Aphekom

Improving Knowledge and Communication
for Decision Making on Air Pollution
and Health in Europe

Air Pollution and Health

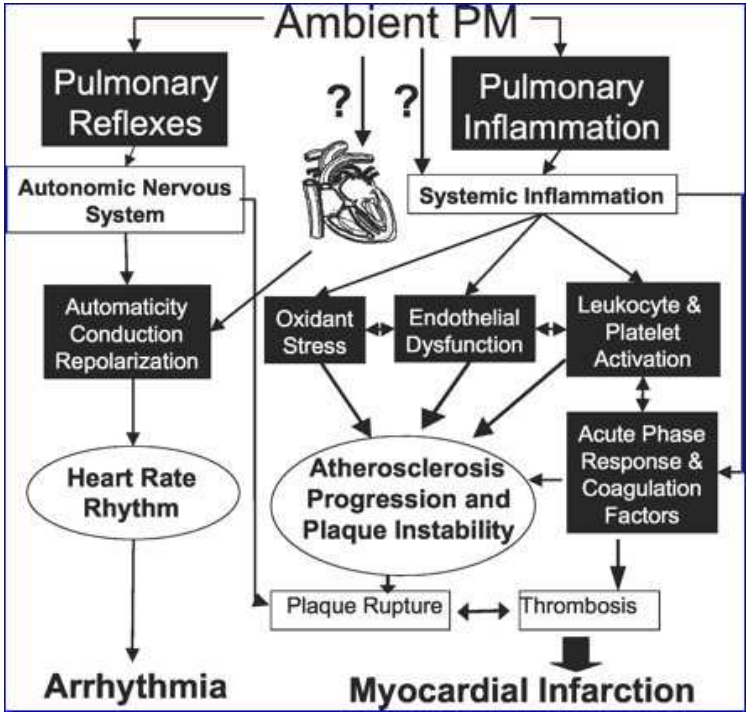
The Aphekom Approach

Hanns Moshammer

on behalf of the Aphekom network

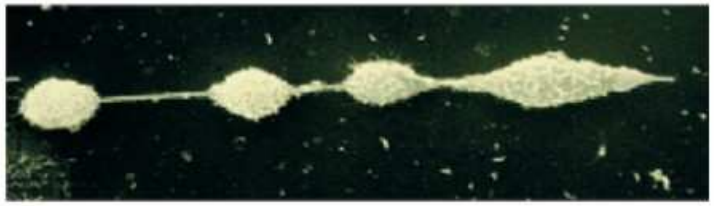
www.aphekom.org

Particle action

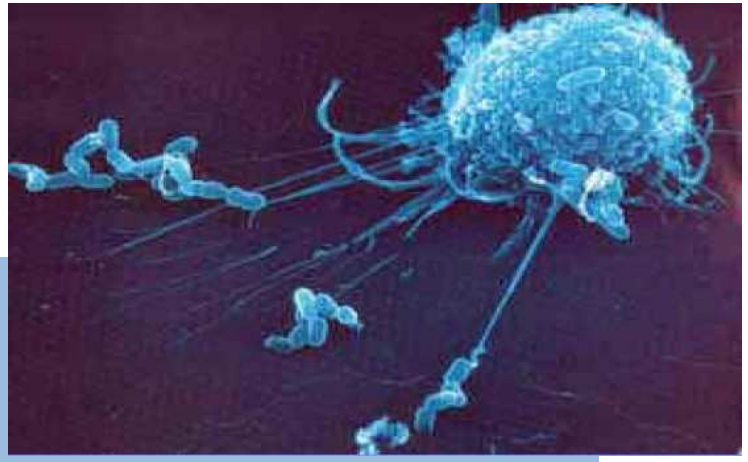


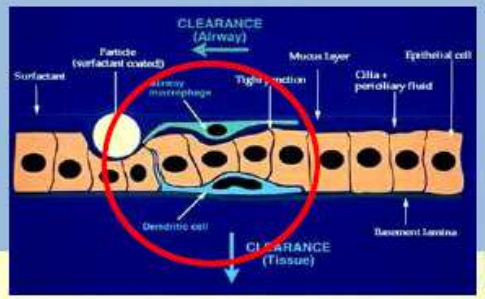
- Chronic
  - Arteriosclerosis
  - Tissue damage
- Acute Effects
  - Bronchial Reflexes
  - Heart-rate
  - Inflammation
  - Oxidative Stress

