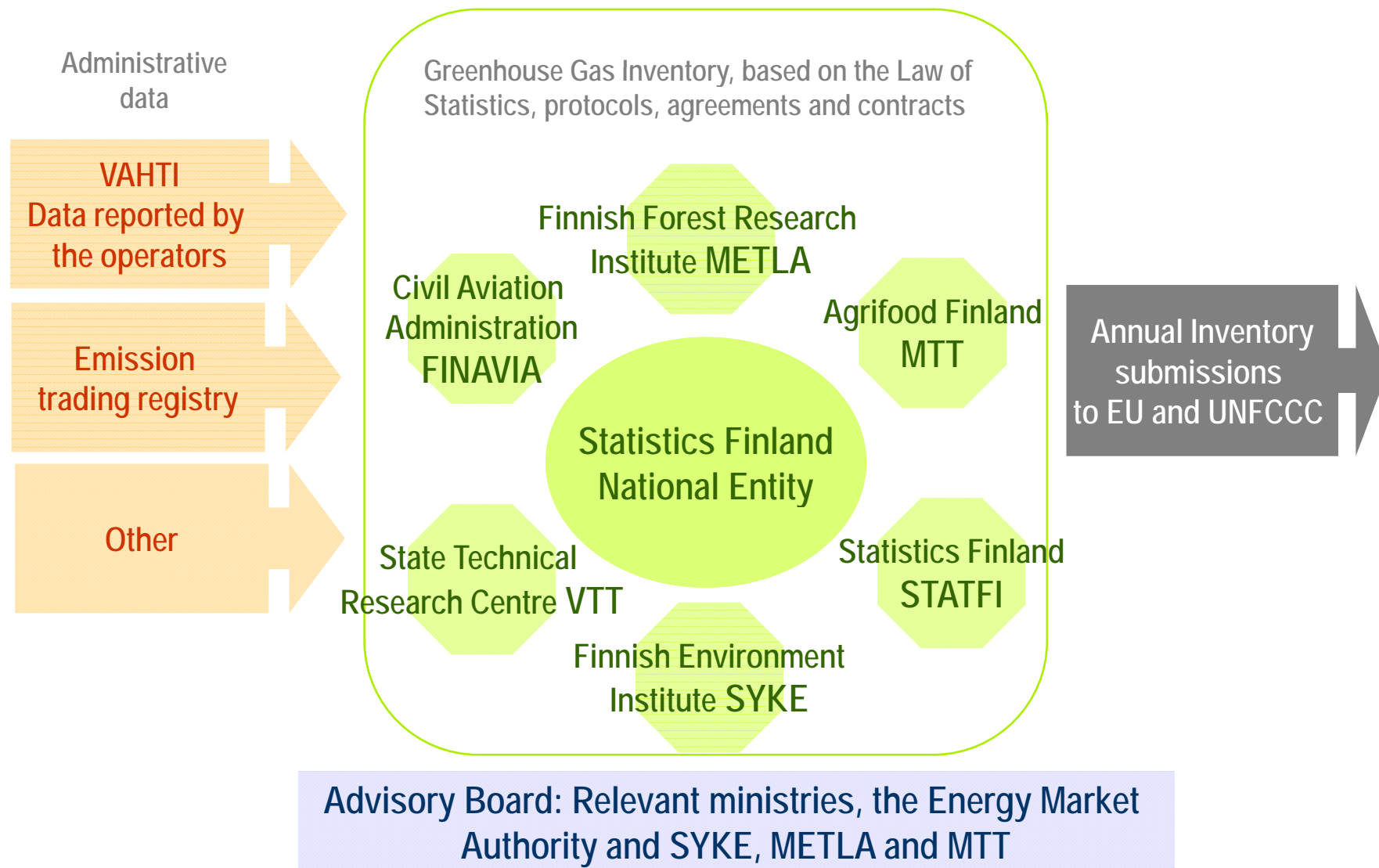
- experts/expert institutes
- environmental authorities, industry, research
- Nordic countries (similar conditions & problems)

## ACTIVE WORK

- national methodology
- international groups
- inventory reviews

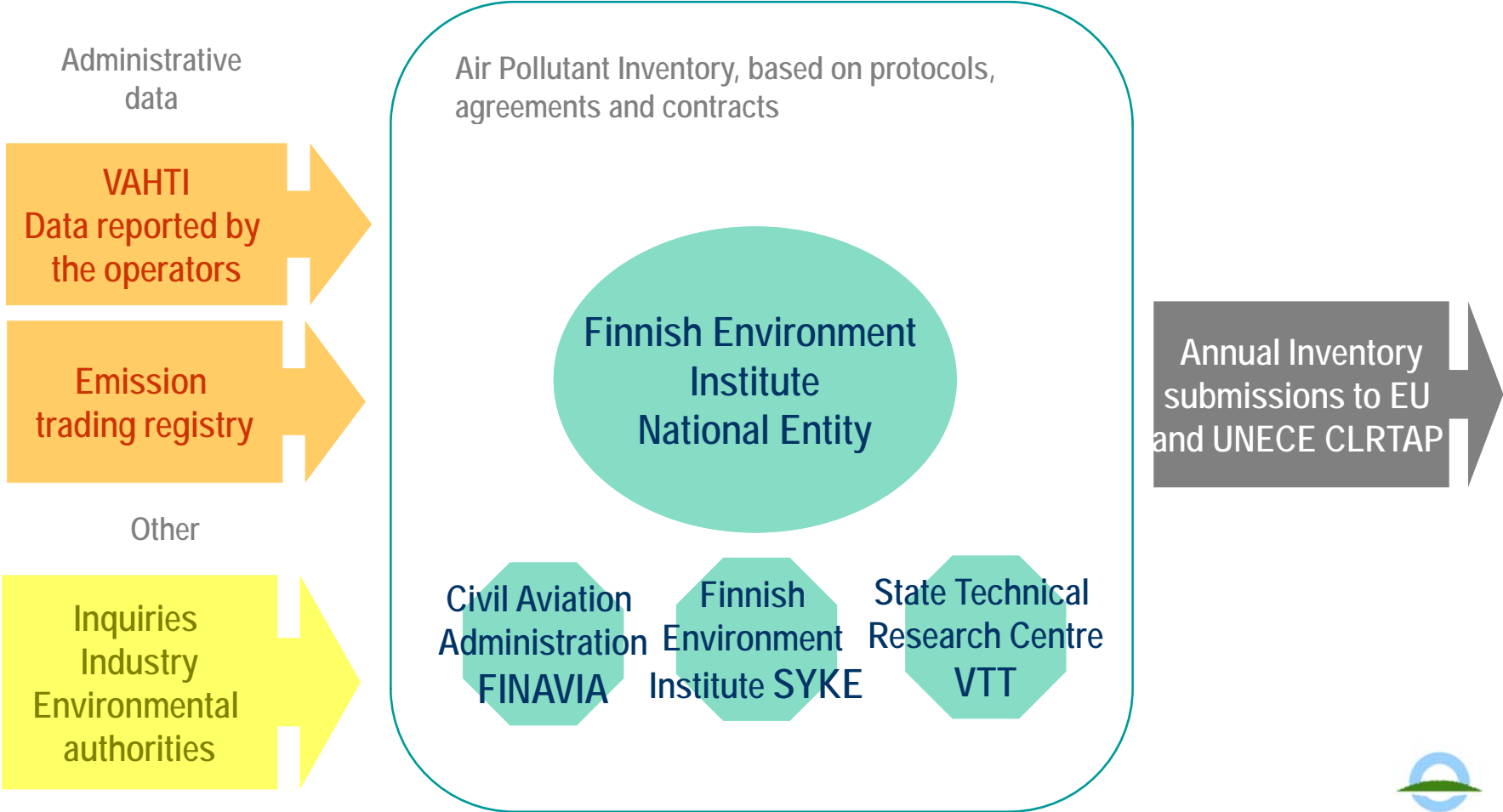
## NATIONAL GREENHOUSE GAS INVENTORY SYSTEM IN FINLAND

[www.stat.fi/greenhousegases](http://www.stat.fi/greenhousegases)



