# Coping with particulate emissions by traffic management – possibilities and constraints

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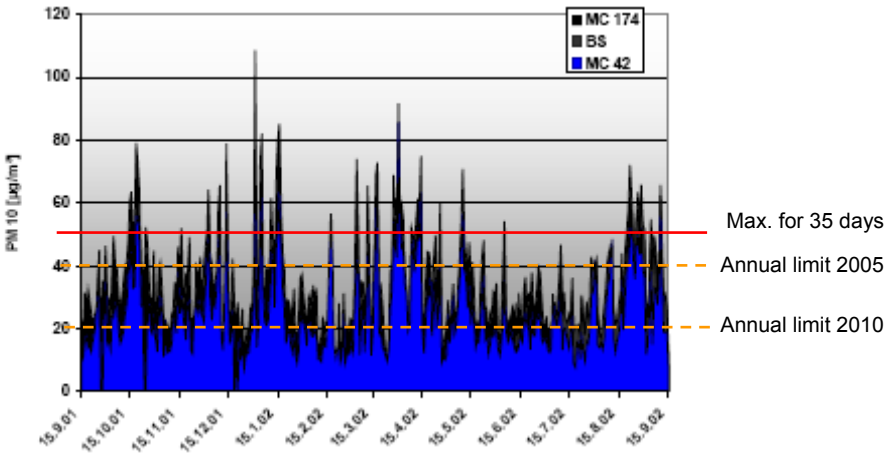
## EU limits for PM10 mass concentration passed

- **EU regulation focusses on mass concentrations of PM10:**
  - Max. 50 µg/m³ PM10 as daily average for less than 35 days and
  - Max. 40 µg/m³ PM10 annual average (2005)
  - Linearly reduced to max. 20 µg/m³ PM10 in 2010 (indicative)
- **Does a reduction of PM10 mass concentration reduce the health impact?**
- **What is the correlation of the PM10-concentration with nano- / ultra-fine particle emissions? In their origin? In their atmospheric development? In chemical speciation?**
- **PM10 limit values passed in several German agglomerations => actions demanded**

## Exceedances at inner city and traffic stations

Berlin (9/2001 – 9/2002): Inner city and traffic measurement site

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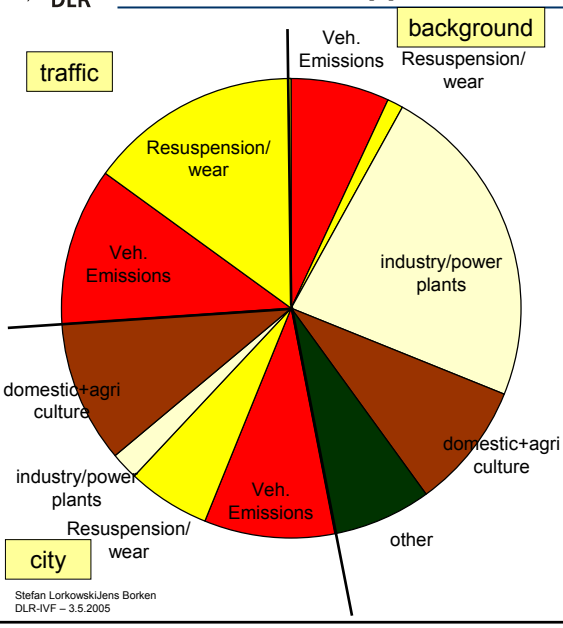
## Source apportionment of urban PM10




- Even at urban hot spots ~50% of PM10 from background / long-distance sources.
- In total ~50% of PM10-concentration related to road traffic, half of which resuspension, road and tyre wear.
- Limit value exceeded when high long-range transport and local traffic.
- Traffic management local and short-term measure

