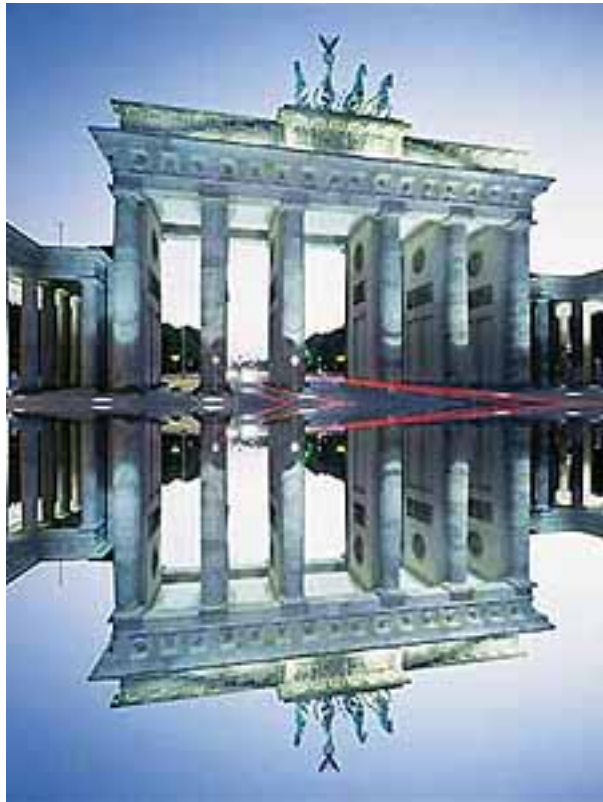


Berlin's Air Quality Strategy: **pollution sources,** **measures and their expected effects**



Martin Lutz

Senate Department for Urban Development, Berlin
Directorate IX, Environment Policy

- **a few facts about EU legislative framework**
- **brief overview: problems, origin, sources**
- **expected benefit of a trend scenario**
- **additional measures and their impact**

Air pollution control in the EU

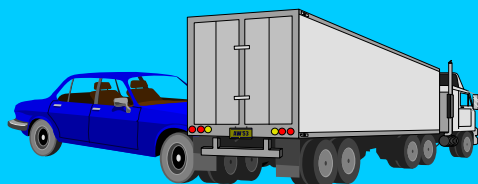
6th Environment Action Program

...to achieve **levels of air quality** that **protect** all people effectively **against** recognised **health effects** from air pollution and take into account the protection of the environment

Controlling emissions

National Emission Ceilings

Mobile sources



EU-Standards for vehicle emission and fuel quality (EURO III - V)

Voluntary agreements with industry, e.g. with ACEA

Economic measures

Road pricing
Fiscal incentives for BAT
Energy taxes
Scrappage schemes
Restricted access

Complementary measures on a **local** level

Stationary sources



EU-legislation on emission control of certain type of installations

Improving Air Quality

AQ Framework Directive

AQ standards
basic assessment criteria
action plans, reporting

SO₂, PM, NO₂, lead

Benzene, CO

Ozone

**Heavy metals
PAH**

**Acidification,
Eutrophication**

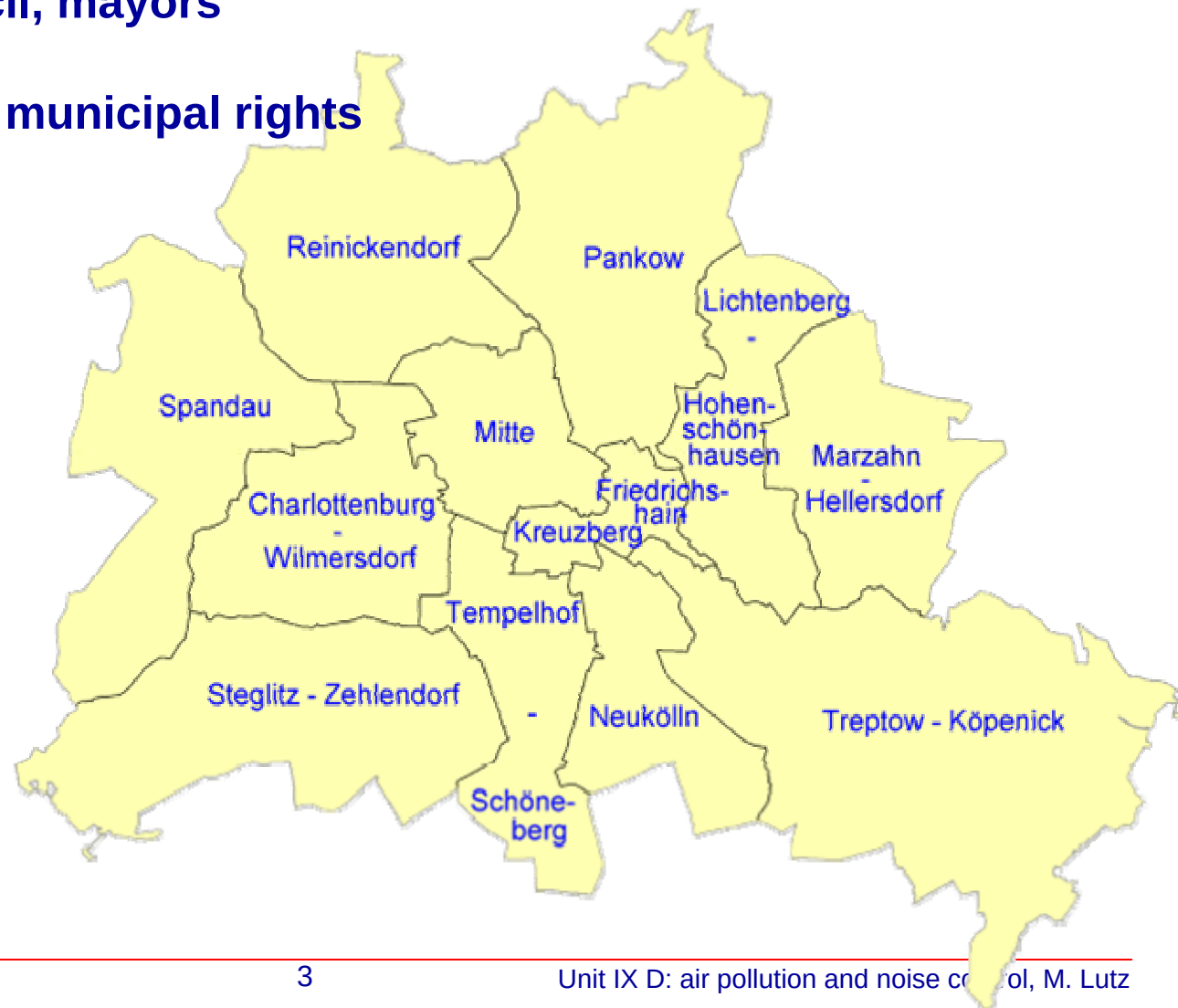
achieve Air Quality standards

trigger for further measures

a few facts about Berlin (ii)

3.4 Mio inhabitants (incl. 434,000 foreigners)

- **Municipality and State**
- **12 boroughs**
 - each > 250,000 inhabitants
 - own elected council, mayors and administration
 - but with restricted municipal rights

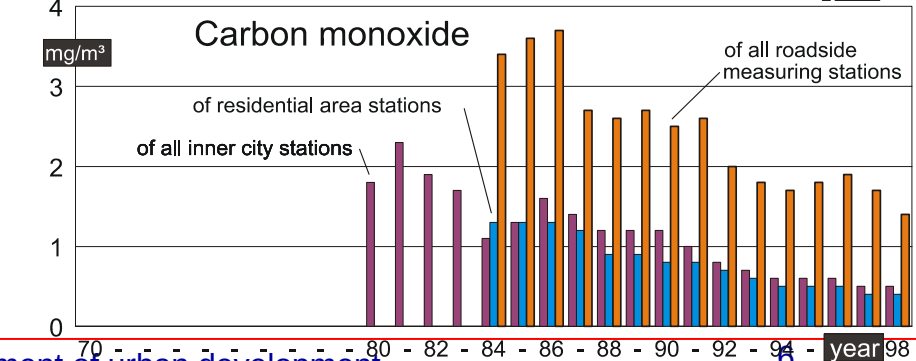
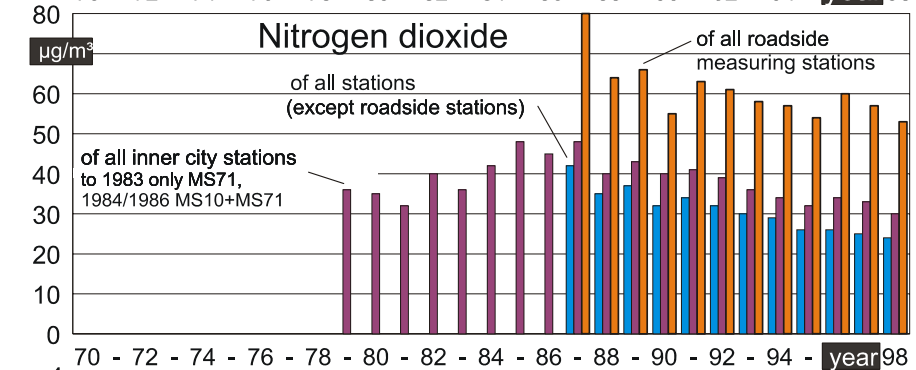
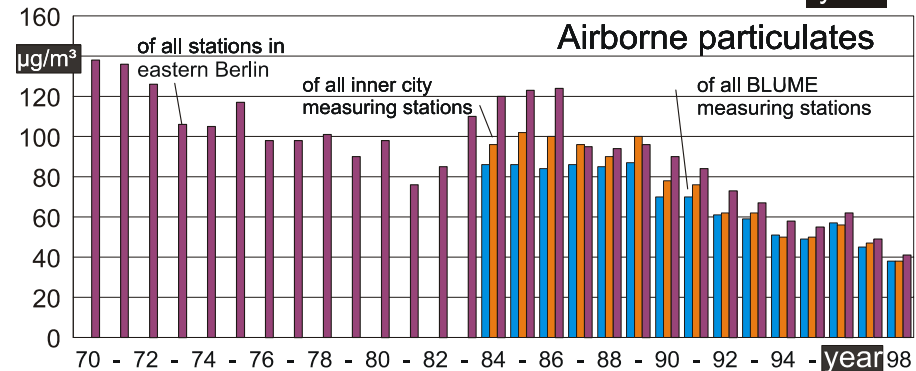
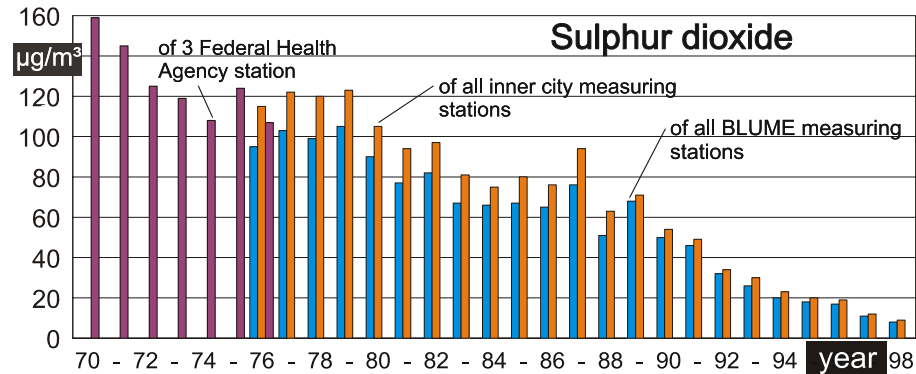