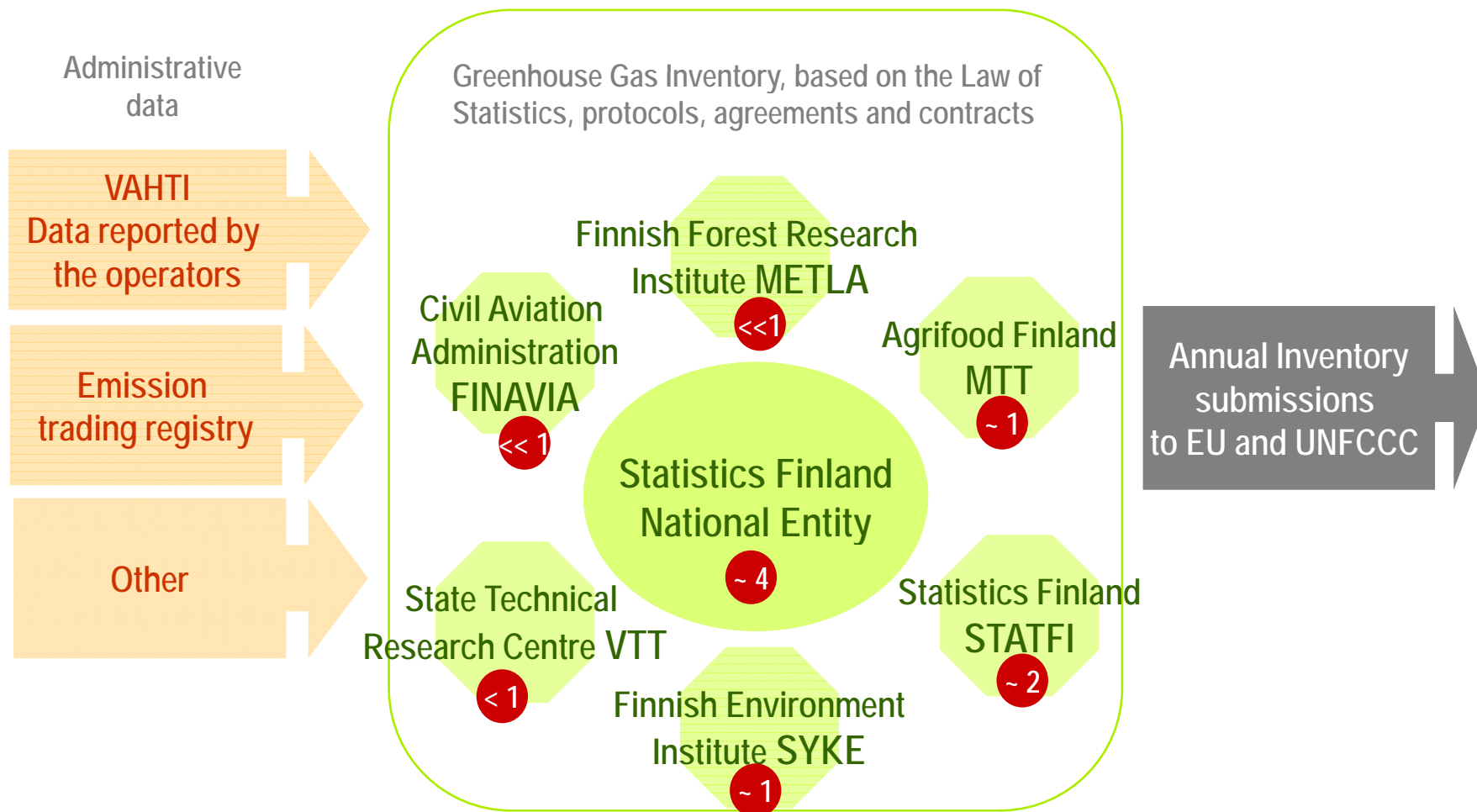
# NATIONAL AIR POLLUTANT INVENTORY SYSTEM IN FINLAND

[www.environment.fi](http://www.environment.fi) > State of the environment > Air



# NATIONAL GREENHOUSE GAS INVENTORY SYSTEM IN FINLAND

[www.stat.fi/greenhousegases](http://www.stat.fi/greenhousegases)



**Advisory Board: Relevant ministries, the Energy Market Authority and SYKE, METLA and MTT**

# NATIONAL AIR POLLUTANT INVENTORY SYSTEM IN FINLAND

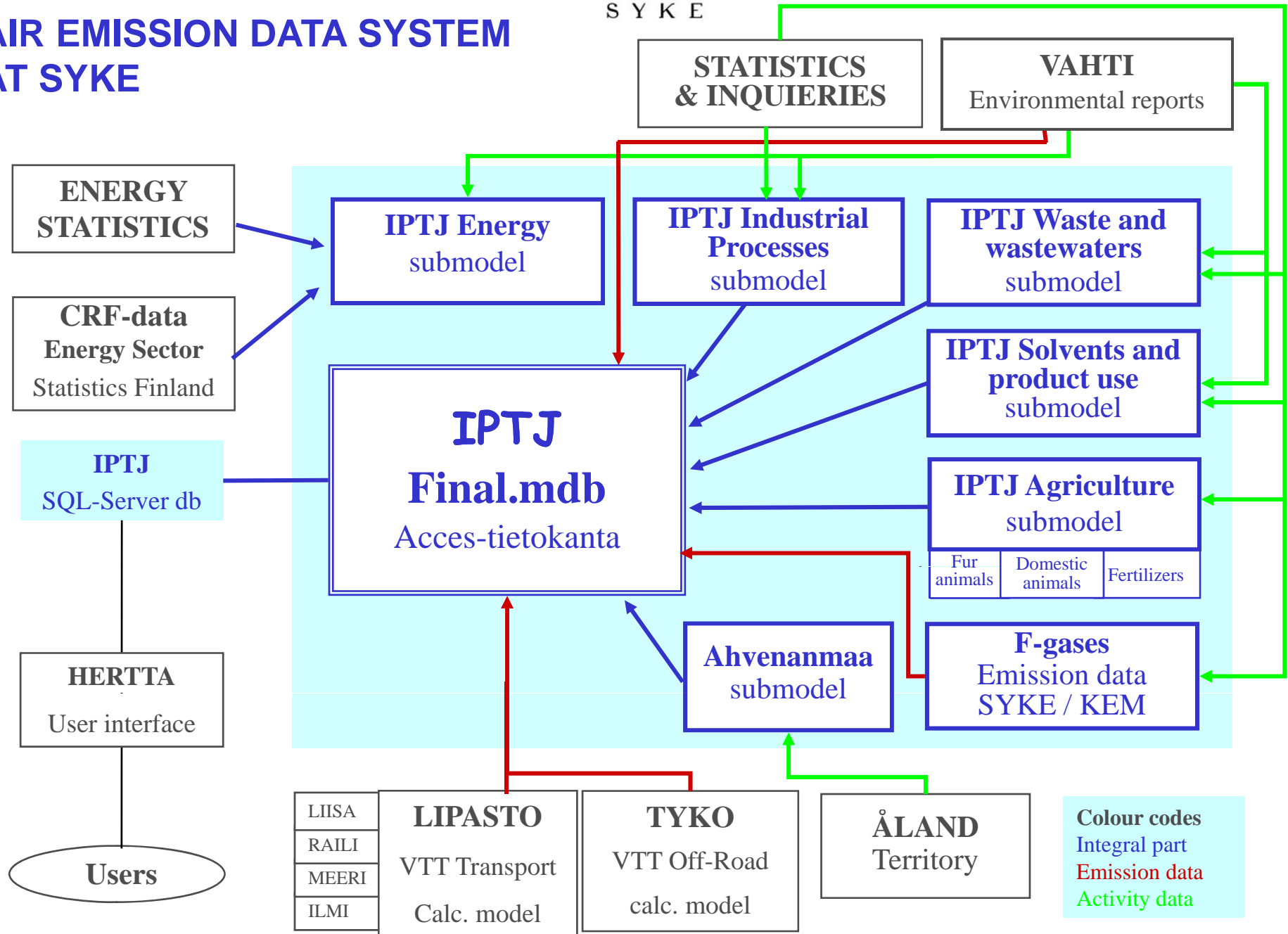
[www.environment.fi](http://www.environment.fi) > State of the environment > Air