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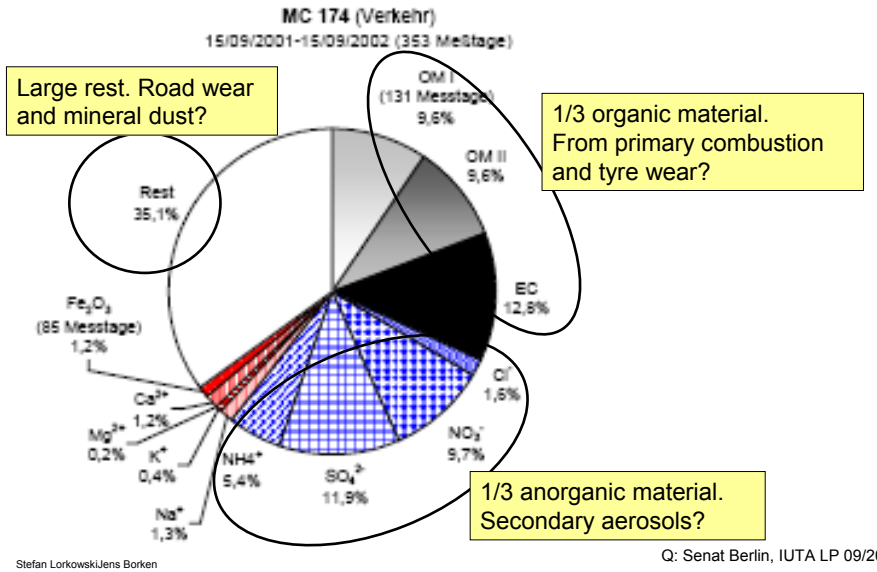
## Average chemical composition of „traffic“ PM10

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## Potential of dynamic traffic management

**Traffic management := Information, guidance and/or regulation of traffic, vehicle, time, space and situation dependent.**

1. **Primary formation: Driving -> engine -> combustion conditions**
2. **Exhaust emission:**
   - Selection of vehicle type by emission standard, i.e. specific emission.
   - Limit traffic, i.e. absolute amount.
3. **Exposure: Routing of traffic depending on population exposure**
4. **Resuspension and wear: Routing of traffic depending on road surface**
5. **Adaptation: Inform administration / population on exposure**
6. **Repair: Charging according to polluter**

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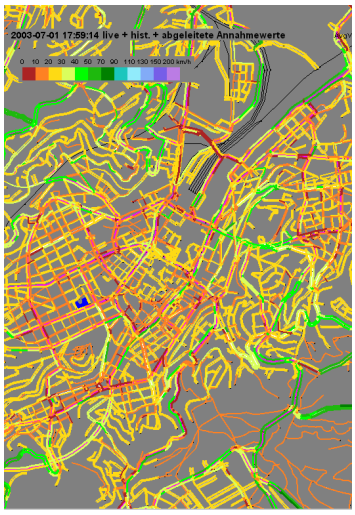
## Processing of Taxi-FCD

Taxi FCD

- **Recording of Taxi Positions**
  - ID, position, time stamp, status
  - Construction of trajectories
- **Map-Matching and Routing**
  - Projection of trajectories to digital road network
  - Determination of routes and velocities
- **Enhancement by historical FCD**
  (same day of week, same hour of day)
- **Completion by assumptions**
  Typical daily variation for each street category etc.

Stuttgart Inner Centre, Di., 1.7.2003, 17–18 hours

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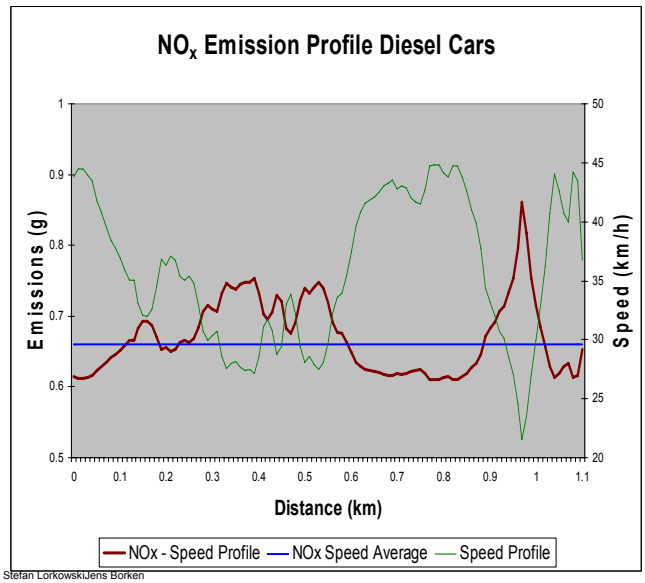
## Influence driving, hence combustion conditions




Smoothen the traffic flow ->

provide conditions for optimisation of combustion.