assessment of the air quality in Berlin

☞ summary

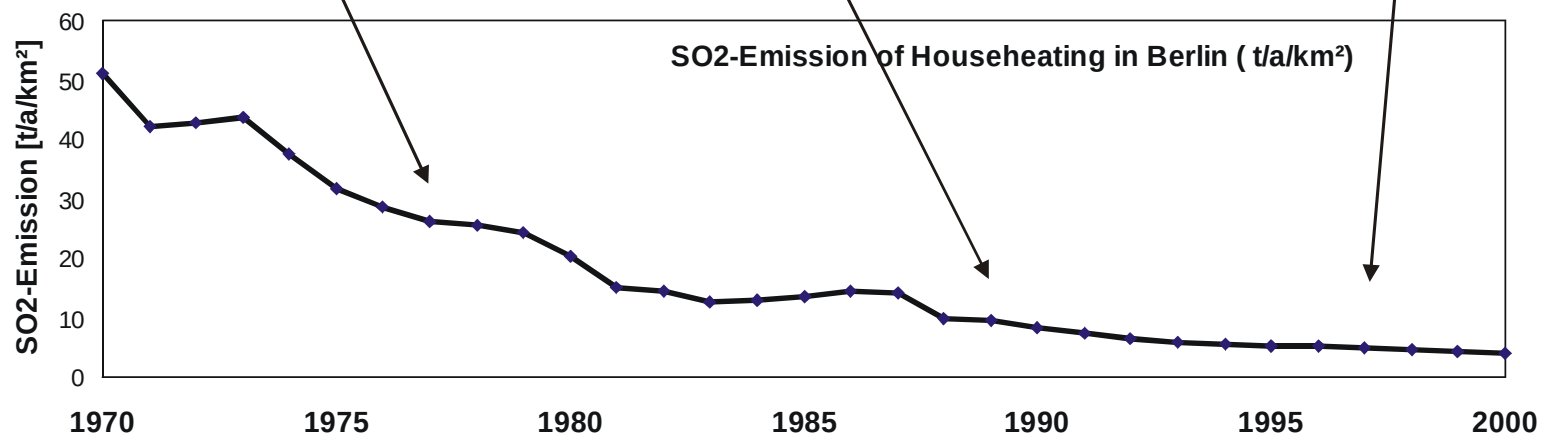
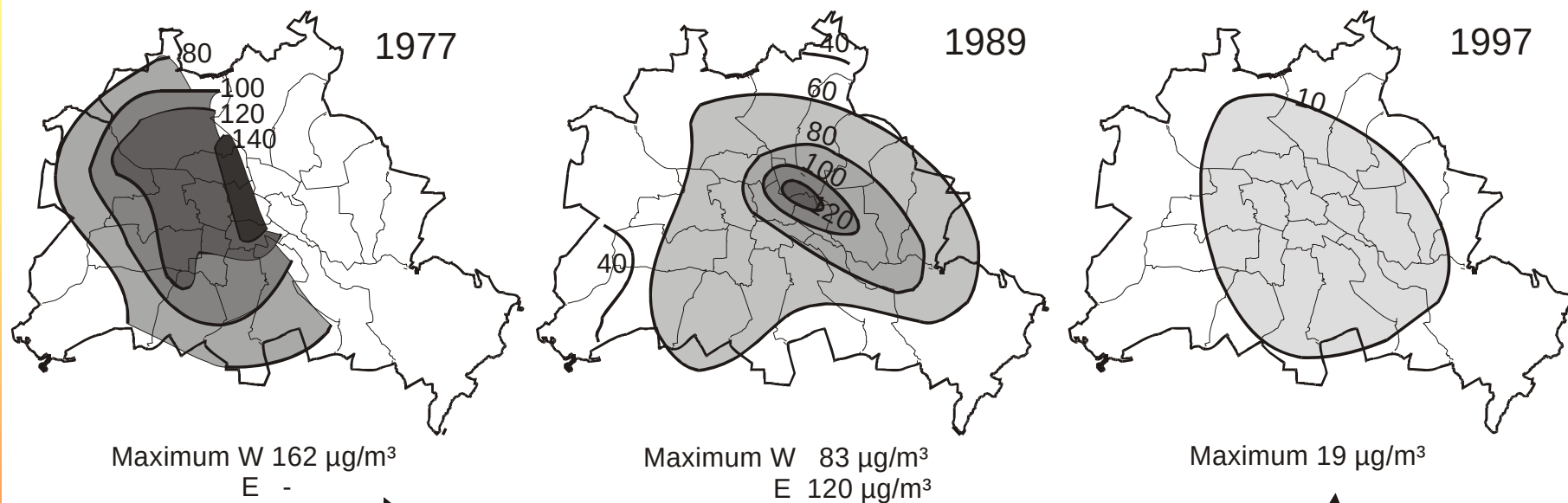
- on sulfur dioxide: ☺ no problem
- on lead: ☺ no problem
- on carbon monoxide ☺ no problem
- on benzene ☹ diminishing problem
- on nitrogen dioxide ☹ serious problem
- on PM₁₀ ☹ severe problem, to be tackled on local and European level
- on ozone ☹ serious problem, to be tackled mainly on a European level

Annual mean values



Long-term trends of air pollution

Annual averages of SO₂-concentration in Berlin



SO77_97.cdr, 9.10.98,ps

Past efforts to control air pollution in Berlin

☞ action to abate **sulfur** dioxide emissions

- ☐ **Desulphurization** of all large combustion plants
- ☐ Enhancing **energy efficiency** by, for example, energy saving measures during building renovation and more heat & power cogeneration (☞ climate change)
- ☐ **Ban of high-sulfur fuels** (brown coal and heavy fuel oil) in industrial combustion
- ☐ **Switch** from solid fuels **to gas** and low-sulfur oil for domestic heating
- ☐ Extended use of low-sulfur and **sulfur-free diesel**

assessment of the air quality in Berlin

☞ summary

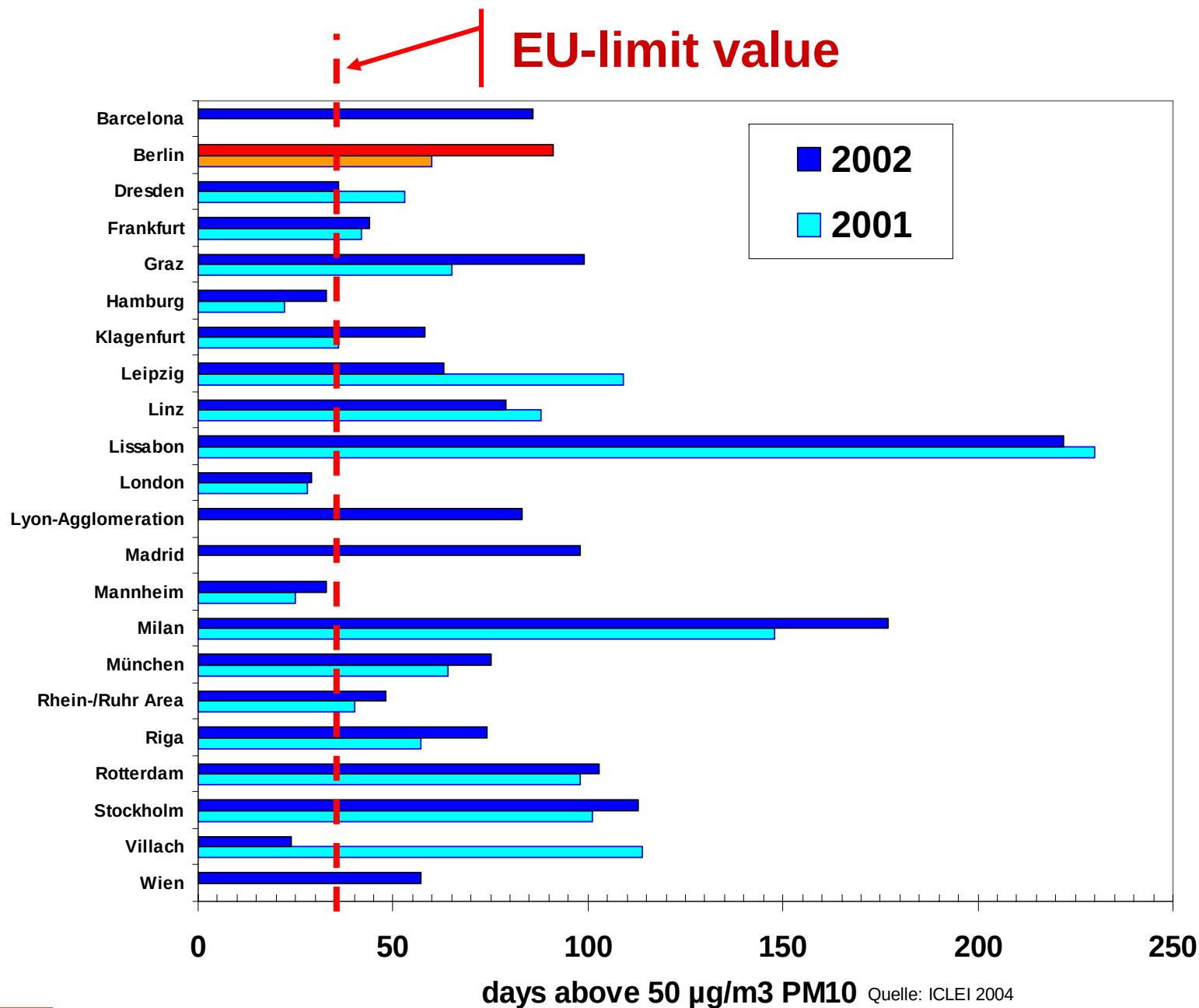
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EU limit values for PM₁₀ and NO₂

averaging period	limit value	attainment period
24 h	50 µg/m³ PM₁₀ 35 exceedances/year	1 Jan. 2005
1 year	40 µg/m³ PM₁₀	1 Jan. 2005
24 h	50 µg/m³ PM₁₀ 7 exceedances/year	1 Jan. 2010*
1 year	20 µg/m³ PM₁₀	1 Jan. 2010*
1 h	200 µg/m³ NO₂ 18 exceedances/year	1 Jan. 2010
1 year	40 µg/m³ NO₂	1 Jan. 2010

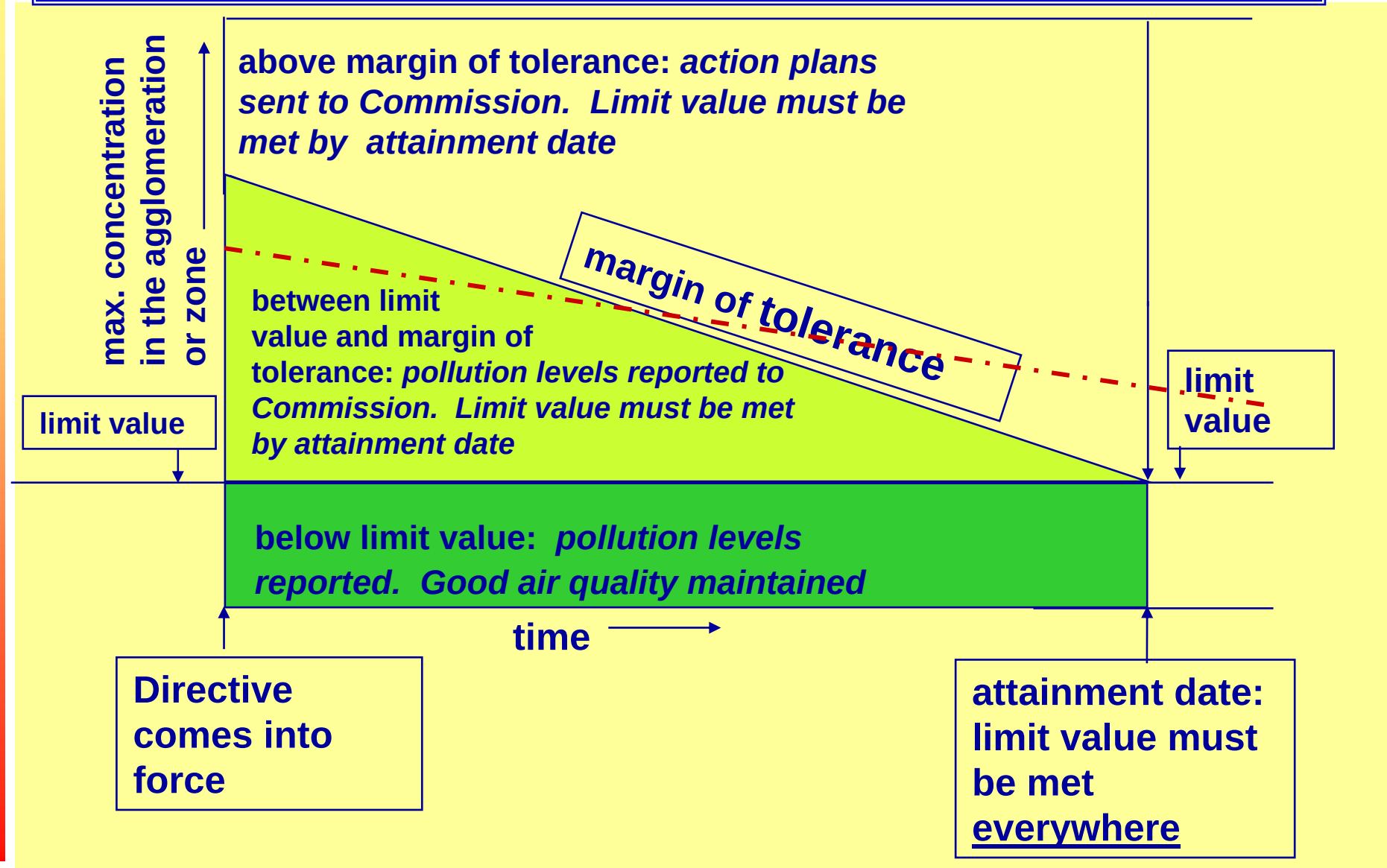
* **indicative limit values**, to be reviewed by the EU Commission

Comparison of PM10-pollution in European cities



Margin of tolerance

👉 **trigger for abatement plans**



Air pollution control plan

☞ **Structural template** required by EU law

Requisite issues to be dealt with

■ **assessment** of the air pollution

☞ Compliance check, trends

■ **source** analysis

☞ Where does it come from & how much ?

scales: local, urban, regional, continental

☞ Who's to blame & for how much ?

source sectors: transport, industry, domestic, ...