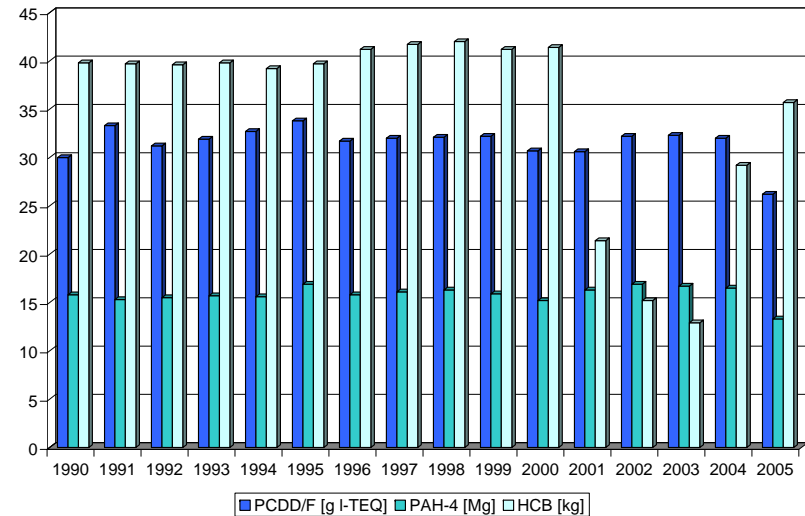
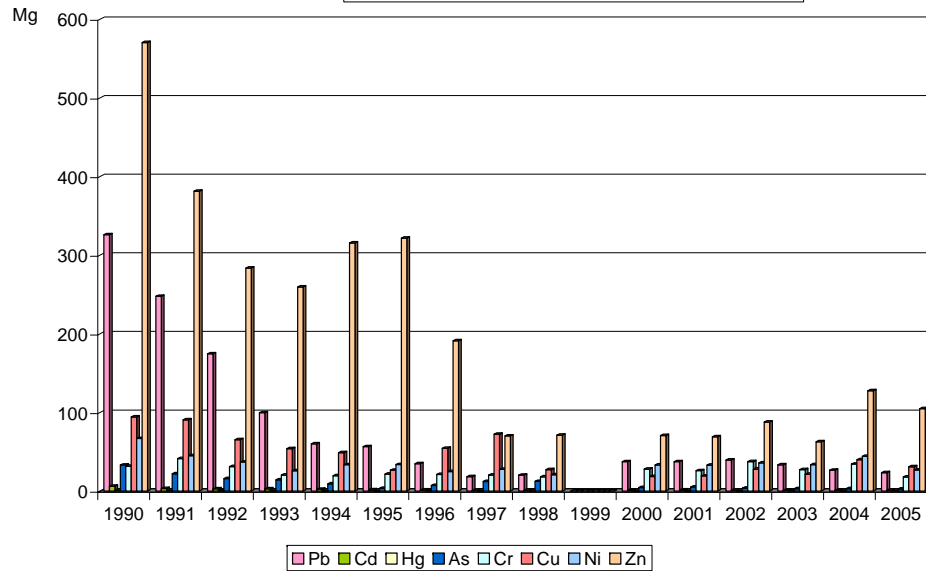
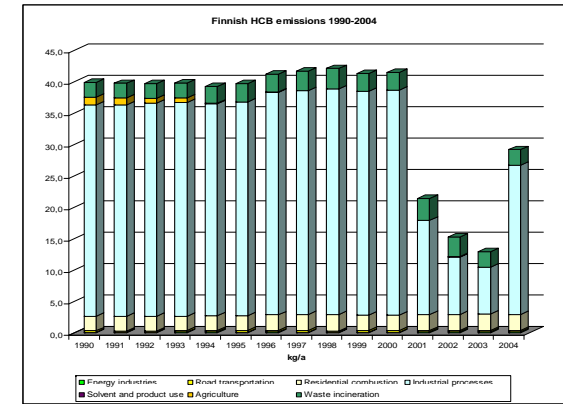
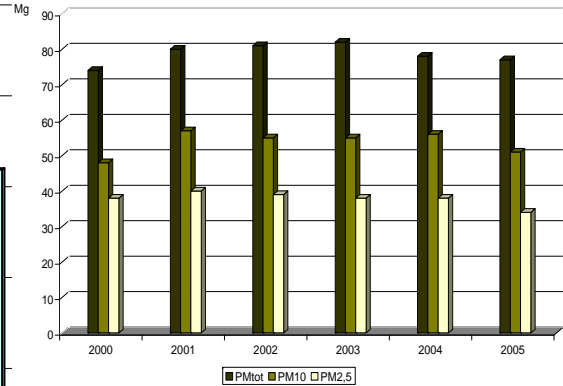
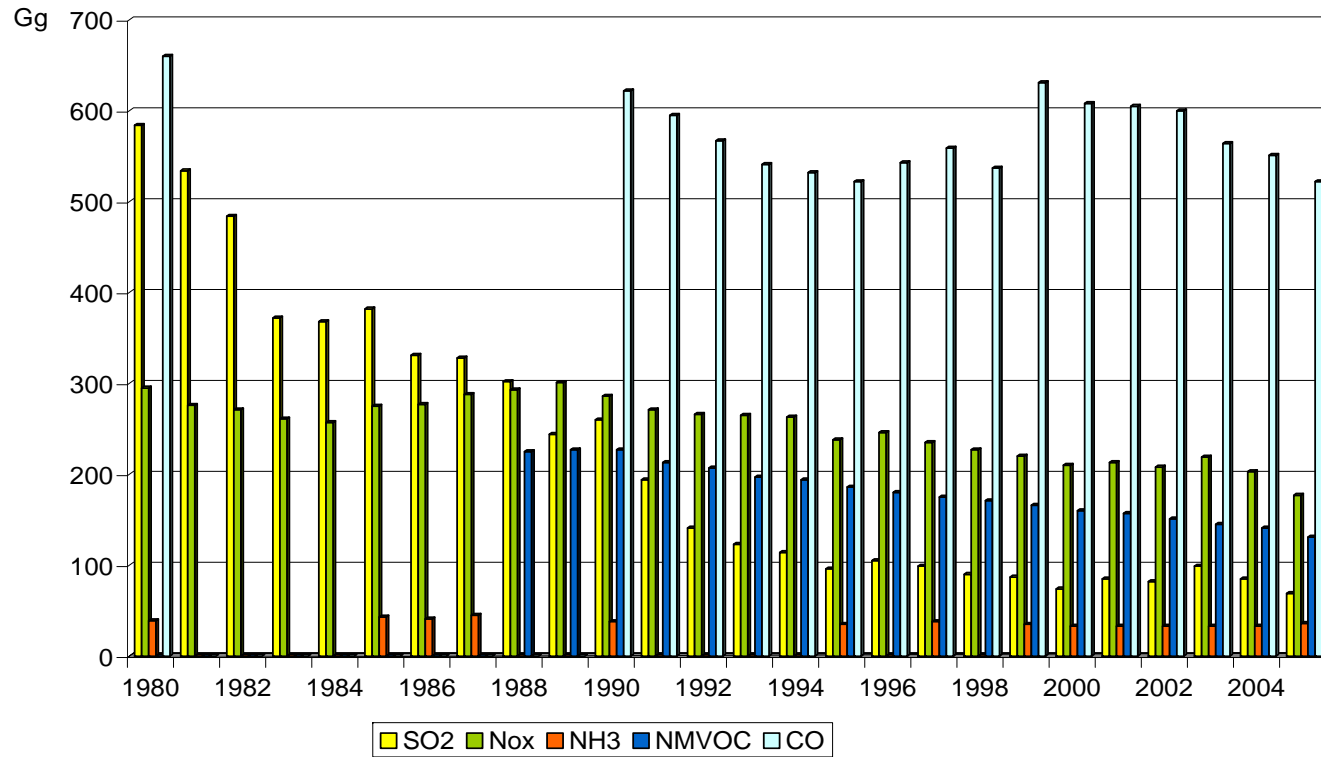


# IPTJ

## AIR EMISSION DATA SYSTEM AT SYKE

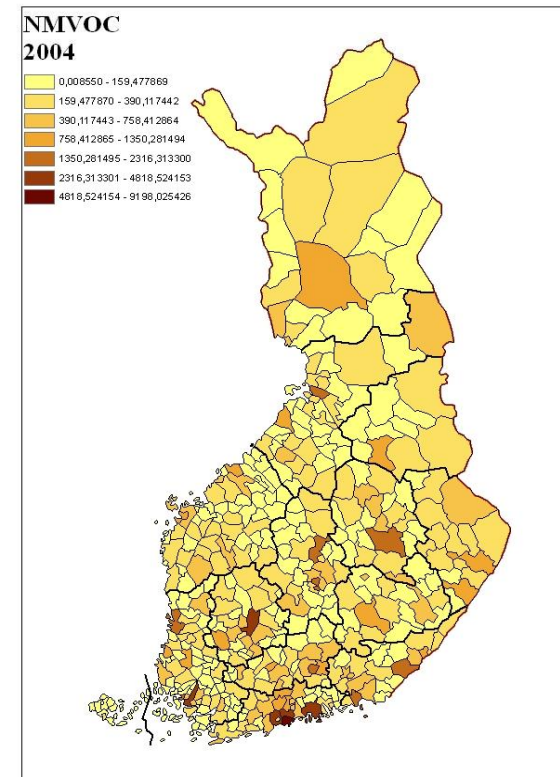
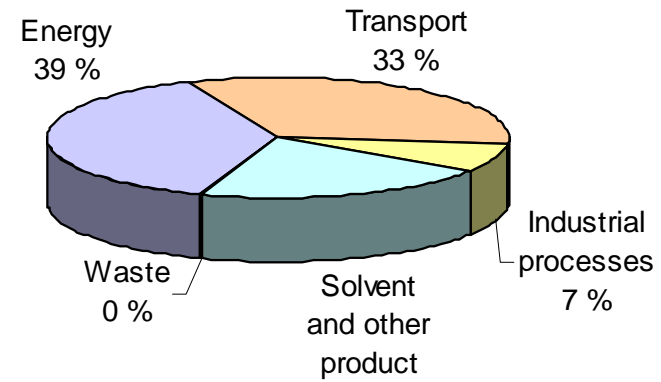


