Berlin's low emission zone (LEZ) as a successful recipe to curb pollutant emissions from road traffic in cities

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1. Starting point: What's the problem?
☞ Air quality in Berlin

- **AQ standards (PM, NO2) exceeded** in **many roads** concentrated in **central city** areas
  - ☞ Focus on road **traffic** as the **main contributor**
- **previous measures insufficient**
  - ☞ e.g. modernisation of municipal and taxi fleet

NO2 direct emissions 18%

regional background 12%

other 2%

industry 2%

combustion plants 5%

other traffic 1%

local traffic

road traffic 31%

urban background

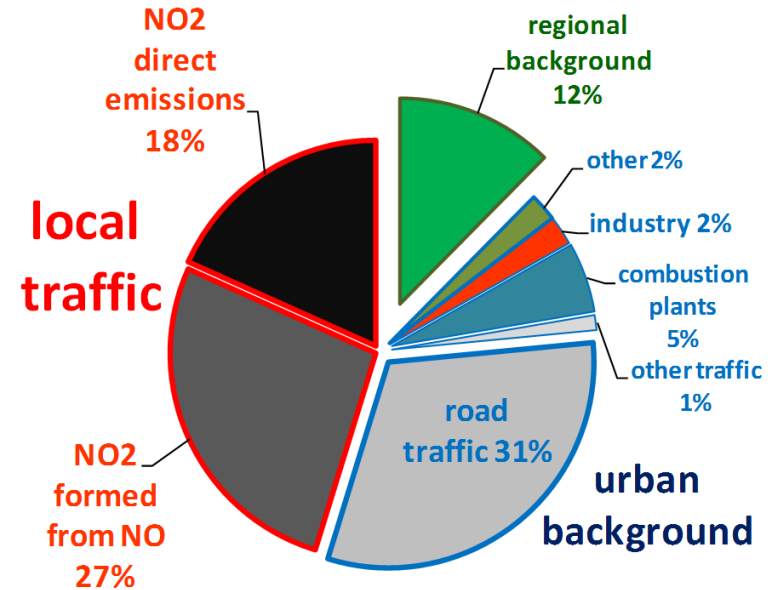NO2 formed from NO 27%

Based on dispersion modelling

- need for **accelerated** improvement of **growing** Diesel vehicle **fleet**
  - ☞ replacing polluting by new cleaner vehicles or retrofitting existing vehicles with particle filters
- widely apply **filter** technology to **curb toxic** Diesel emissions
  - ⇨ Gain **maximum** health **benefits** at relatively **low costs**
- ☞ Development of a vehicle **access restriction** scheme

2. Institutional setting:
Framework for Air Quality Management in Europe

7th Environment Action Program

.....to safeguard EU citizens from environment-related pressures and risks to health and wellbeing, like air pollution, and further reduce its impact on ecosystems and biodiversity

Controlling Emissions

National Emission Ceilings

Mobile sources

EU-Standards for vehicle emission and fuel quality (EURO 5/V – 6/VI)

Product standards, e.g. solvents in varnishes, Eco-Design

additional national strategies …
Economic measures
Road pricing
Fiscal incentives for BAT
Energy taxes
Scrappage schemes….

Air Quality Plans: additional measures on a local level ...
traffic planning & management
vehicle access restrictions (LEZ)
small combustion, construction
green public procurement
short-term actions if useful

Stationary sources

EU-Directive to control industrial emissions (LCP, waste incineration, industrial plants)

Improving Air Quality

achieve Air Quality standards

trigger for further measures

AQ Directive 2008/50

- sets **air quality standards** for
  - SO_2, PM, NO_2, lead
  - Benzene, CO
  - Ozone
  - *PAH*, heavy metals**

- requires Air Quality Plans in non-attainment areas
- sets common **criteria for air quality assessment**
- sets minimum **require-ments** to **inform the public** about air quality

Critical loads for Acidification & Eutrophication

*seperate Directive 2004/107

3. Approach

☞ **selective traffic ban for polluting vehicles (LEZ)**

■ **Features** of the low emission zone:

⇨ **durable:** not only on days with peak concentrations

☞ reduction of long-term exposure creates extra **health benefits**

⇨ **large-scale:** largely covering the non-attainment **area**

Innerer S-Bahnring ("Hundekopf")

„Zeichen 270.1"