■ **current legislation** and it's likely **impact**

☞ includes effects of national and EU-wide measures

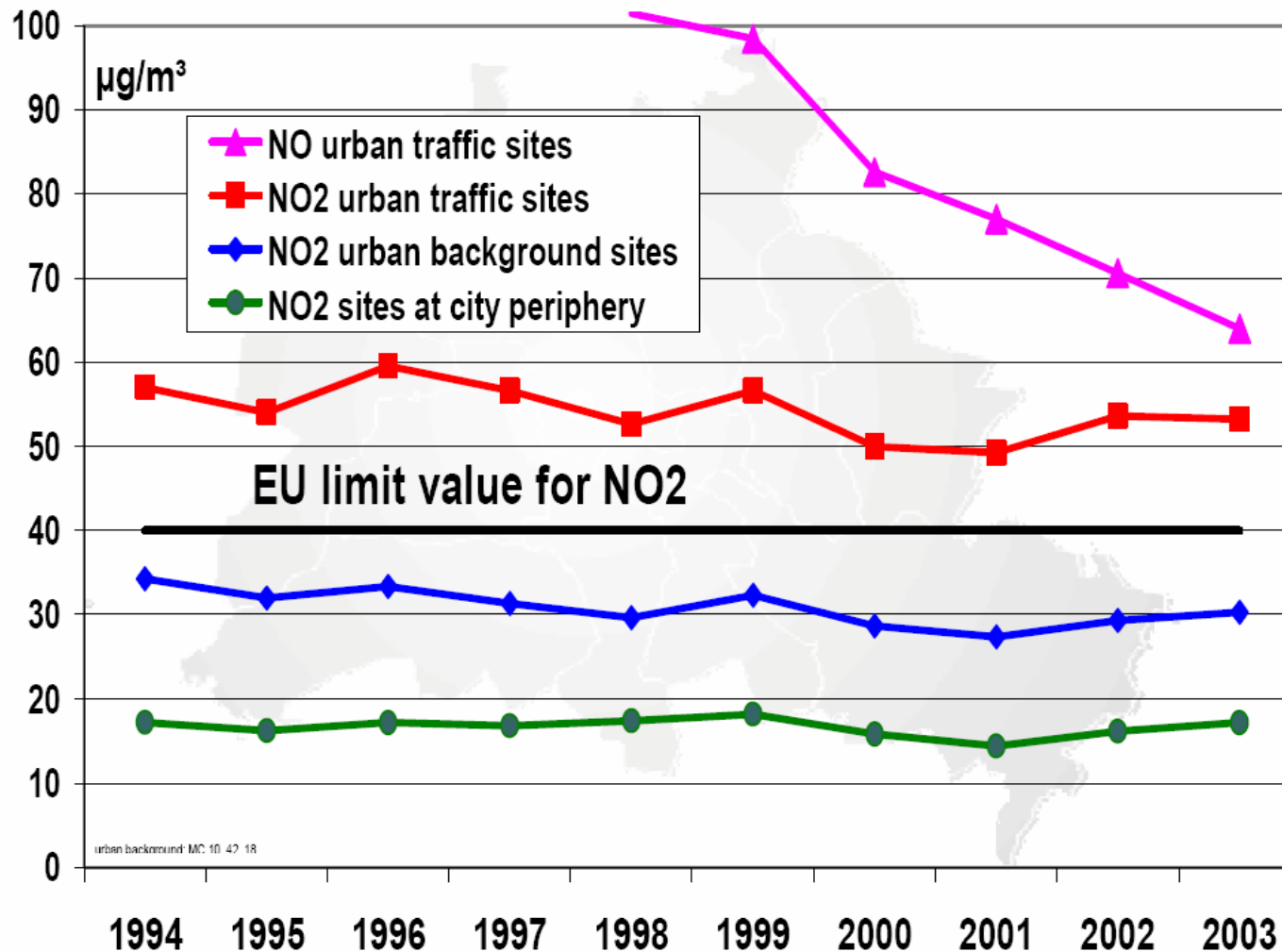
■ **Additional measures** planned & their likely **effect**

☞ Will the limit values be met ?

■ **Further possible long-term measures** & their benefits

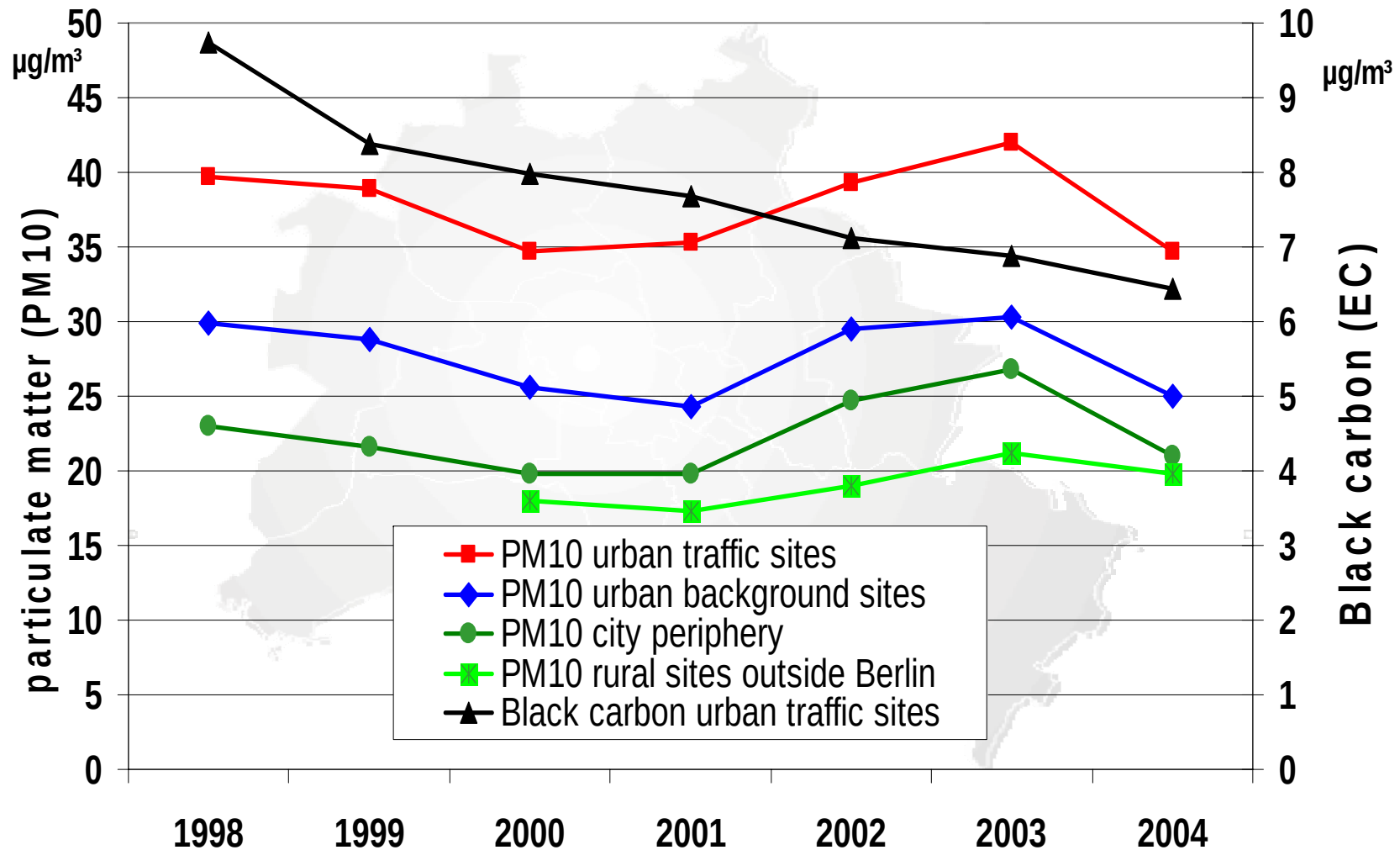
Long-term trend of NO₂ and NO in Berlin

trend of nitrogen oxide concentration in Berlin



Long-term trend of NO₂ and NO in Berlin

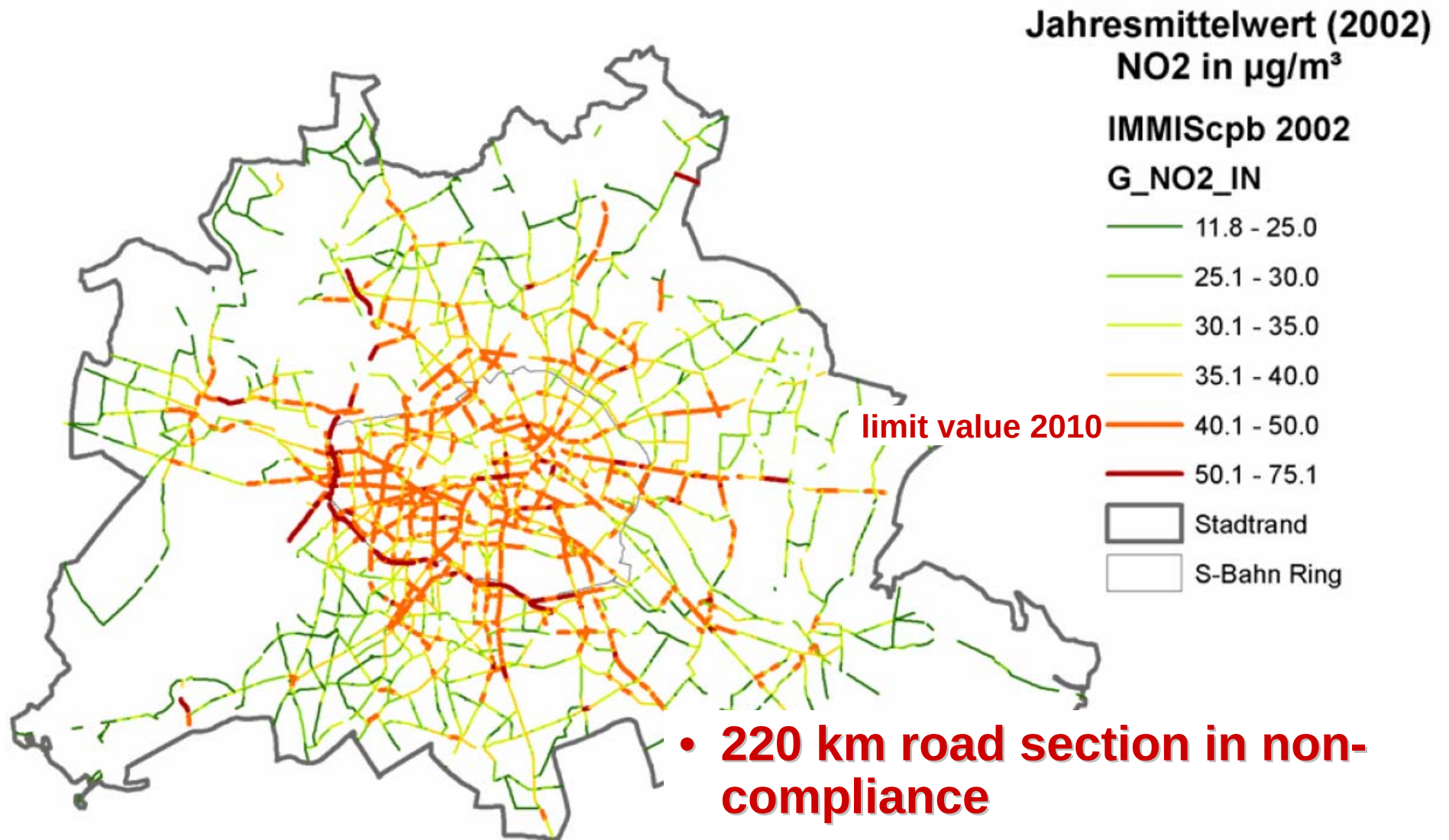
Trend of PM₁₀ and Black carbon levels in Berlin





AQ assessment by modelling

👉 modelled NO_2 in street canyons (2002)