# FINNISH AIR POLLUTANT TIME SERIES (1980-) 1990-2005

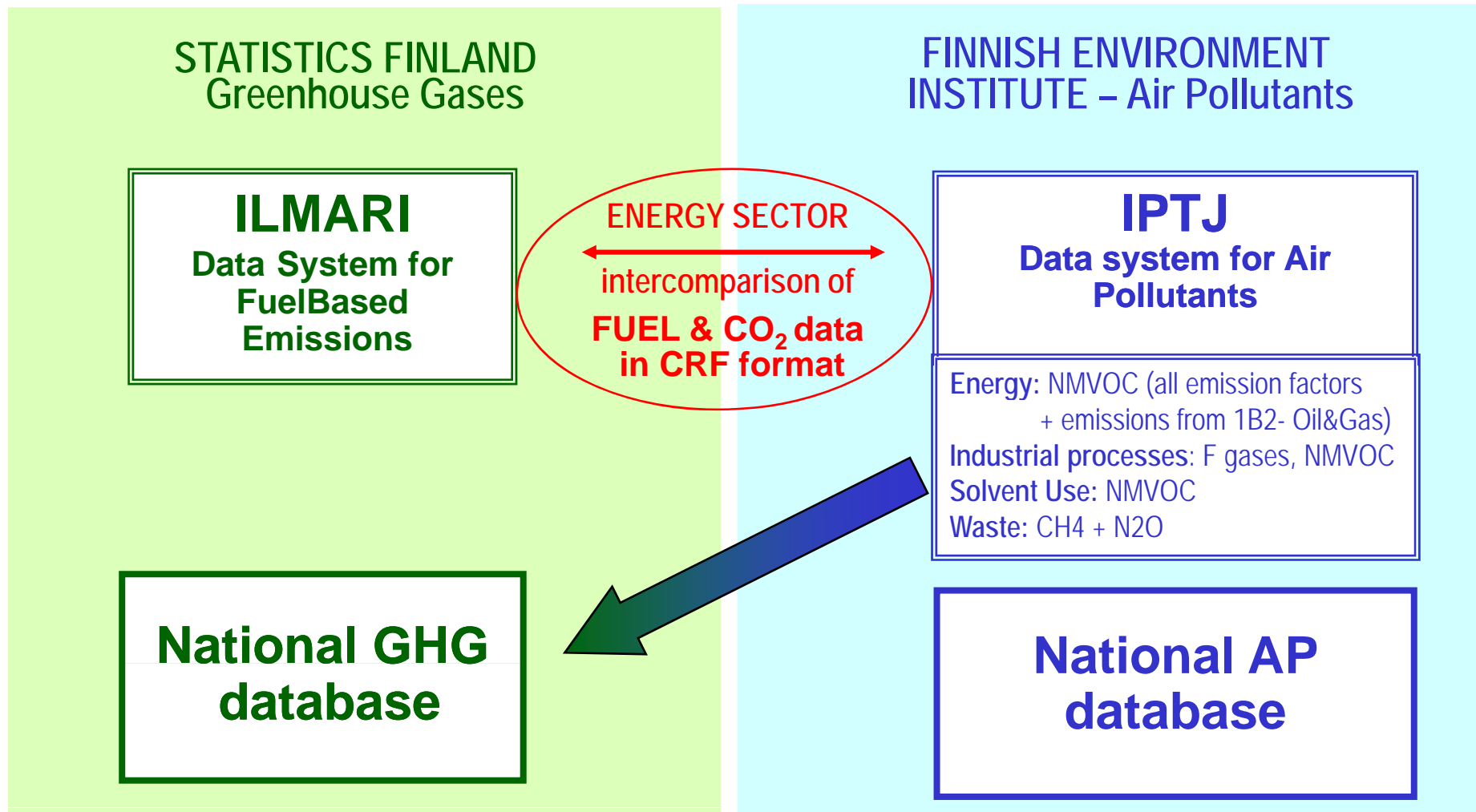


NFR	% of national total	Total release. Gg	% reported by the plants
1A1a	0.6	0.9	6.0
1A1b	< 0.1	0.1	23.3
1A1c	< 0.1	< 0.1	0.0
1A2a	0.1	0.1	0.1
1A2b	< 0.1	< 0.1	30.2
1A2c	< 0.1	0.1	26.1
1A2d	0.2	0.3	17.7
1A2e	< 0.1	< 0.1	0.0
1A2f	1.7	2.4	2.3
1A3aii(i)	0.1	0.1	0.0
1A3aii(ii)	< 0.1	< 0.1	0.0
1A3bv	5.1	7.2	0.0
1A3bi	16.0	22.5	0.0
1A3bii	0.9	1.3	0.0
1A3biii	2.5	3.5	0.0

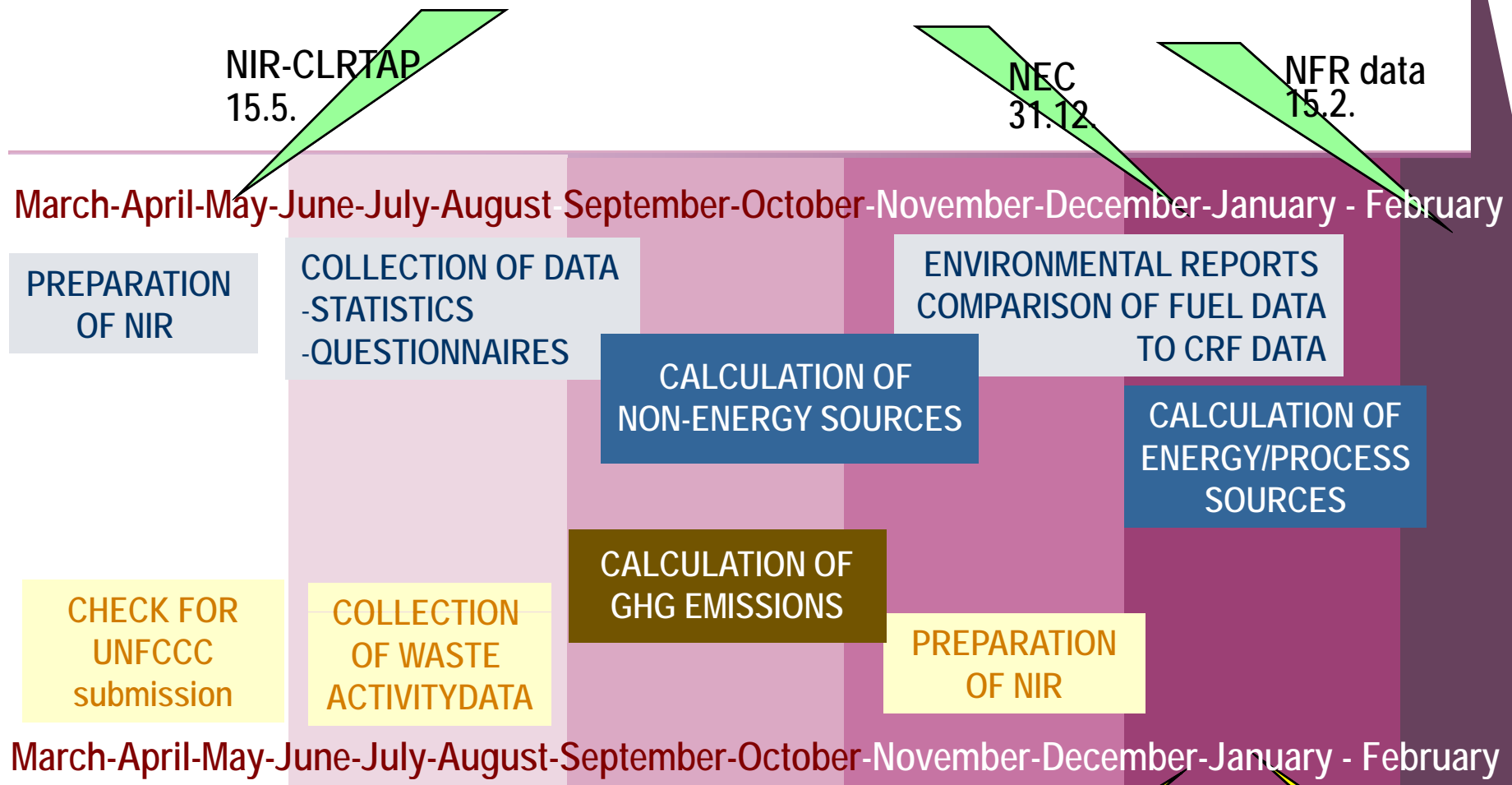
## EMISSION DATA BY SECTOR & REGIONALLY



# DATAFLOW BETWEEN GHG & AP INVENTORIES



# THE INVENTORY YEAR FOR AIR POLLUTANTS



# THE INVENTORY YEAR FOR GHGs



# MANAGEMENT & DEVELOPMENT OF THE INVENTORIES

## **Regular meetings**

- Inventory experts
- QAQC issues
- Source sector specific issues

## **QAQC in preparation of inventories**

- Target ISO 9001 or equal level
- Involves all experts participating inventory work