Umwelt ZONE

Area: about 88 km²
Inhabitants: about **1 Million**

■ **Stage 1: since 1.1.2008**

☞ Diesel vehicles: at least **Euro 2**

☞ Gasoline vehicles: at least **Euro1**

☟ affected **7%** of the vehicle fleet

■ **Stage 2: since 1.1.2010**

Diesel: Particle emission Euro 4:
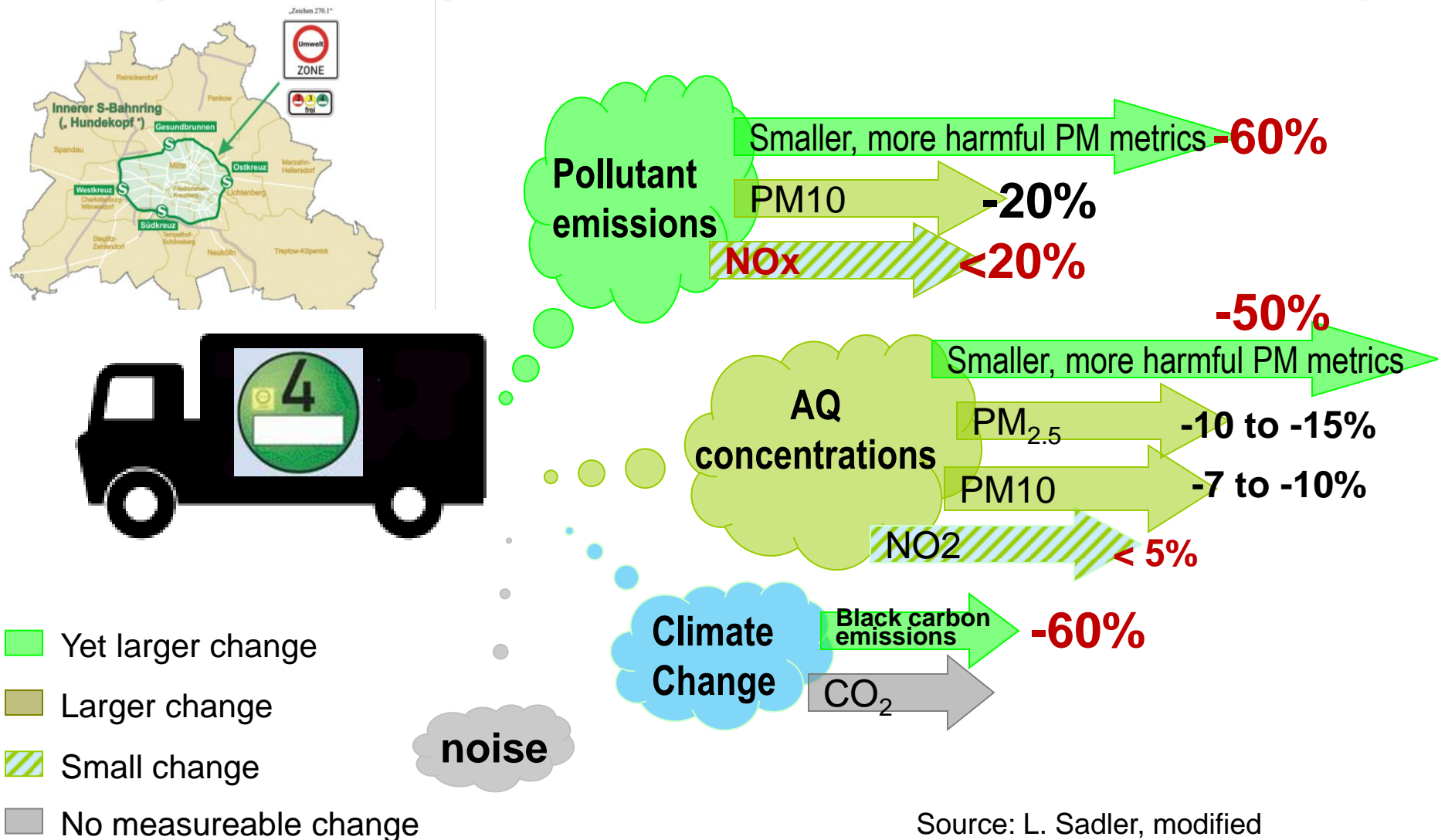
☞ cars: **Euro 3** + **particle filter** or better

☞ goods vehicles: also retrofit of Euro 1-3 towards Euro $4_{Particle}$

☞ affected **10%** of the vehicle fleet

4. Outputs

☞ **Impact** analysis of LEZ in Berlin & Germany

Pollutant emissions
- Smaller, more harmful PM metrics **-60%**
- PM10 **-20%**
- NOx **<20%**

AQ concentrations
- Smaller, more harmful PM metrics **-50%**
- $PM_{2.5}$ **-10 to -15%**
- PM10 **-7 to -10%**
- NO2 **< 5%**

Climate Change
- Black carbon emissions **-60%**
- CO_2

noise

Legend:
- Yet larger change
- Larger change
- Small change
- No measureable change

Source: L. Sadler, modified

5. Lessons:

☒ Set **ambitious** environment criteria with convincing benefits for health and urban quality of life

☒ Define the LEZ **area** sufficiently **large**
  ☞ to avoid pushing traffic in neighbouring areas
  ☞ to create an **impact** on the vehicle fleet in the whole city

☑ effective **enforcement** & sanctions
  ☞ **Manually** with stickers: Simple, but needs sufficient personnel
  ☞ **Automatically** with cameras: effective, but expensive

☑ **Few general exemptions** from traffic ban, but allow limited individual exemptions in case of economic hardship
  ☞ no exemptions for public fleet to maintain role model

☑ Allow sufficiently long **transition periods** in combination with **economic incentives** focusing on small businesses

  ☞ Tax discounts, funding for clean/retrofitted vehicles (with particle filters, CNG, Plugin-hybrids, electric vehicles)

6. Transfer

☑ **Extensive public information campaign**

☞ **early stakeholder involvement in the preparatory phase**

☞ **Thorough ex-ante impact assessment study showing the expected health benefits for the urban population and for climate policy**

☑ **Focus on heavy Diesel vehicles could be a useful option**

☞ **examples in London, Copenhagen & Scandinavia**

☑ **national vehicle classification scheme (& stickers)**

☞ **the simpler to convey the better**

☞ **For Diesel-cars to be based on real-driving-emissions**

☑ **complimentary measures, like**

☞ **modernisation programme for public vehicle fleet, like buses, garbage collection, road cleaning vehicles, etc.**

☞ **Serves as role model for the private sector**