Can you give recommendations?

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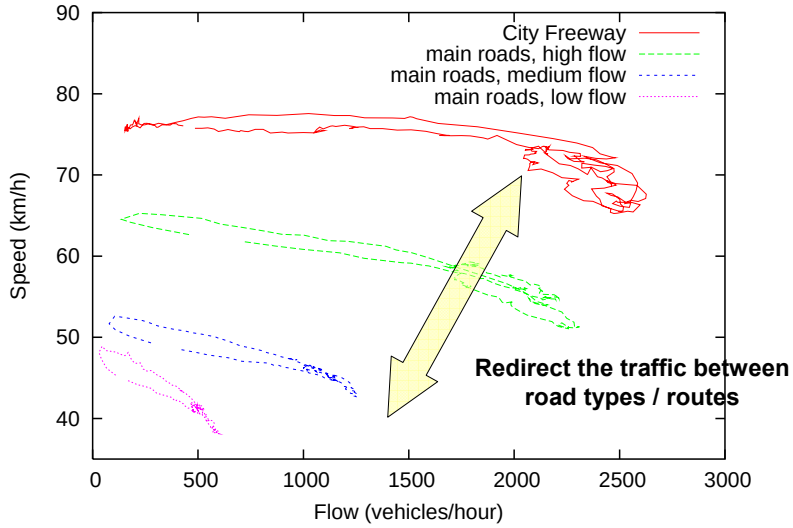
## Influence total amount of traffic

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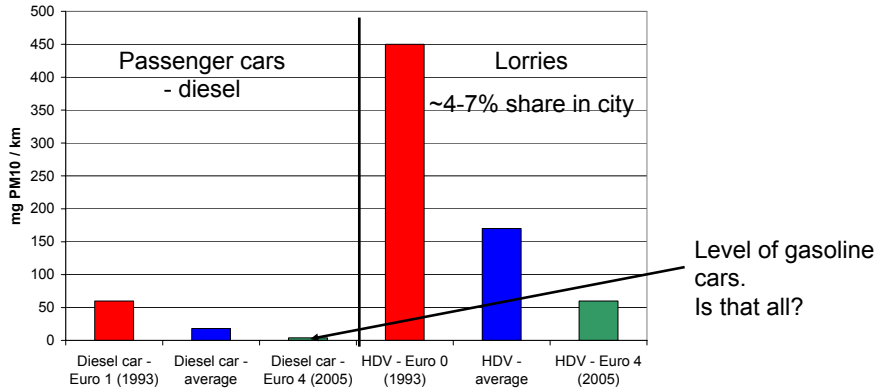
## Vehicle and emission selective traffic guidance

- **Specific emission by vehicle vary widely:**
  - PM10 emission between passenger car and lorry ~factor 10
  - PM10 emission between old and new emission standard ~factor 10
- **Selection of super-emitters with low transport work but high emissions**

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## Further options of traffic management

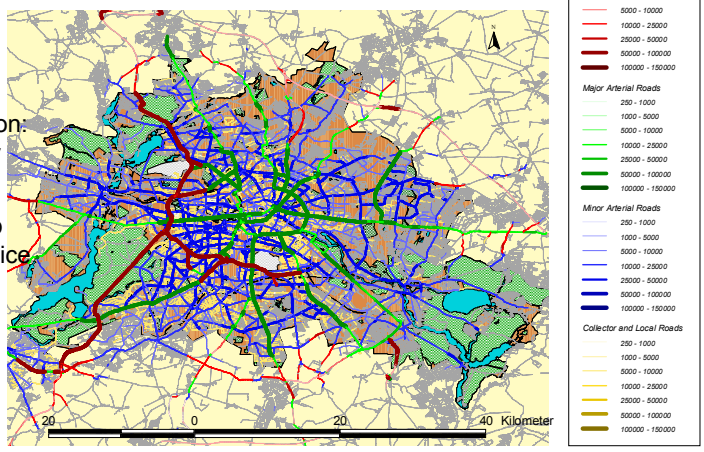
Routing by road surface

Minimise exposure

Real time information: Adaptation strategy

Influence mode, trip and destination choice

Charging: „Polluter pays!“




Dynamically depending on current population densities, traffic + emissions.