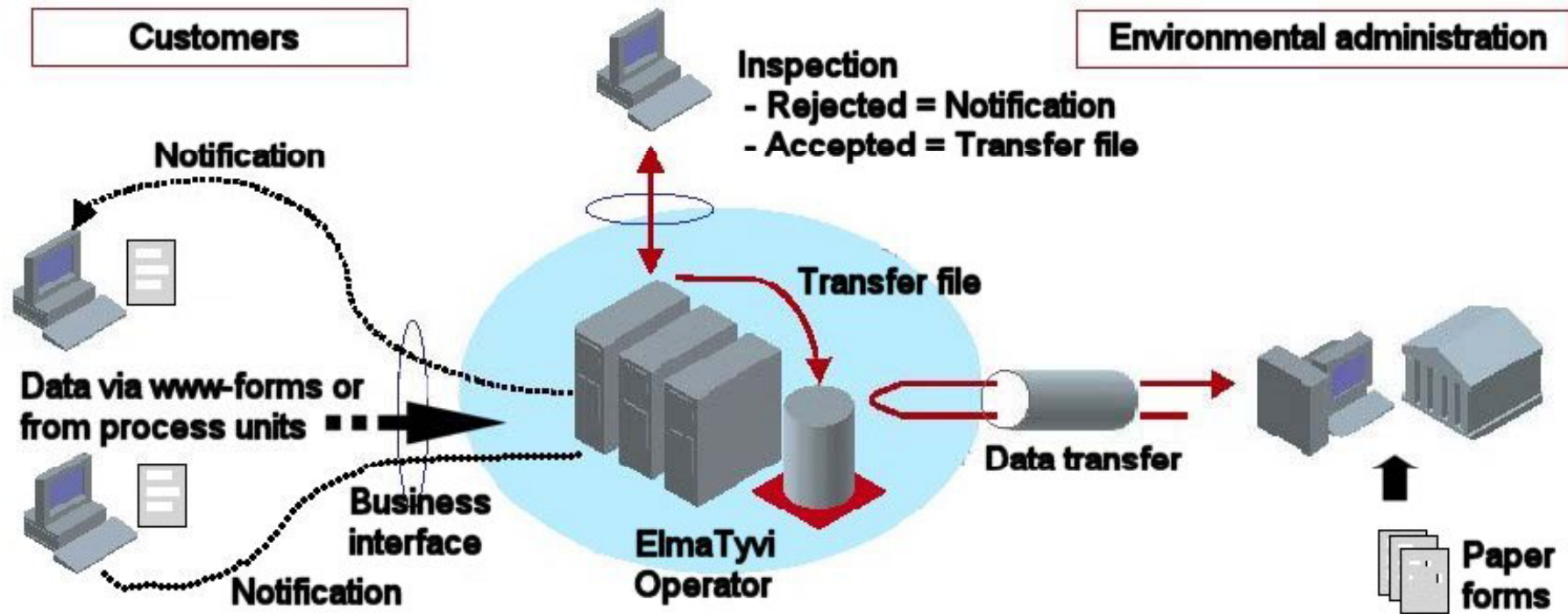
## **Development of methodologies**

- Expert institutes + inventory agencies
- National and international projects
- Coordination between methodologies: UNFCCC, CLRTAP, EPER, PRTR