- 220 km road section in non-compliance
- ca 98.000 residents affected

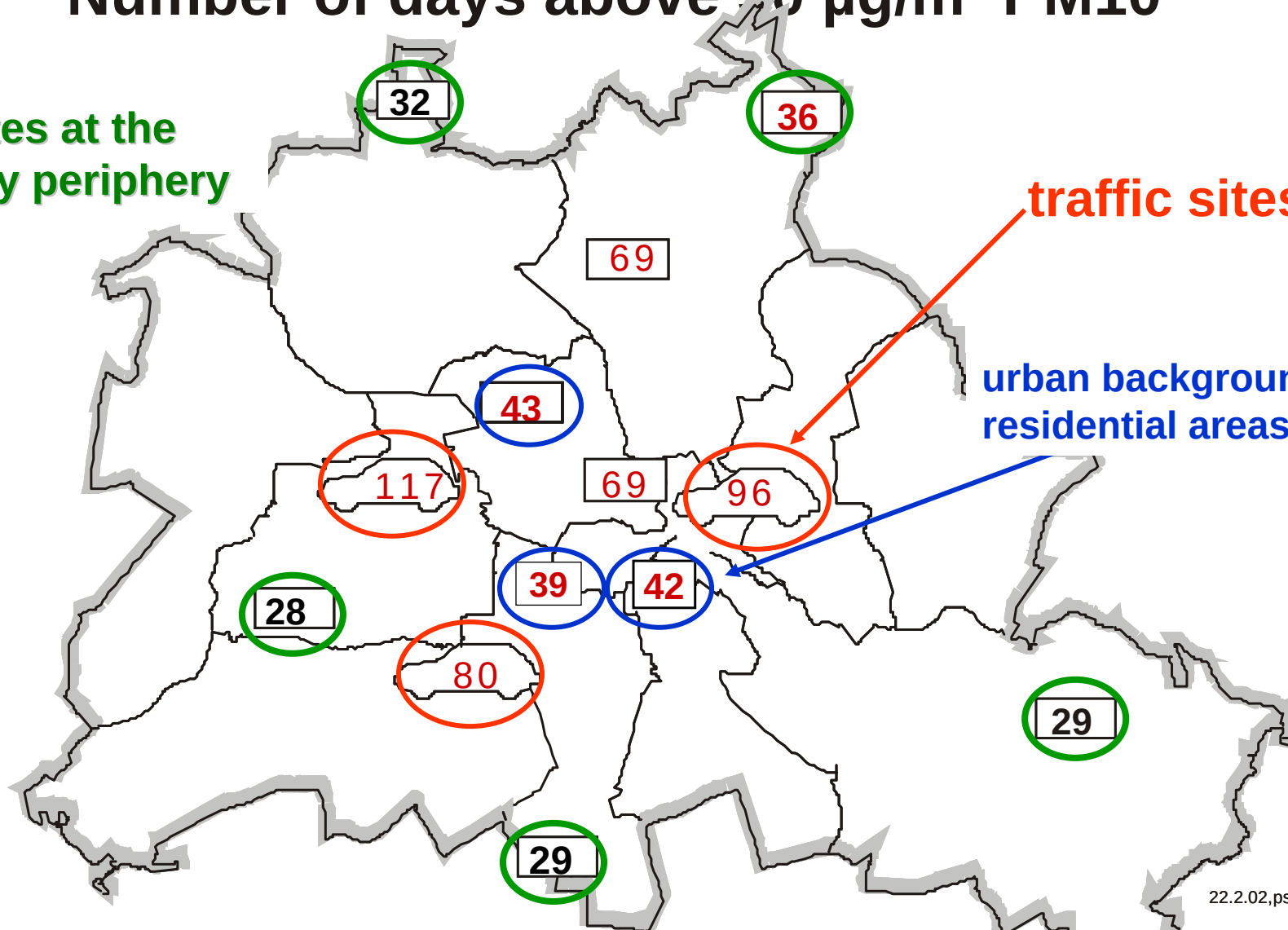
Levels of PM10 in Berlin in 2003

Number of days above $50 \mu\text{g}/\text{m}^3$ PM10

Sites at the
city periphery

traffic sites

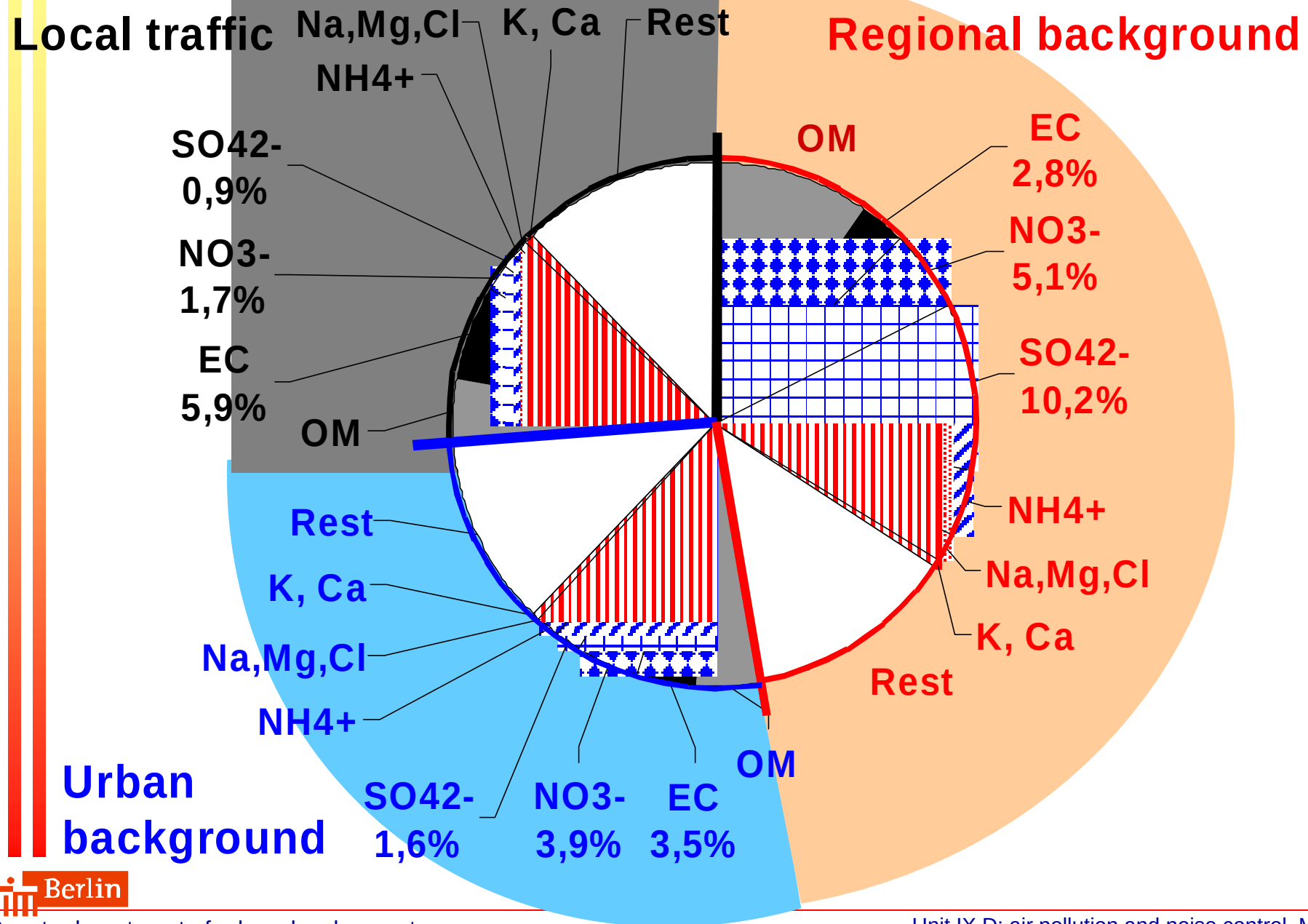
urban background sites in
residential areas



22.2.02,ps

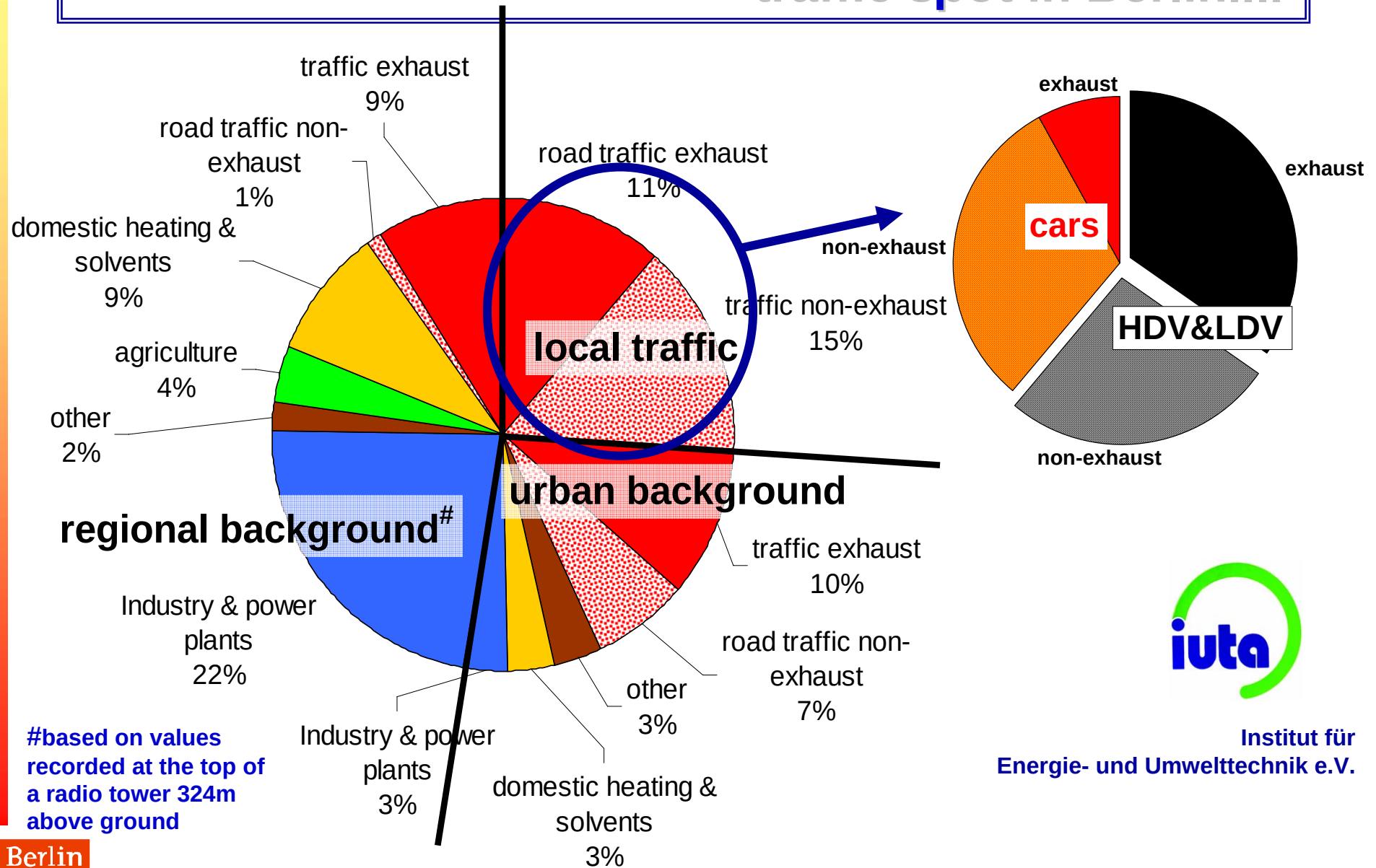
Source analysis

speciation and origin of PM10 in Berlin



source attribution by monitoring

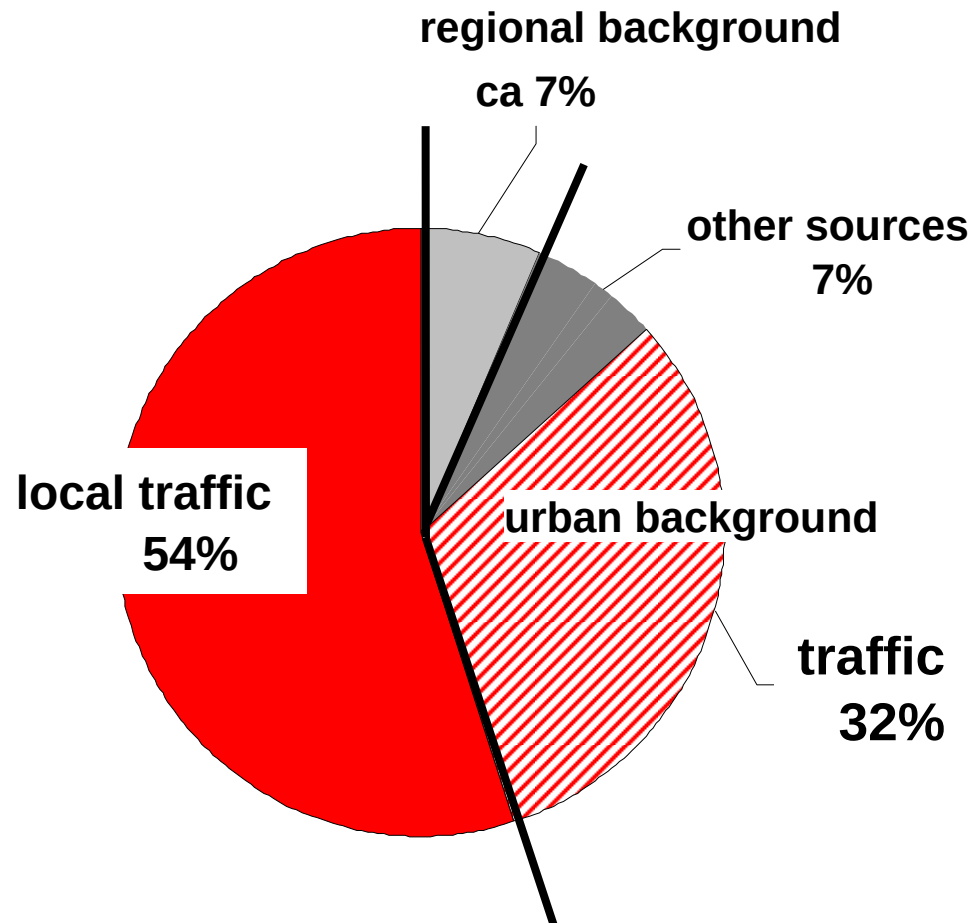
👉 Sectors contributing to total **PM10** at a busy traffic spot in Berlin....