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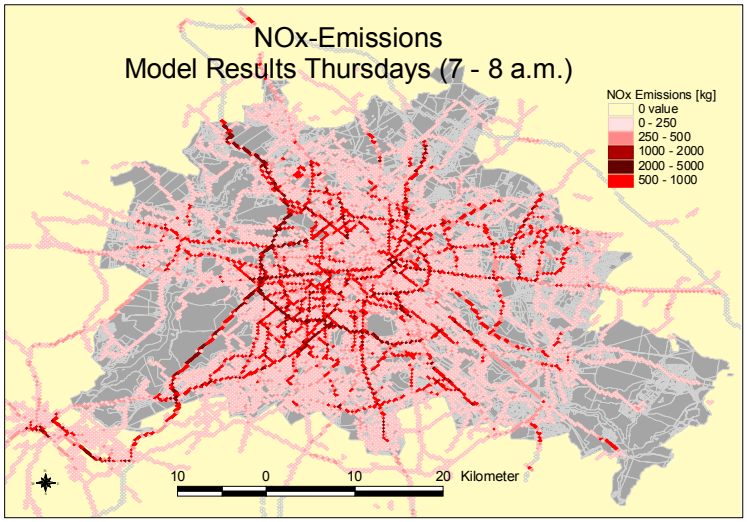
## Does a redistribution reduce health effects?

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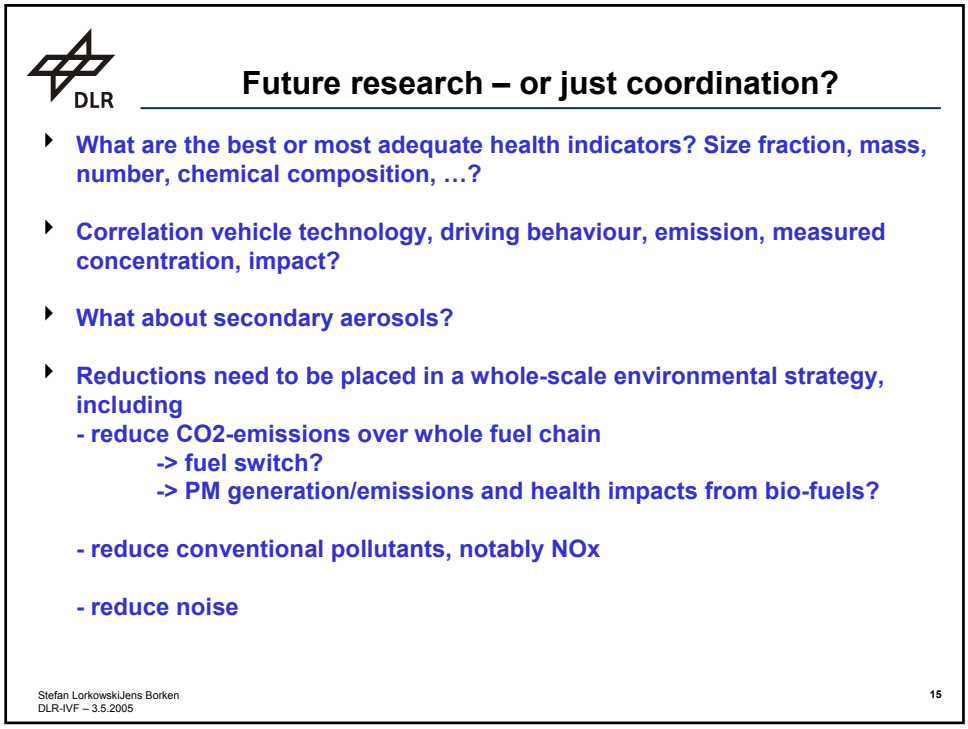
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Future research – or just coordination?
What are the best or most adequate health indicators? Size fraction, mass, number, chemical composition, …?
Correlation vehicle technology, driving behaviour, emission, measured concentration, impact?
What about secondary aerosols?
Reductions need to be placed in a whole-scale environmental strategy, including
- reduce CO2-emissions over whole fuel chain
-> fuel switch?
-> PM generation/emissions and health impacts from bio-fuels?
- reduce conventional pollutants, notably NOx
- reduce noise
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