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## AIR QUALITY MANAGEMENT IN EUROPE

CITIES PERSPECTIVE



## CONTENT

- Legal background
- Main air pollutants and their impact
- Main air quality problems in Europe, sources of air quality problems in Europe
- General considerations
- Examples of successful measures to improve air quality
  - Integrated approaches
  - Traffic
  - Domestic heating / cooling





# AIR QUALITY RELATED LEGISLATION

- Product related legislation
  - e.g. fuels, paints
- Regulations for different source categories
  - e.g. vehices, industry, power plants
- National emissions ceilings for specific pollutants
  - NH<sub>3</sub>, NMVOC, NO<sub>x</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>
- Air Quality Directives

plans & programmes





## EFFECTS OF AIR POLLUTANTS

- main environmental risk factor for human health
- 4.3 mio. deaths annually due to ambient air pollution, 400,000 in Europe
- 1 mio. children die from pneumonia each year, half of which related to air pollution
- almost 1/10 of children deaths are due to air pollution
- air pollutants cause reduced lung functions, life long respiratory problems (e.g. asthma)

agency AUSTRIA **umwelt**bundesamt<sup>®</sup>

### MAIN AIR QUALITY PROBLEMS IN EUROPE



 $\begin{array}{l} \mbox{Particulate Matter} \\ \mbox{PM}_{10}, \mbox{PM}_{2.5} \end{array}$ 

Nitrogen dioxide NO<sub>2</sub>

Ozone O<sub>3</sub>

## MAIN SOURCES FOR AIR QUALITY PROBLEMS

Pollutants	Traffic	Power plants	Industry	Domestic heating	Transboundary, natural sources
NO <sub>2</sub>	×				
PM	×		<b>x</b> <sup>1)</sup>	×	×
SO <sub>2</sub>		×	×		
Heavy metals			<b>x</b> <sup>2)</sup>		
BaP			( <b>x</b> ) <sup>3)</sup>	×	
Ozone	sources for $NO_x$ , NMVOC, (CO, CH <sub>4</sub> )				×

<sup>1)</sup> including construction sites

<sup>2)</sup> mainly non-ferrous metal processing

<sup>3)</sup> coking plants, carbon cathodes plants

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## CONTRIBUTION TO PM<sub>2.5</sub> IN URBAN AREAS

Spain 2009, 30 urban stations





- Primary PM: Traffic
- Sec. PM: Traffic + agri.
- Sec. PM: Industry + agri
- Primary PM: Industry
- Natural
- WHO guideline value

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## EXAMPLE MADRID – LOCAL CONTRIBUTION

Local  $PM_{10}$  emissions



© Madrid 2017: Plan A: Plan de Calidad del Aire y Cambio Climático de la Ciudad de Madrid

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## ROADSIDE NO<sub>X</sub> CONCENTRATIONS

UK national average Contribution of different sources, 2015



NRMM: Non-Road Mobile Machinery LGV = Light Goods Vehicles HGVr = Rigid Heavy Goods Vehicles HGVa = Articulated Heavy Goods Vehicles

© DEFRA 2017: Tackling nitrogen dioxide in our towns and cities. A consultation.

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## **GENERAL CONSIDERATIONS & PRINCIPLES**

- Air Quality Directive Art 23: "the air quality plans shall set out appropriate measures, so that the exceedance period can be kept **as short as possible**"
- Measures should address those sources that contribute most to the pollutant
- Air quality plan should include an overall estimate of its impact and the timeframe for compliance
- Air quality plan should be aligned with other plans and strategies (e.g. for climate change, national emission ceilings, noise, traffic, ....)
- "Appropriateness of measures": protection of human health allows for far-reaching interventions



## **TYPES OF MEASURES**

#### Types of measures

- 1. to reduce (traffic) volume (activity)
- 2. to (technically) reduce emission factors of vehicles, installations
- 3. to reduce emissions by behavioural changes
- 4. to re-allocate emissions either spatially or temporally
- 5. to confine emissions

#### Examples

- 1. Congestion charge, parking schemes, road pricing, speed limits, public transport, cycling, ...
- 2. foster uptake of clean vehicles, regulations for machinery, filters, change of fuel / energy source, electric machinery, district heating, ...
- 3. speed limits, inspections, ban of agricultural waste burning, educational programmes, ...
- 4. ban of through-traffic, bypasses, tunnels, noise barriers, ...
- 5. screening of demolition / construction activities, spatial planning, ...