Institut für
Energie- und Umwelttechnik e.V.

source attribution **by modelling**

👉 **Source sector contribution to total NO_2 at a busy traffic spot in Berlin's city centre**



Basis: NO_x modelling

Enhanced large-scale PM transport during episodes

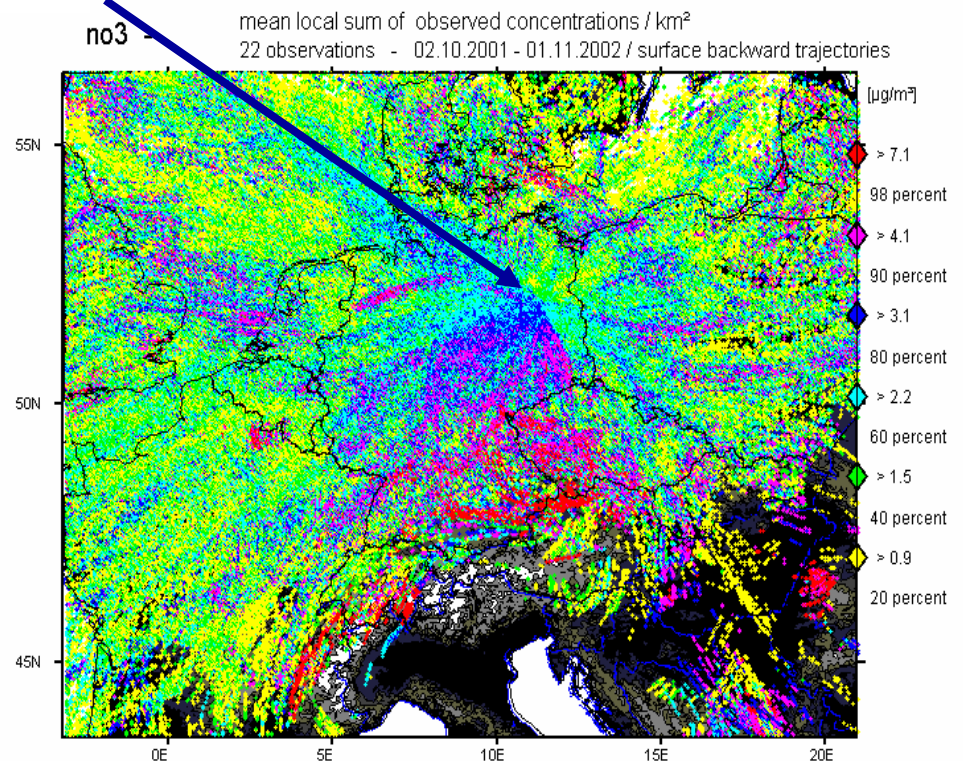
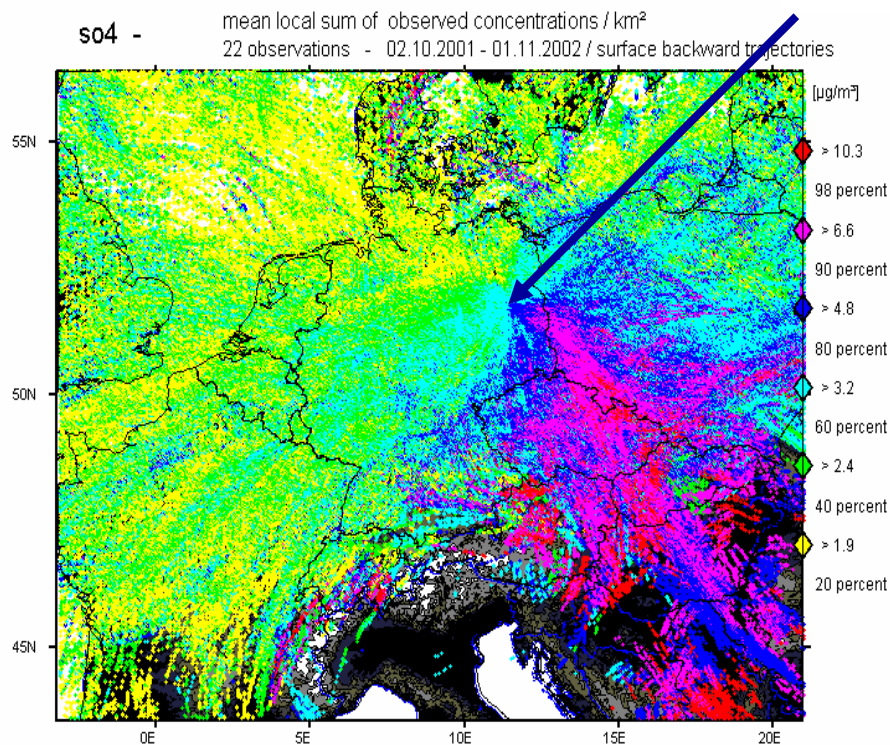
➡ little effect of local short term measures

Spatial distribution of potential source areas of secondary PM-10 imported into the Greater Berlin area

sulphate

Berlin

nitrate



source analysis

☞ interim conclusion

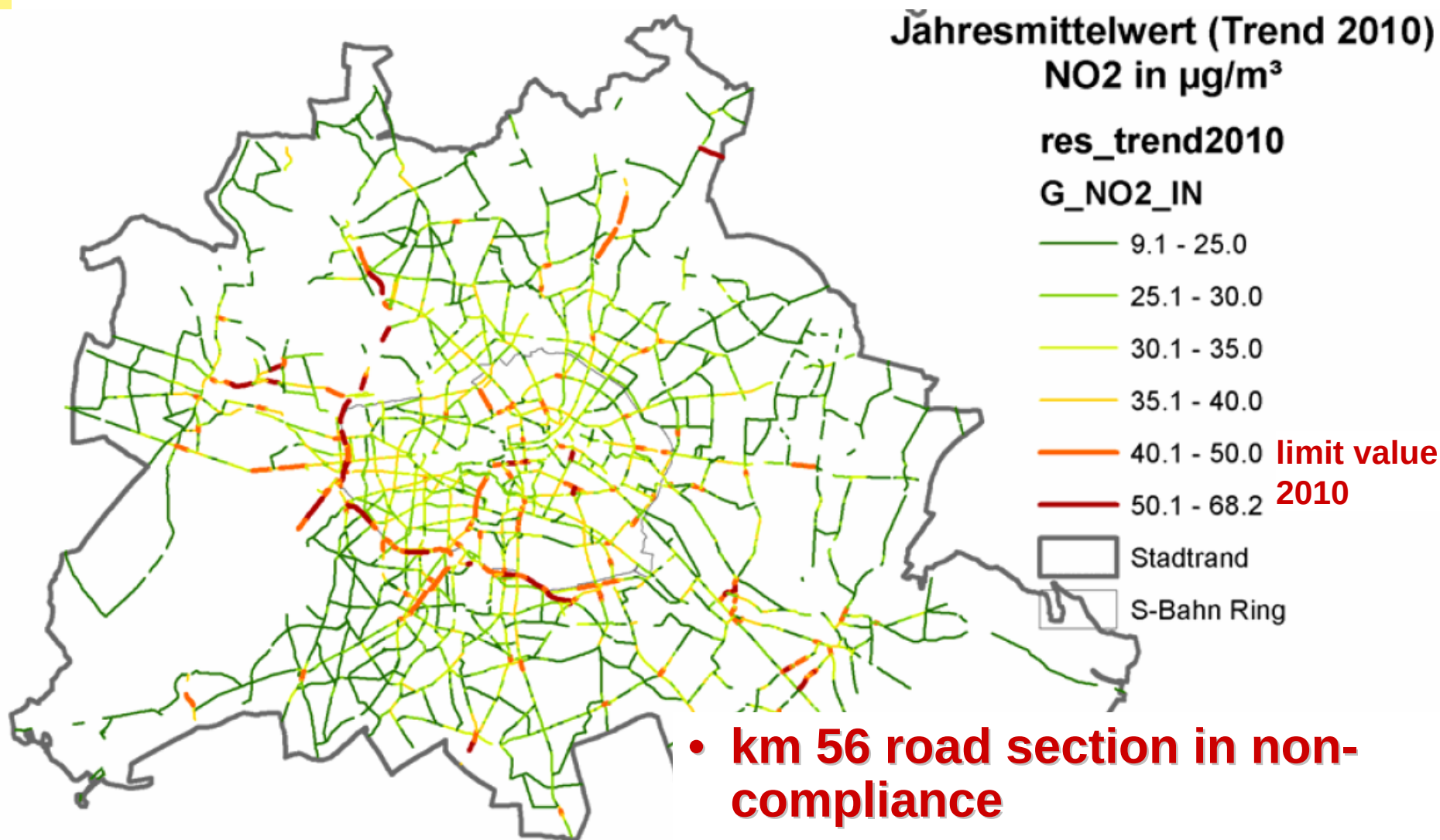
- regional PM₁₀ background is around half of kerbside levels
- motor traffic is the predominant source of PM pollution
- 20% of regional PM₁₀ background can be attributed to traffic exhaust emissions, but the bulk is secondary PM from industry & power plants
- more than half of traffic related PM₁₀ stems from road&tire abrasion and resuspension of road dust
- HDV & LDV emissions of particular importance
- NO₂ regional background usually less than 10 %

temporary short-term traffic ban as a possible measure in a action plan ➡ **interim conclusion (ii)**

- **PM10-smogalarm with a traffic ban is not an appropriate means to avoid exceedances of the 24h-limit value**
- **even duration or extent of exceedances can hardly be reduced**
- **area-wide traffic bans would require exemptions for business to ensure the supply of citizens**
 - ➡ **trucks and lorries need to run anyway**
- **peak-shaving strategy is not effective to reduce health risk because of lack of a no-effect level for PM**
- ➡ **launch of area wide, durable traffic restrictions for the most polluting vehicles are more effective**
 - (➡ **low emission zone**)
 - ➡ **needs transition period to allow adaptation of vehicle fleet**

trend scenario 2010

☞ predicted **NO2** concentration in main road network



- km 56 road section in non-compliance

- ca 17.000 residents affected

- **similar** relative improvement of PM10 pollution in and around **Berlin**
- envisaged improvement through “business as usual” measures not sufficient to meet NO2 limit values by 2010
- annual PM10 limit value can be attained
- 24h-limit value for PM10 won't be met by “business as usual” **even in 2010**
- ☞ **additional measures necessary to curb PM10 und NO2 – emissions!**
- ☞ **city-wide non-attainment needs city-wide action**

Air pollution control planning

additional measures planned

- stationary sources: BAT - already done

- transport:

- ↪ cleaner vehicles and fuels

-  municipal car fleet (CRT retrofit & CNG)

-  **LEZ** (low emission zone)

- ↪ less traffic through sustainable transport- and city planning (master plan transport, “StEP”), *inter alia*....

-  re-routing through traffic on tangential roads

-  extension of zones with parking fees

- ↪ expected effect: ~ 10% traffic reduction in Berlin’s centre

- ↪ Optimized traffic management at hot spots ( HEAVEN)

-  linked with noise abatement

- ↪ Speed limits

-  big effect on noise and safety

-  little effect on air quality

- ↪ City toll

- ↪ enhanced road washing

- ↪ “smog alarm” type of temporary measures (traffic ban)

Air pollution control planning

➡ **additional measures planned (ii)**

Cleaner vehicles and fuels.....

■ **cleaning up the municipal vehicle fleet**

- ↪ particle filter: police, buses (1000 old buses retrofitted with CRT, 400 new with CRT)
- ↪ compressed natural gas: BSR (25% of garbage collection vehicle)

■ **improving private & business Diesel vehicles**

- ↪ private cars: Gas-vouchers & tax refunds
- ↪ Taxis and driving schools: funding of new CNG-vehicles (TuT)
- ↪ freight transport: funding of CNG HDVs&LDVs (Tellus)
- ↪ particle filter: talks with business about retrofitting

■ **network of gas refilling stations (12 stations by now)**

☹ **what is lacking....**

- **tax incentives for clean (light) duty vehicles and retrofitted vehicles ➡ federal government**
- **tougher vehicle emission standards ➡ EU**

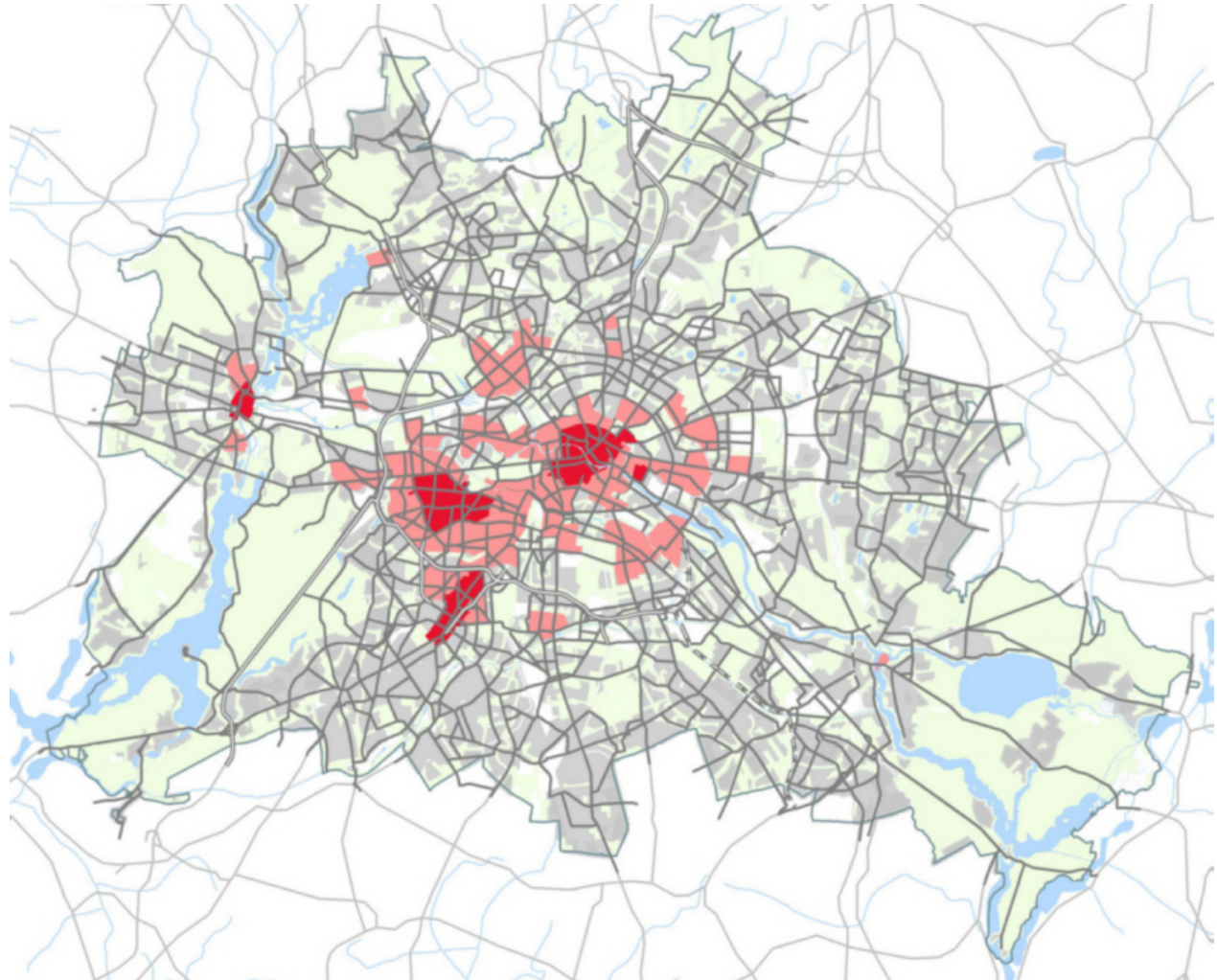
air pollution control planning

👉 transport planning & management

enlargement of areas with parking fees

"STEP"