# **USE OF POINT SOURCE DATA**

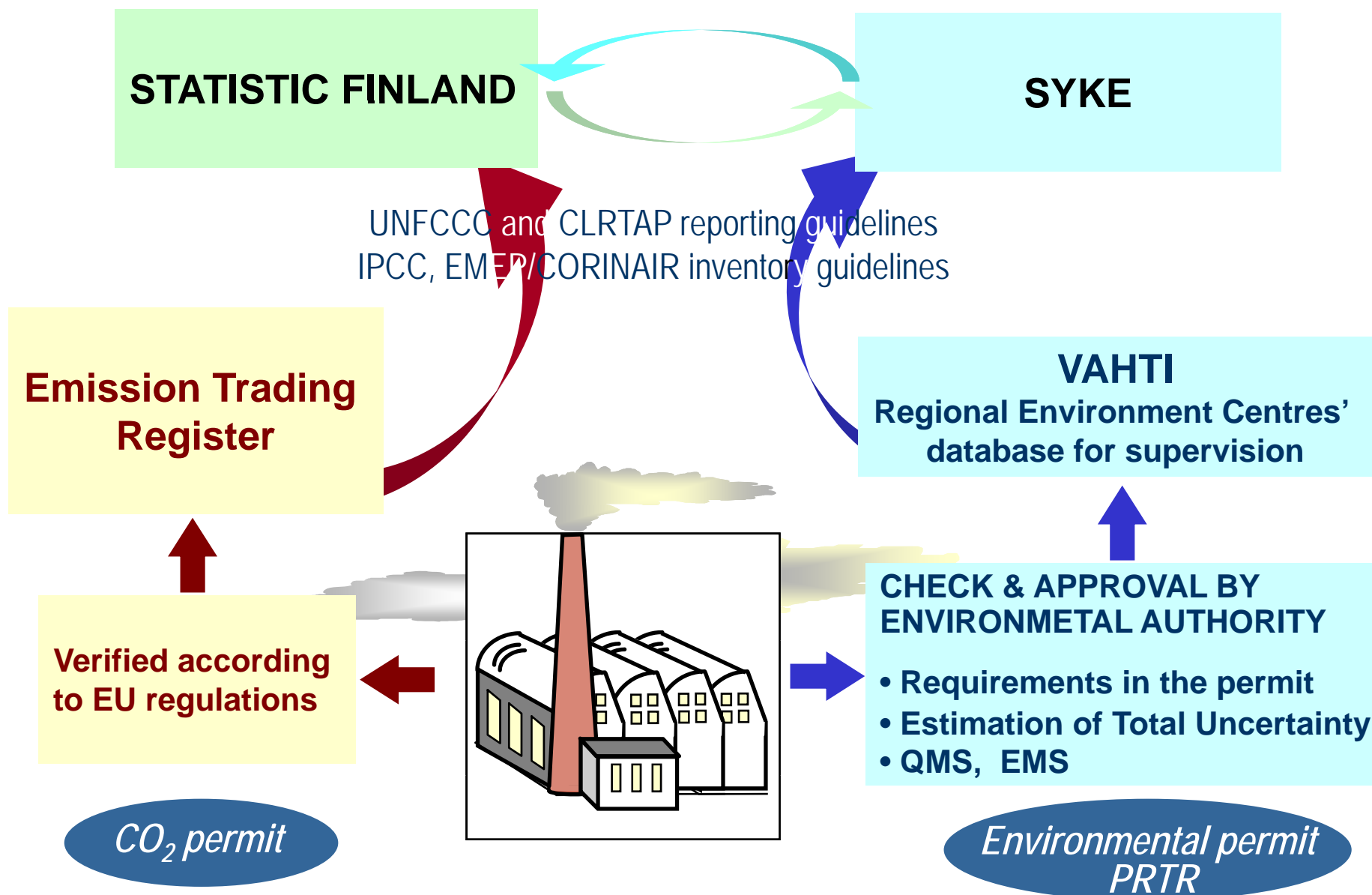
# REPORTING OPTIONS FOR THE OPERATOR

- Environmental permit & CO2 permit
- PRTR





# USE OF BOTTOM-UP DATA IN THE INVENTORIES



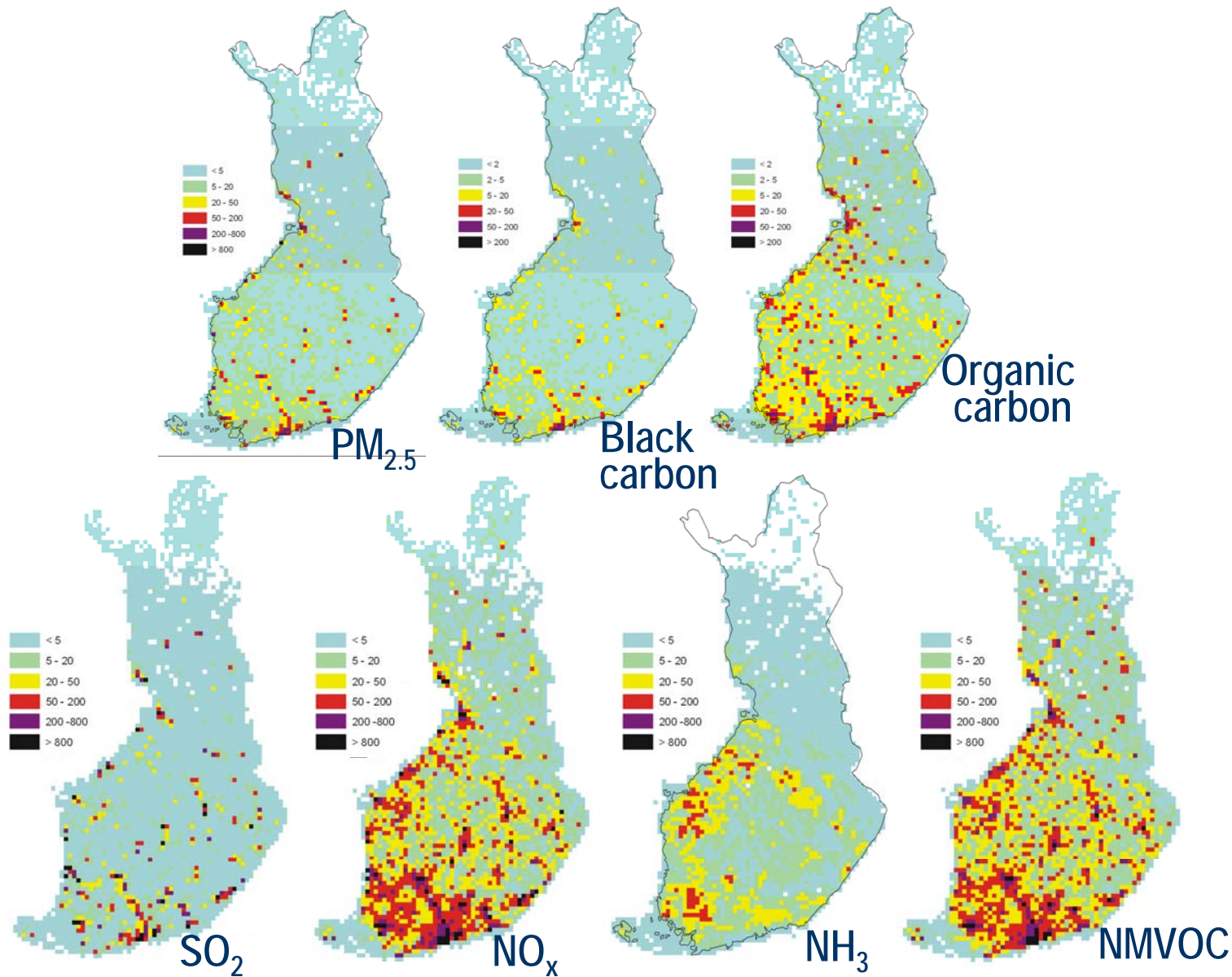
# **EMISSION SCENARIOS**

# Finnish Regional Emission Scenario (FRES) model

[www.environment.fi/syke/pm-modeling](http://www.environment.fi/syke/pm-modeling)

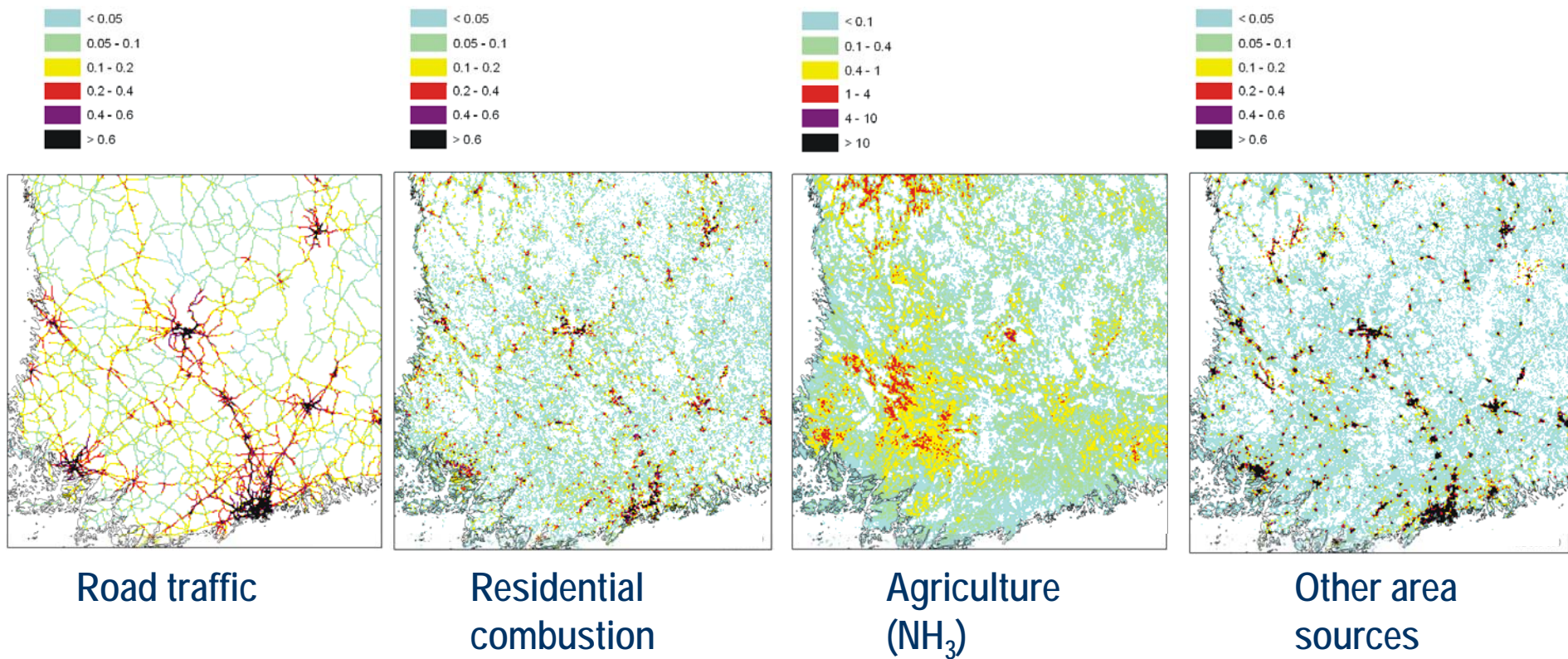
- Anthropogenic emissions 1990, 2000, 2010, 2020 (several activity scenarios)
- Comprehensive and congruent calculation for primary and secondary PMs
  - primary PM (TSP, PM10 - 2.5 - 1 - 0.1, chemical composition in size classes)
  - SO<sub>2</sub>, NO<sub>x</sub>, NH<sub>3</sub>, NMVOC
- Abatement technologies and costs
- Aggregation: 8 main sectors, over 100 sub-sectors
- Large point sources (~ 250), area emissions (1 × 1km<sup>2</sup>)
- Several emission heights