#### EXAMPLES TRAFFIC – LOW EMISSION ZONES, ACCESS REGULATIONS Paris low emission zone Milan Area C LEZ & cost rises

- restrictions for certain vehicles / machinery in specific areas
- fosters uptake of new vehicles / change in transport patterns
- might be applied to specific fleets only (taxis, buses, ...)
- problem: NO, emissions of Euro 5 & 6 diesel passenger cars higher than expected
- → more general approach needed to limit traffic & improve quality of life in cities
- → address specifically diesel cars + LDV

Antwerp LEZ Belgium starts









**Emergency Traffic Bans** 

London Ultra Low Emission





urbanaccessregulations.eu/, TU-Graz, INFRAS, Umweltbundesam



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## EXAMPLES TRAFFIC – REDUCTION OF ACTIVITY

- Sustainable Urban Mobility Plans (<u>SUMP</u>)
- "<u>klimaaktiv</u>" mobility program (Austria)
- Congestion charge (London, Stockholm), parking schemes
- Redistribution of public space (Madrid, Barcelona, Paris, Copenhagen, ...)
- Quality Bus Corridor (QBC) or Bus Rapid Transit (BRT)
- Promotion of public transport, cycling, walking, through better infrastructure and redistribution of space...













## EXAMPLES TRAFFIC – REDUCTION OF EMISSIONS AT SOURCE

- Speed limits for passenger cars, light duty vehicles + compliance checking
- very effective if speed is reduced to ≈ 80 km/h
- in cities (50 km/h → 30 km/h): emission reduction dependent on traffic flow
- BUT: less noise, less (severe) accidents, equalizing of speed and traffic flow
- e-mobility (large fleets, public transport, bicycles)





### **EXAMPLE INTEGRATED APPROACH – VIENNA ASPERN**

- Austria's largest construction site
- future home for 50.000 people
- high ecological standards, energy efficiency of all buildings (sustainability concept, total quality buildings, district heating)
- priority for public transport from the beginning
- construction logistics
  - use of excavation material at site
  - use of recycled materials at site
  - limitation of site traffic, dedicated routes, rail transport



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## EXAMPLES RESIDENTIAL HEATING, AGRICULTURE – REDUCTION OF EMISSIONS AT SOURCE

- 1. improvement of building envelope
- low/no emission heating/cooling: large district h/c networks, gas networks, solar h/c, heat pumps, low temperature h/c
- intelligent h/c systems, including storage
- ban of solid fuels in households etc. (Krakow, Dublin, ...)
- ban of chimneys in allotments (Vienna)
- strict emission limit values for appliances (Germany)
- ban of agricultural waste burning

h/c: heating / cooling







## **NO-REGRET MEASURES**

- Energy savings
- Efficiency improvements
- Combined heat and power generation
- Advanced residential combustion
- Reduction in traffic volume
- Speed limits for passenger cars
- Bans (environmental zones)
- Shore-side electricity for ships
- ...
- BUT: impact assessment to avoid local hot spots







## SUPPORTING FACTORS IN THE PLANNING PROCESS

- Communication and participation of stakeholders (authorities, trade organisations, NGOs, public) during planning and implementation
- Strong political commitment
- "Leading by example"
- Awareness raising and information of the public about air quality issues
- Reliable data for activities, emissions, impact and effectiveness of measures



## **CONCLUSIONS & SUMMARY**

- Air pollution is still the main environmental problem in Europe (≈ 400.000 premature deaths annually) and globally
- Member States, regions and cities are obliged to implement abatement measures to keep exceedance period as short as possible
- Many examples of successful approaches are available on how cities tackle air quality problems (+ climate change, noise, quality of living, ....)
- Integrated approaches, strong political support, public involvement, leading by examples are key elements of these successful approaches



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