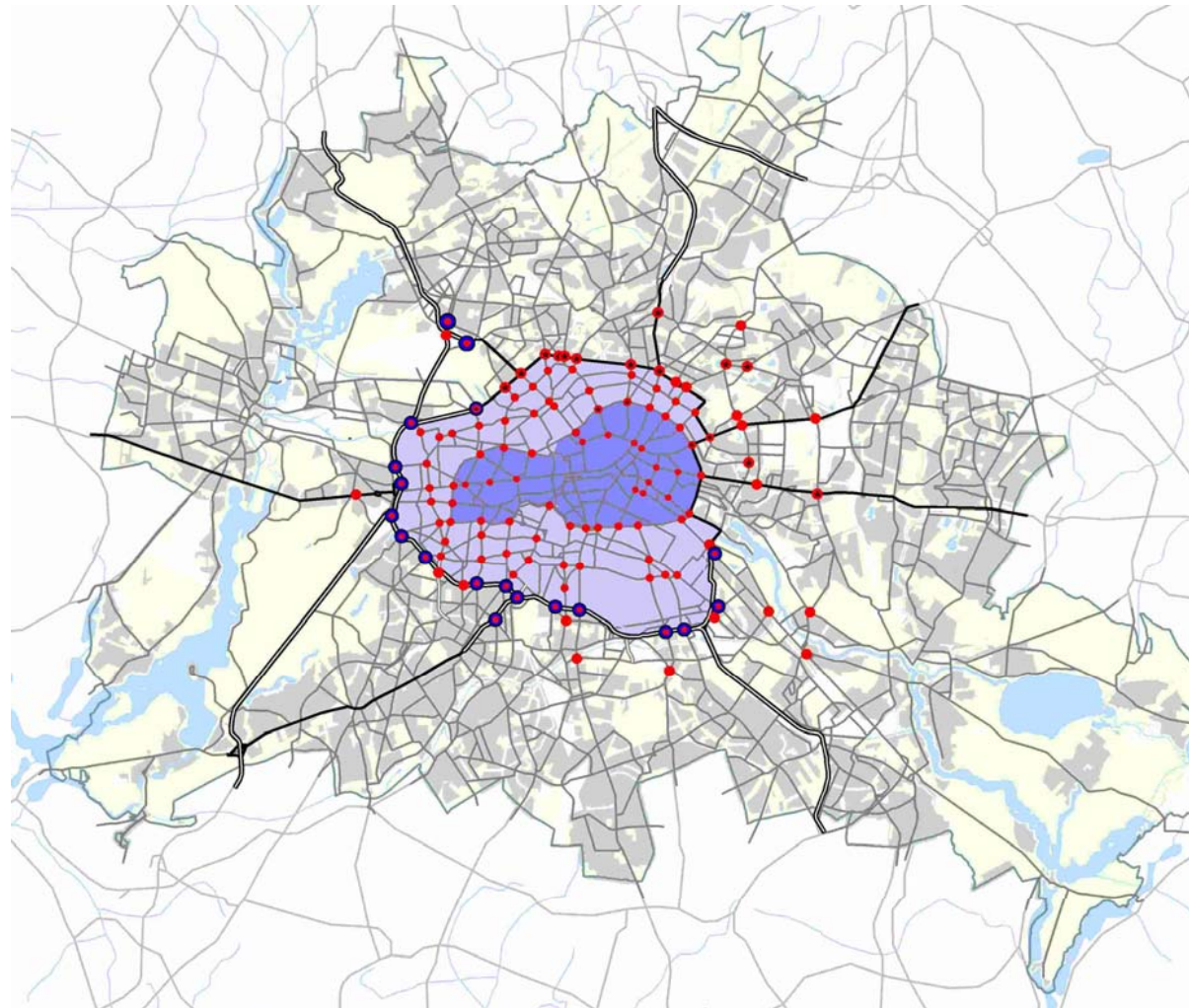
- existing areas
- future enlargement



air pollution control planning

👉 transport planning & management

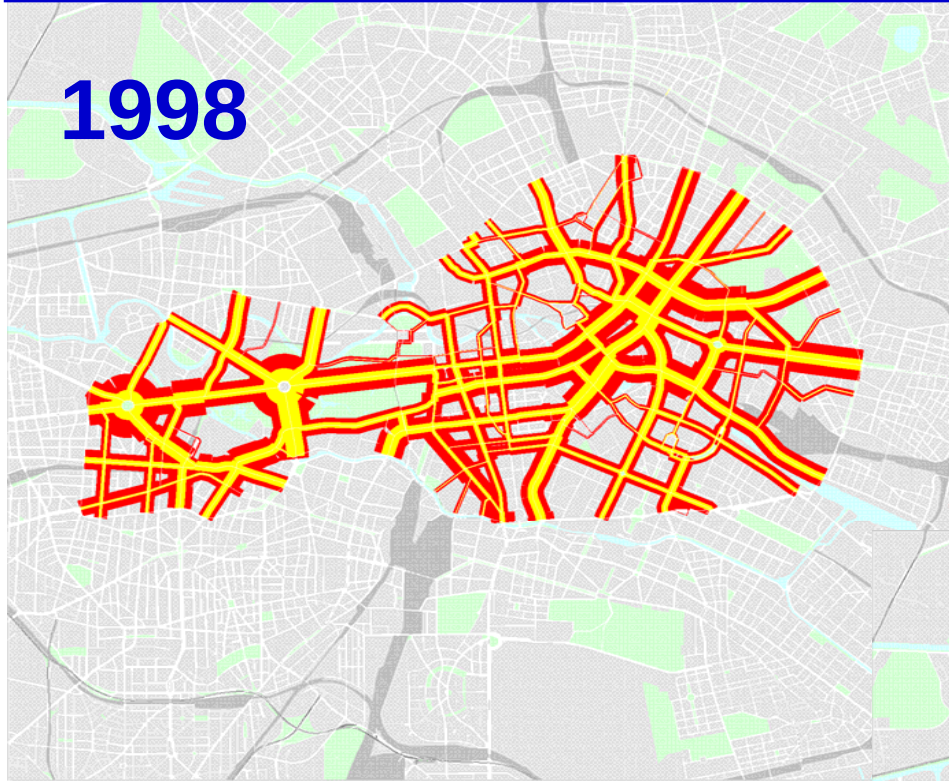
re-routing through traffic



- Entlastung von großräumigem und innerstädtischem Durchgangsverkehr
- Entastung von großräumigem Durchgangsverkehr

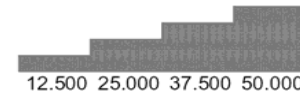
Potential to calm traffic in Berlin's city centre