# Finnish emissions in 2000 (Mg/a) 1 x 1 km<sup>2</sup> level, presented at 10 x 10 km<sup>2</sup> grid

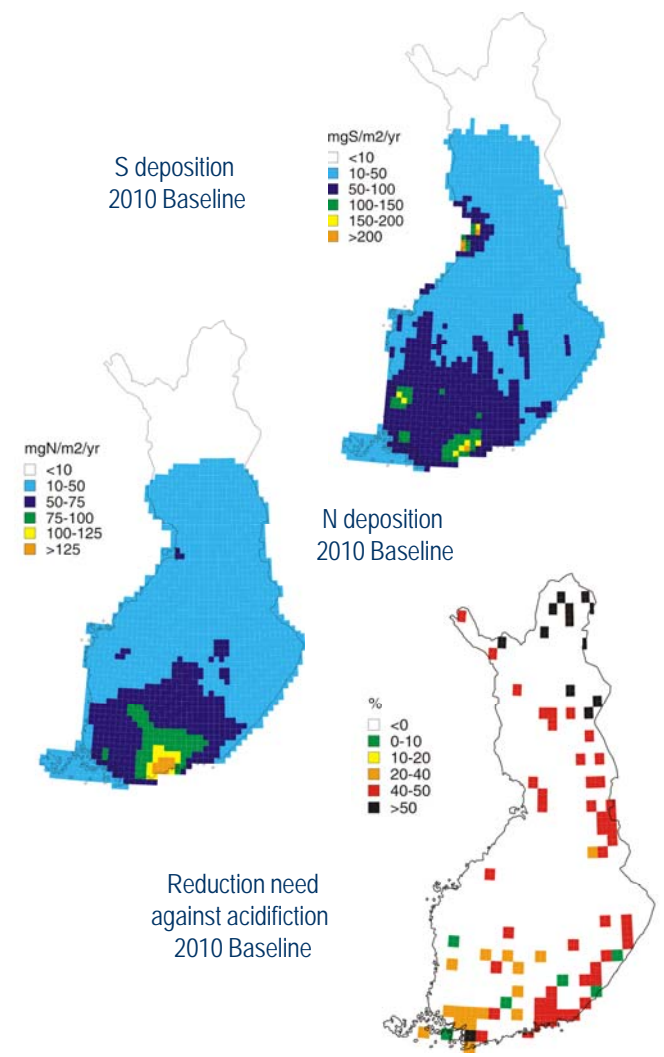
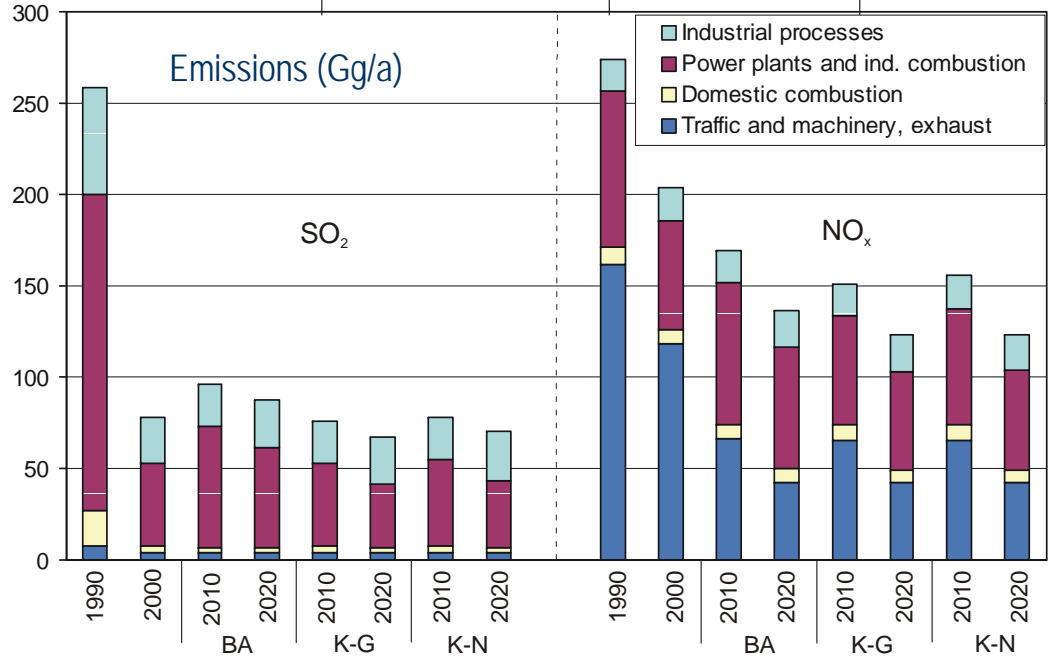
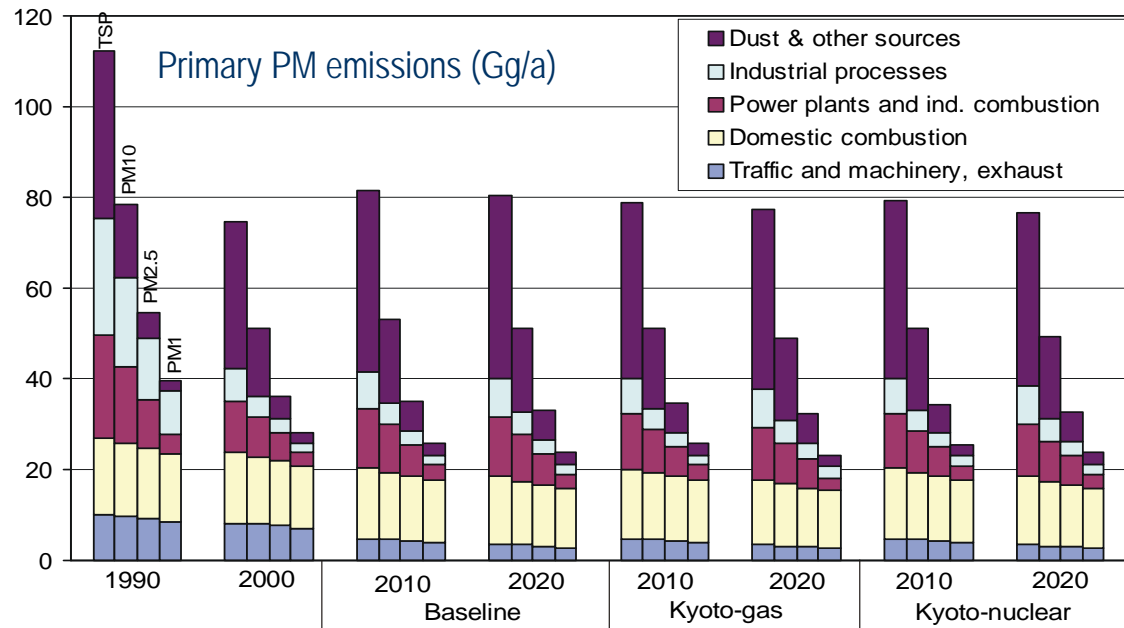


# Primary PM<sub>2.5</sub> by sectors (Mg/a) in Finland (2000)

at 1 x 1 km<sup>2</sup> level, presented at 1 x 1 km<sup>2</sup> grid



# Environmental Impact Assessment of the Climate Strategy 2001

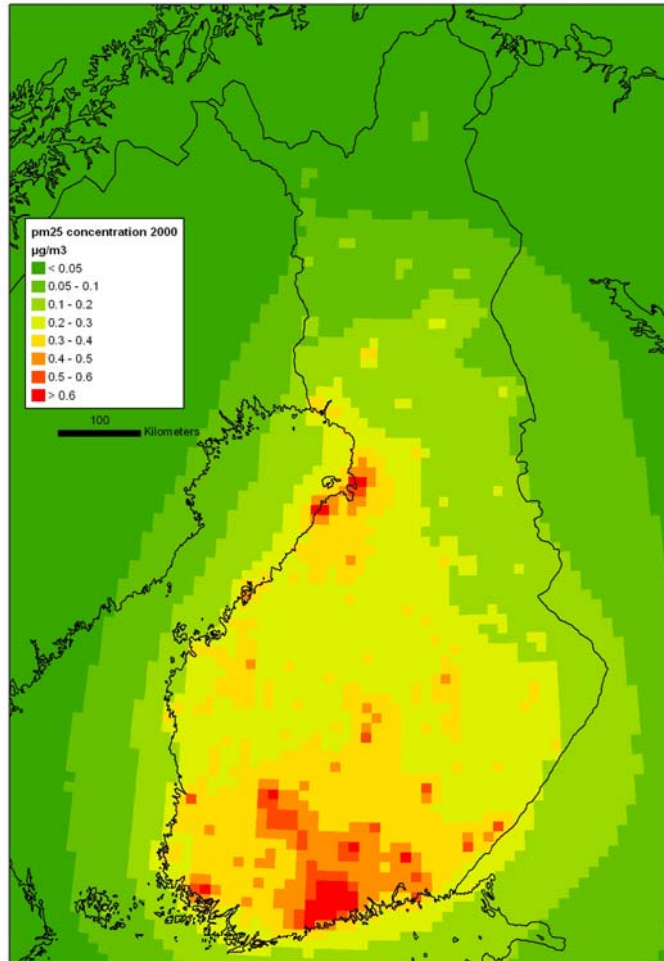


Karvosenoja, Johansson, Kupiainen 2003  
 Syri, Karvosenoja, Lehtilä, Laurila, Lindfors, Tuovinen 2002

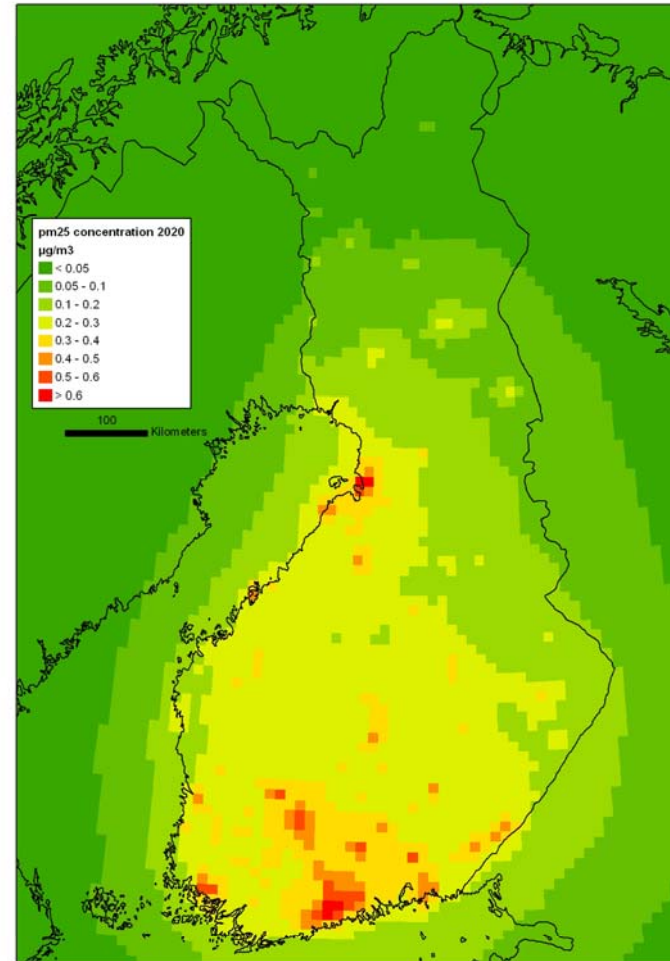


# PM<sub>2.5</sub> concentrations in 2000 and 2020 caused by Finnish primary PM emissions

2000 -> 2020:  
•16% decrease  
in emissions



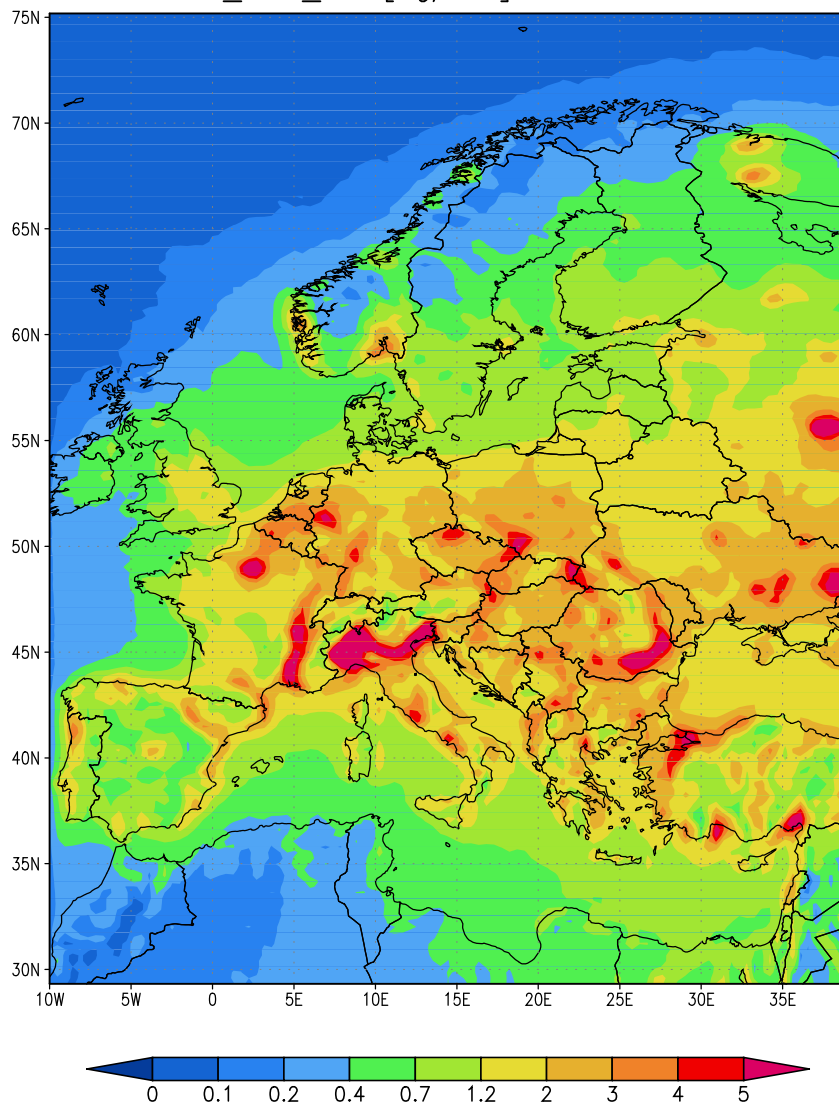
PM<sub>2.5</sub> concentrations in 2000



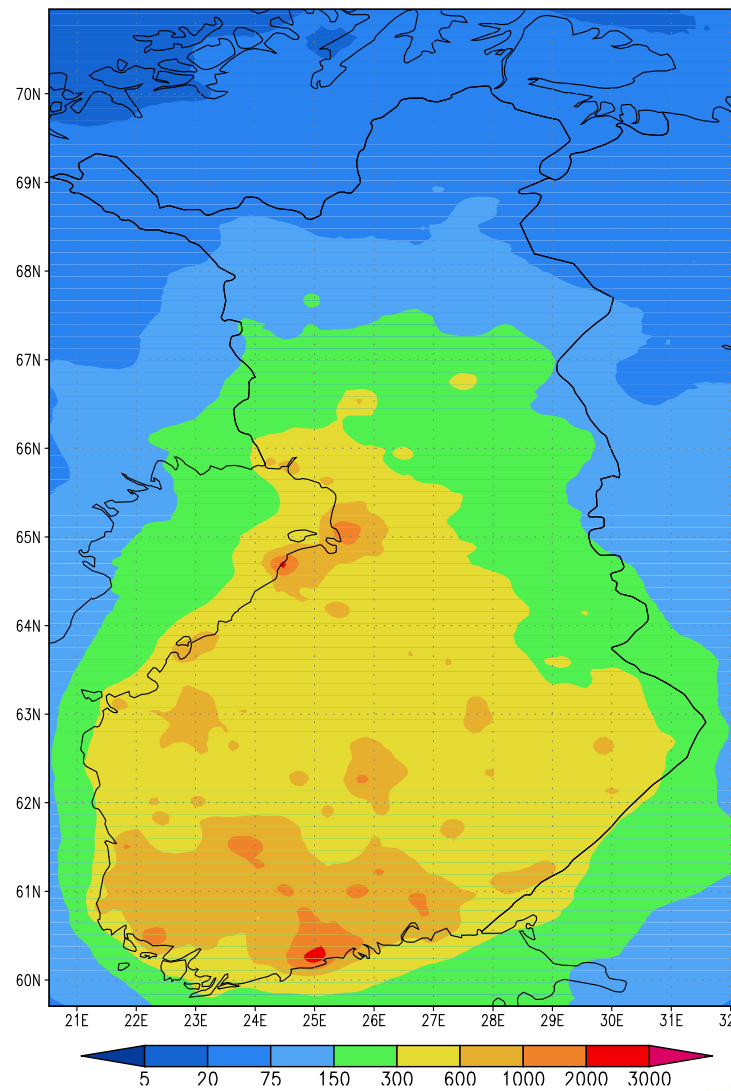
PM<sub>2.5</sub> concentrations in 2020

# European PM2.5 concentrations 2000

EMEP\_2000\_att10\_all\_srcs\_2001  
conc\_PM2\_5, [ug/m3], annual 2000



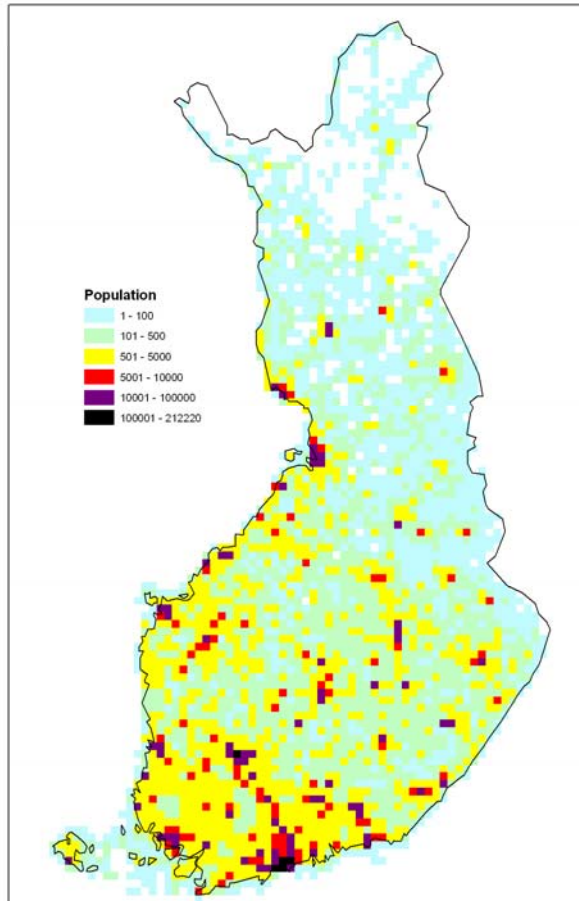
SPM conc. for ALL sources ng/m3, mean 2000



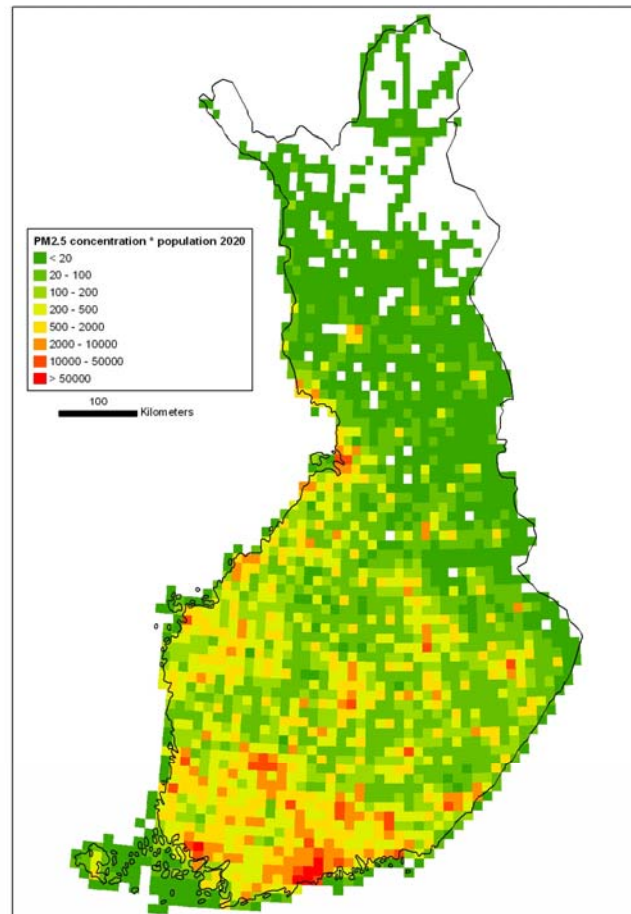
- Models: HIRLAM 6 + SILAM
- Emissions: EMEP / FRES 2000
- Resolution: 30 / 5 km



# Population \* PM<sub>2.5</sub> concentrations = population exposure



Population



Population exposure

2000 -> 2020:  
16% decrease in emissions  
(mainly from traffic sources  
in densely populated areas)  
-> 22% decrease in  
population exposure

THANK YOU