1998



Durchgangsverkehr
kleiner Hundekopf 1998

Anzahl Kfz pro
durchschnittlichen Werktag



■ Gesamtverkehr
■ Durchgangsverkehr

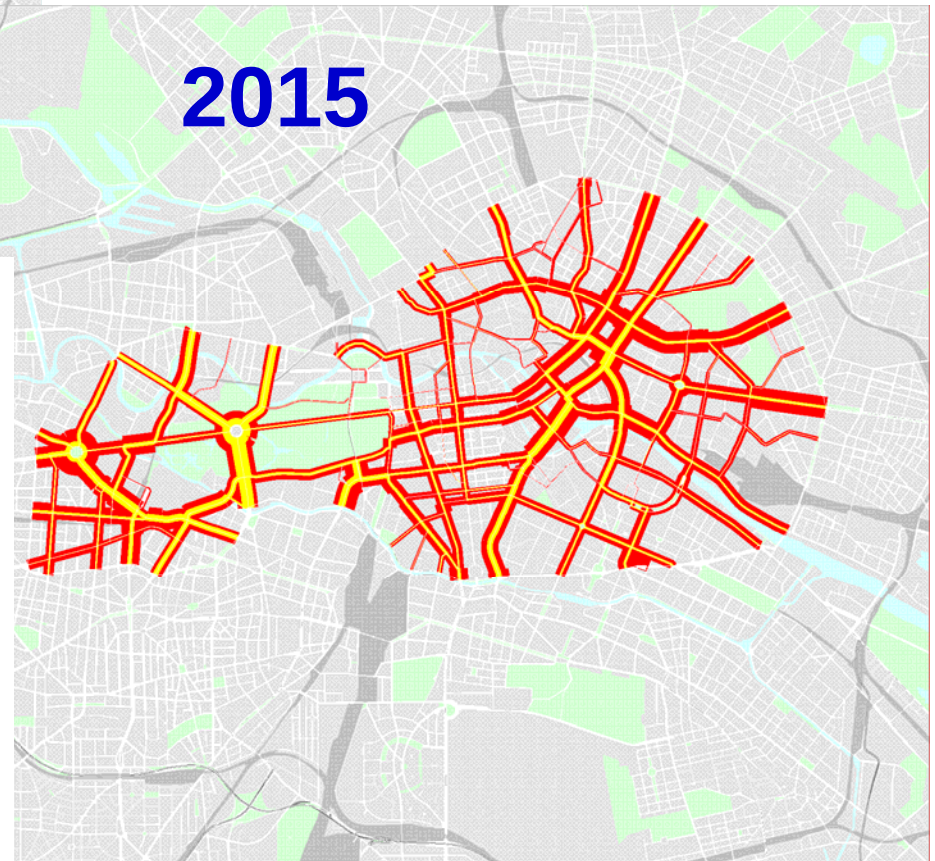
2015

Durchgangsverkehr
kleiner Hundekopf 2015
Szenario 3

Anzahl Kfz pro
durchschnittlichen Werktag



■ Gesamtverkehr
■ Durchgangsverkehr



Air pollution control planning

additional measures planned

■ **stationary sources: BAT - already done**

■ **transport:**

 **cleaner vehicles and fuels**

 **municipal car fleet (CRT retrofit & CNG)**

 **LEZ** (low emission zone)

 **less traffic through sustainable transport- and city planning**
(master plan transport, “StEP”), *inter alia*....

 **re-routing through traffic on tangential roads**

 **extension of zones with parking fees**

 **expected effect: ~ 10% traffic reduction in Berlin’s centre**

 **Optimized traffic management at hot spots** ( **HEAVEN**)

 **linked with noise abatement**

 **Speed limits**

 **big effect on noise and safety**

 **little effect on air quality**

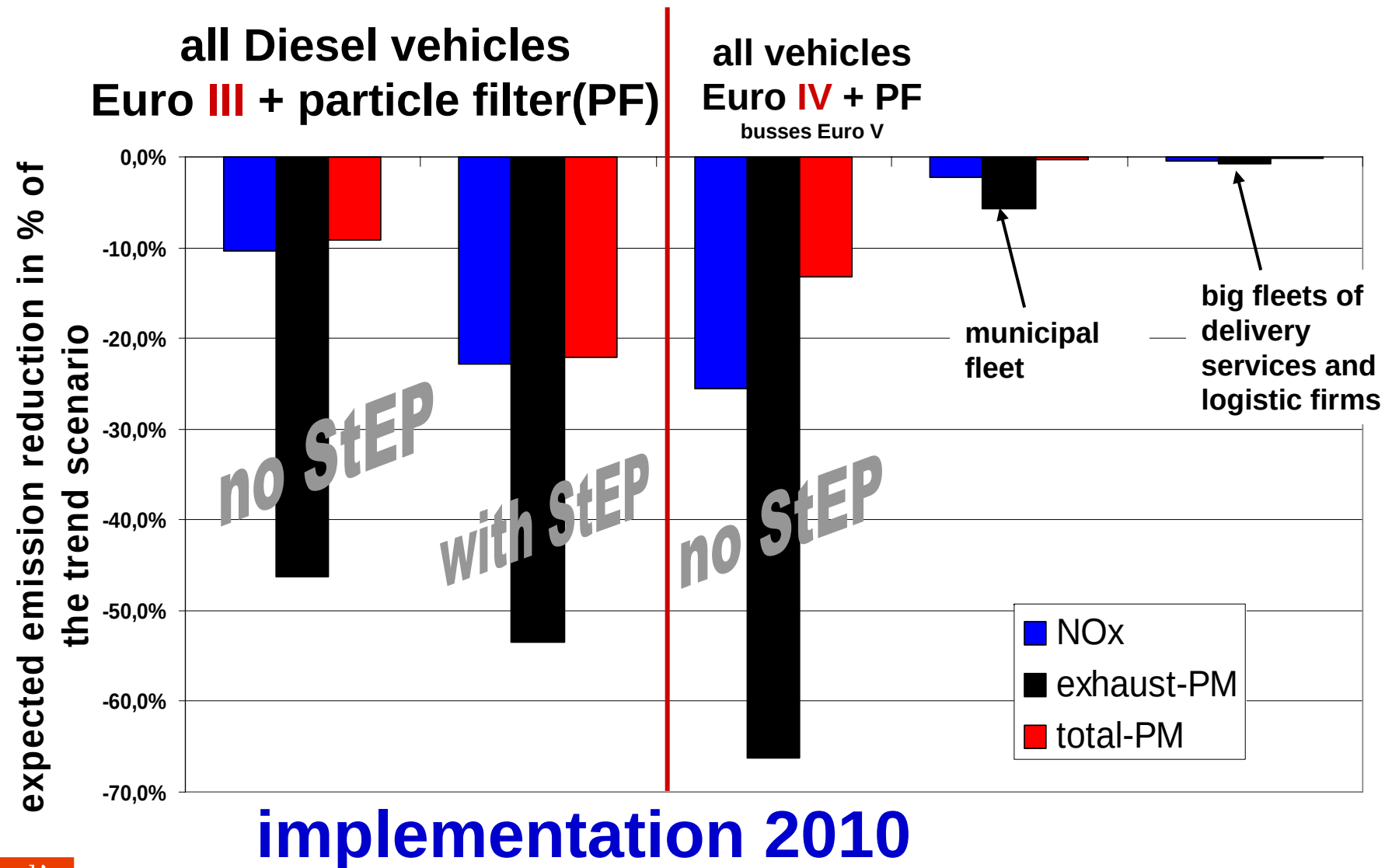
 **City toll**

 **enhanced road washing**

 **“smog alarm” type of temporary measures (traffic ban)**

Options for LEZ: **Emission reduction** in relation to the trend scenario 2010

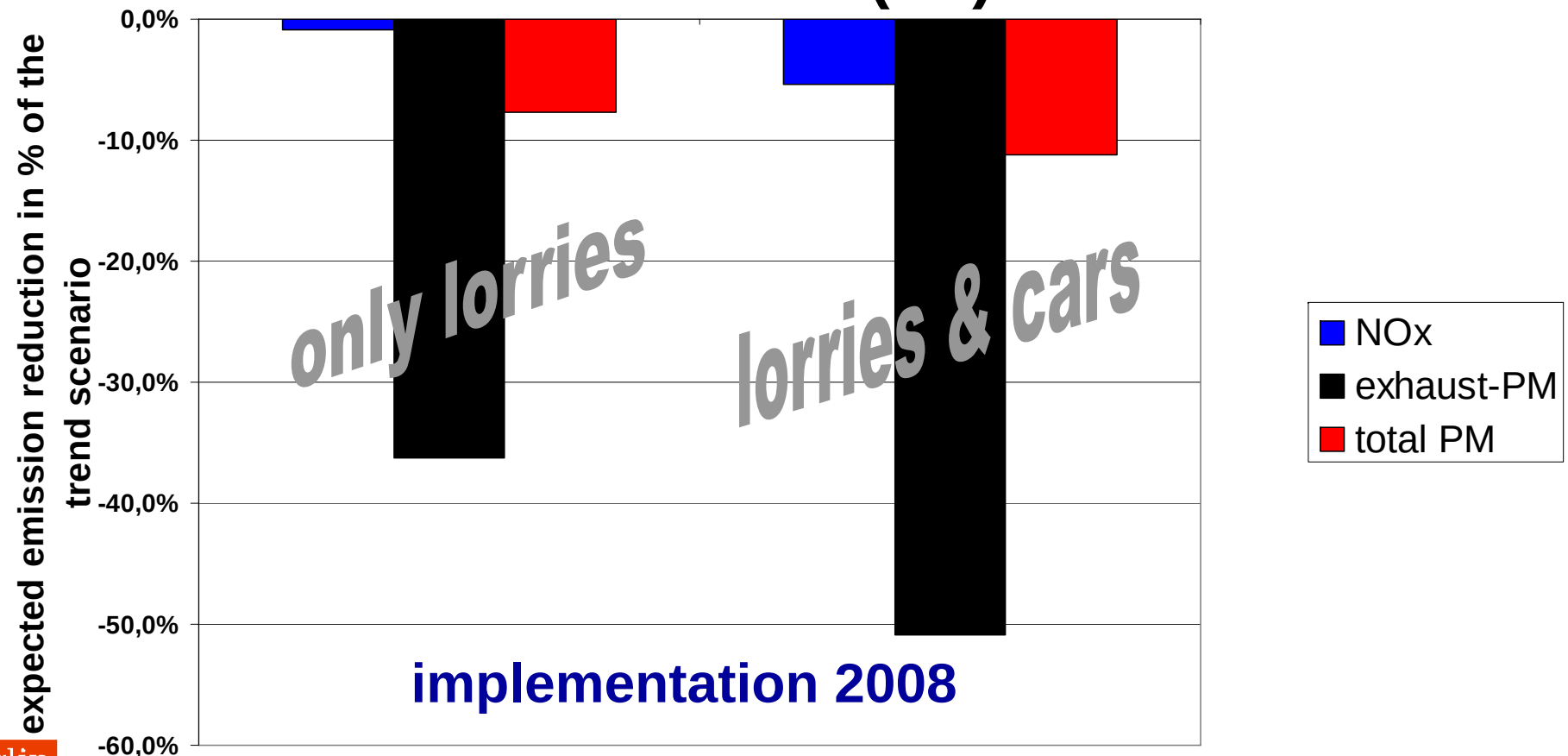
👉 impact of transport planning („StEP“) and vehicle technology



Options for LEZ: Emission reduction in relation to the trend scenario 2010

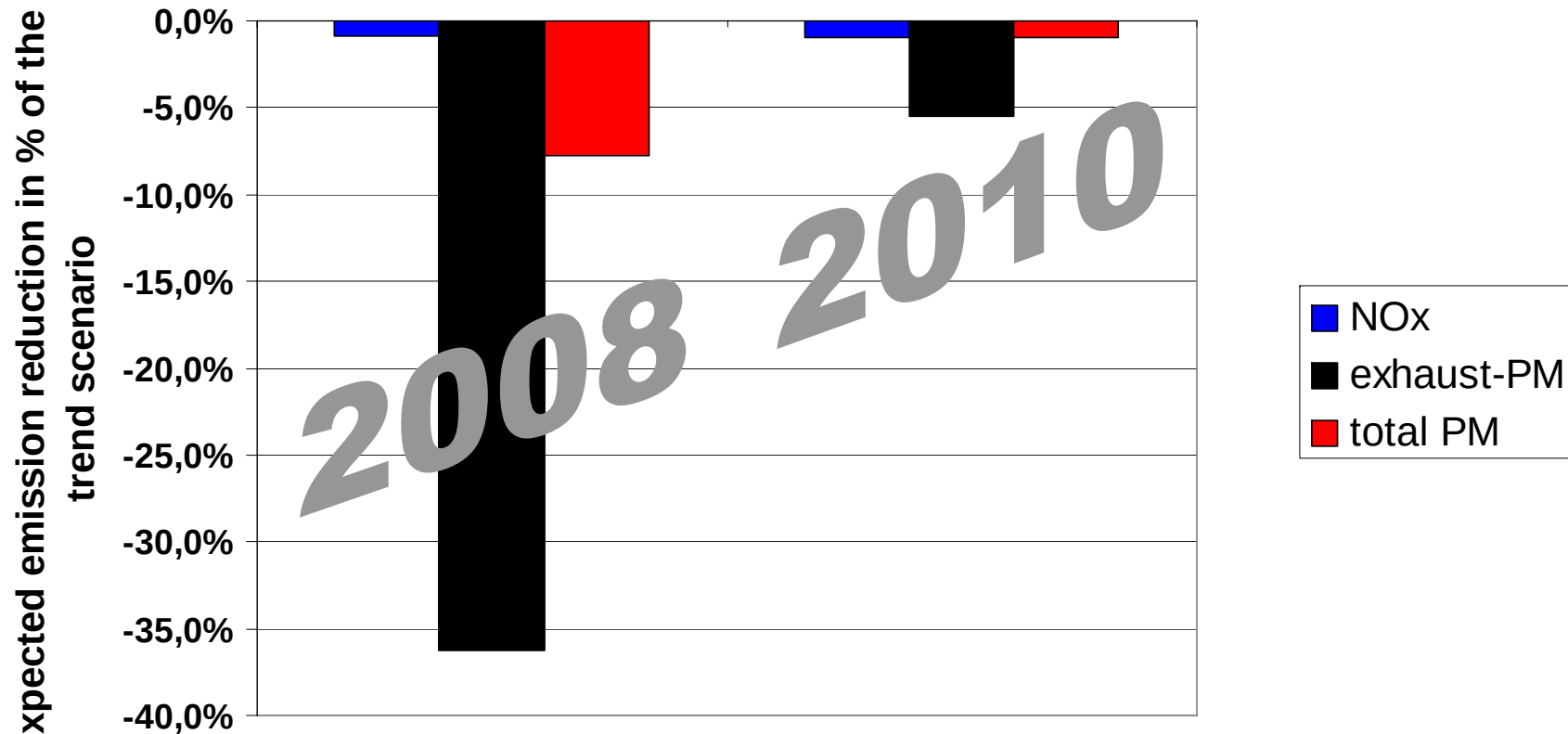
👉 impact of cars vs lorries

„London“
lorries, busses, taxis
Euro II + PM filter (PF)



Options for LEZ: **Emission reduction** in relation to the trend scenario 2010 👉 **impact of implementation date**

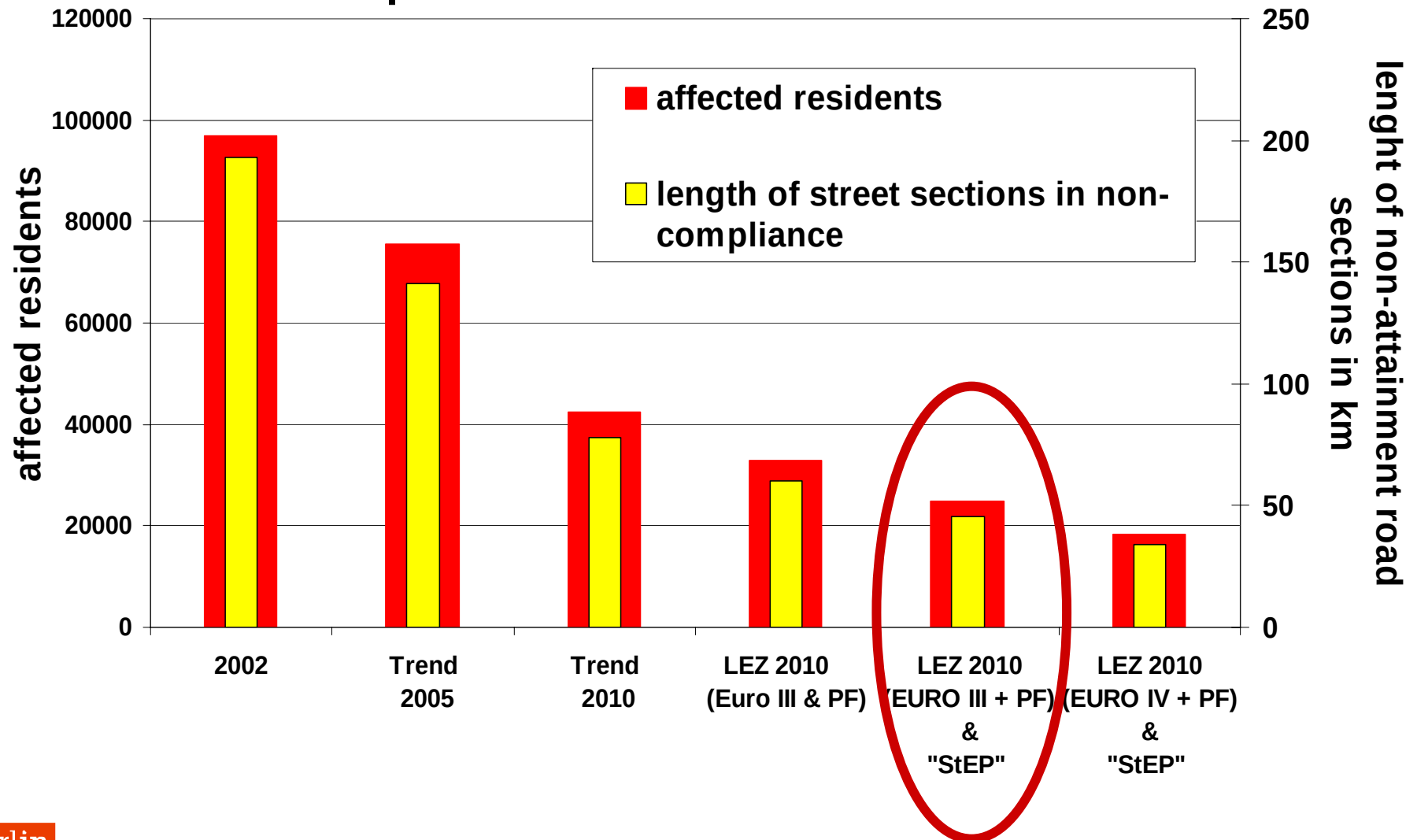
lorries, busses, taxis
Euro II + PM filter



Air Pollution Control Planning

👉 impact of various control scenarios

exceedances of the **PM10** 24h-limit value
impacts of various control scenarios



Air Pollution Control Plan

☞ Core measure: **low emission zone**

traffic restriction for high emitting vehicles in the central city area

☞ stage I: 2008,
Diesel vehicles require at least **EURO II**

☞ stage II: 2010,
Diesel vehicles require at least **EURO III & particle trap**
gasoline vehicles need at least **EURO II**

☞ scrutiny in 2006, whether **retrofit** with particle trap could be required already in stage I

☹ **still needed...**

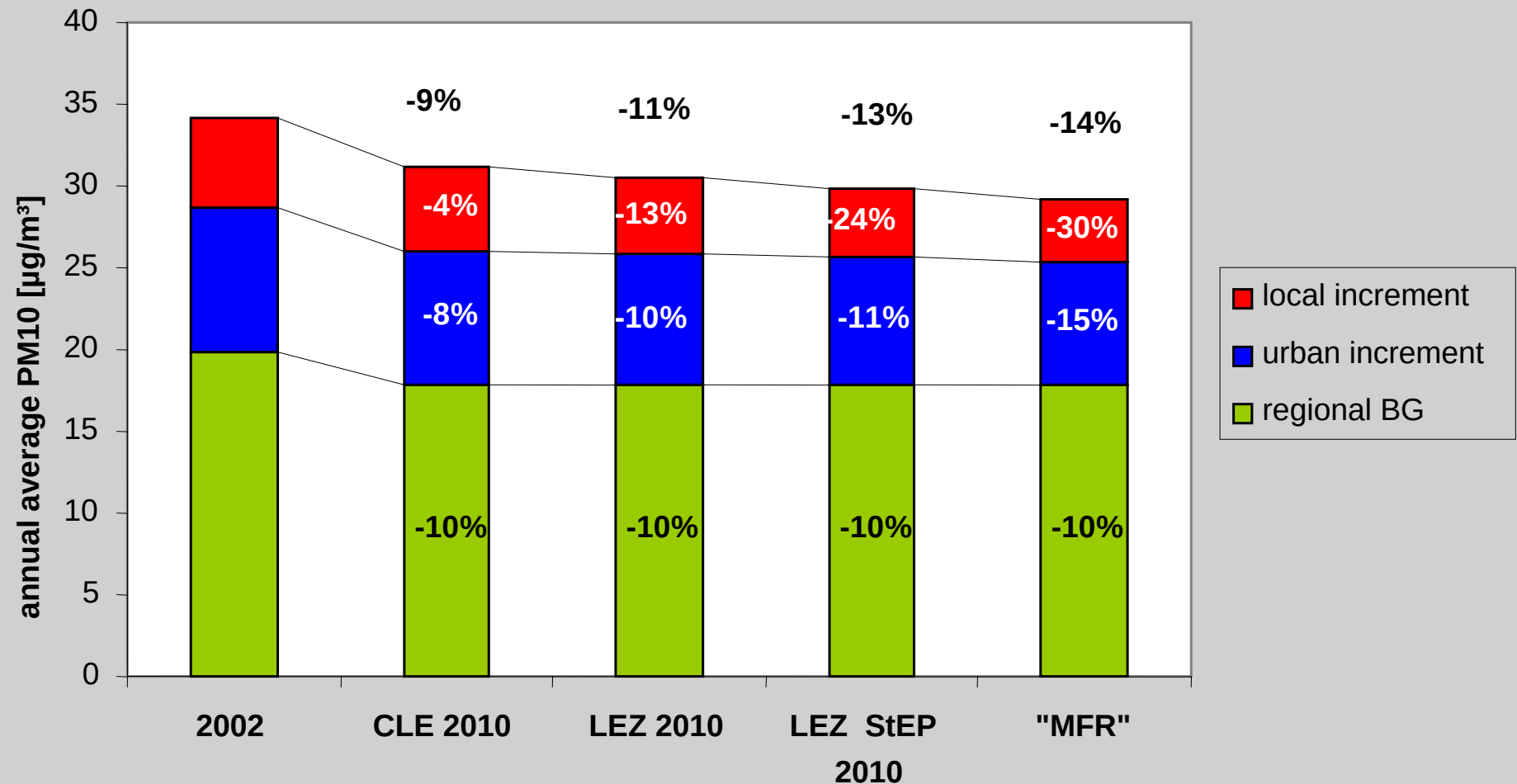
☞ national **labelling** scheme for **clean vehicles**
☞ Federal Government

☞ **economic incentives**, in particular for clean (or retrofitted) vans and lorries
☞ Federal Government

Air Pollution Control Planning

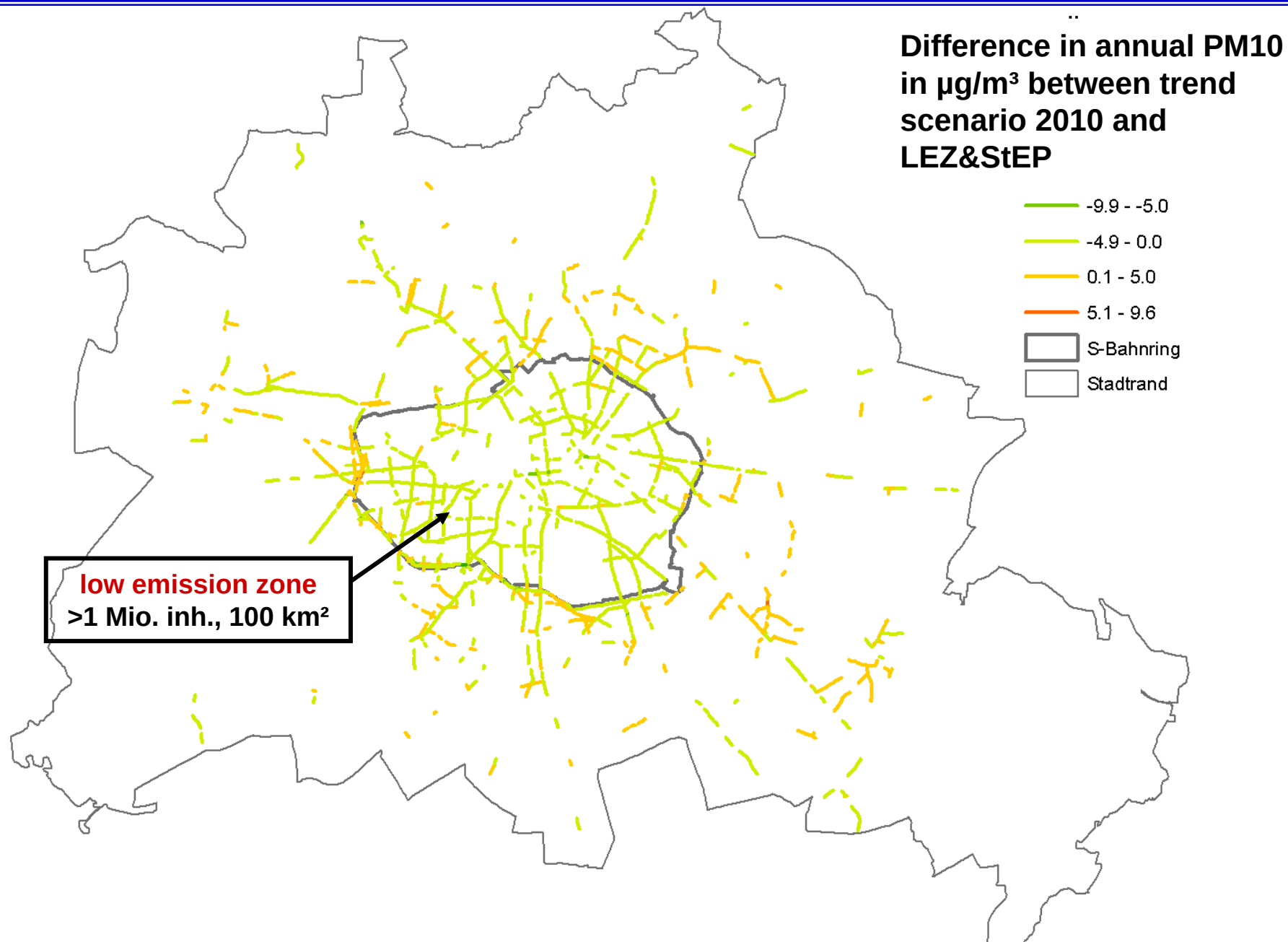
👉 **impact of various control scenarios**

Expected decrease of PM10 in Berlin



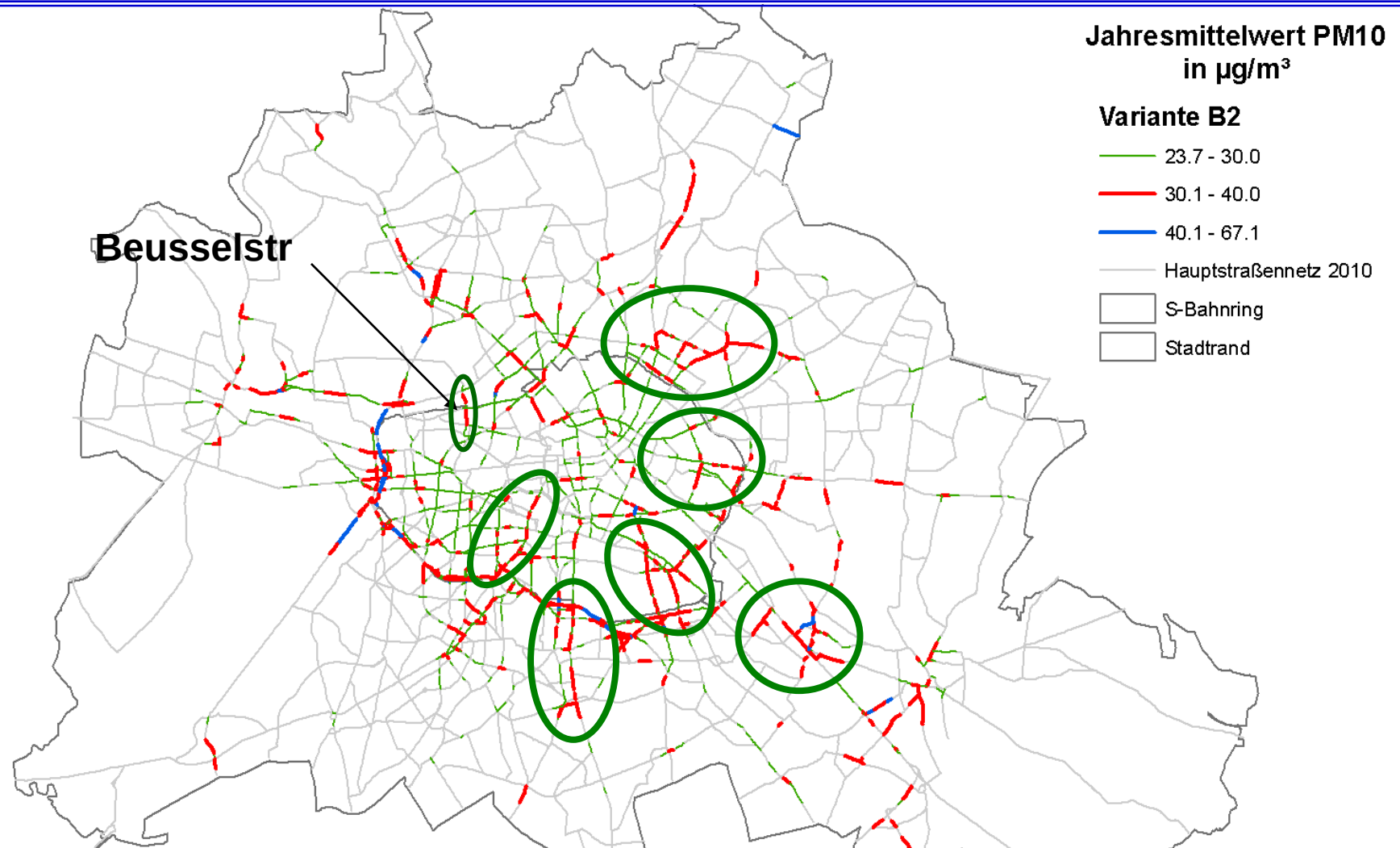
LEZ & “StEP” scenario 2010

☞ **PM10** reduction beyond the trend scenario 2010



LEZ & "StEP" scenario 2010

☞ predicted **PM10** concentration in main road network



remaining hot spots where local traffic management could be an option