Inflammation

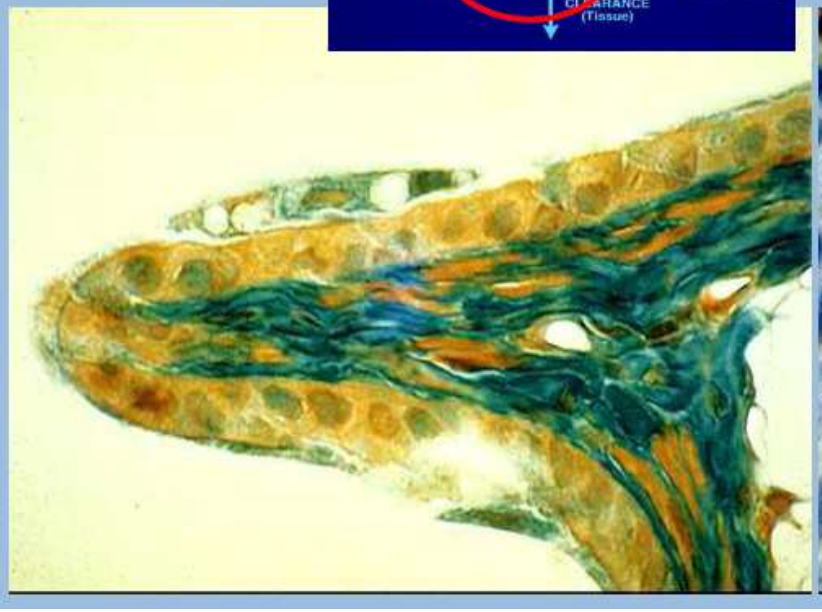


Four macrophages attempting to ingest an asbestos fibre (approximately 80µm long). (Reproduced by permission of Professor Ken Donaldson, University of Edinburgh).





Macrophagen



Dendritische Zellen

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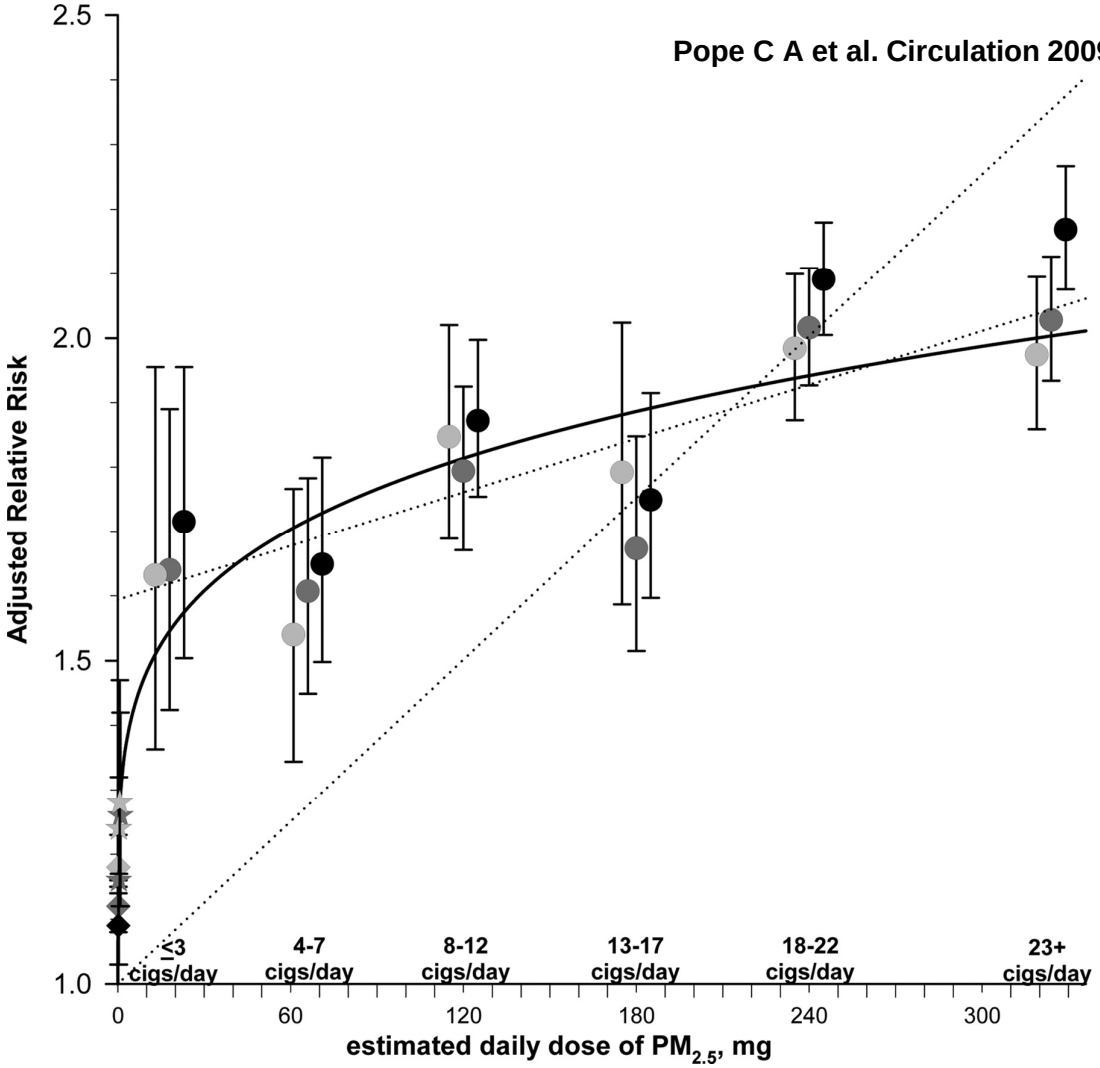
Figure 1. Adjusted relative risks (and 95% CIs) of ischemic heart disease (light gray), cardiovascular disease (dark gray), and cardiopulmonary disease (black) mortality plotted over baseline estimated daily dose of PM2.5.



Pope C A et al. Circulation 2009;120:941-948

Logarithmischer Anstieg des Risikos für KHK / CVD mit Zigarettenzahl

American Heart Association
Learn and Live

ACS Study II: Cardiovasc. Mortality

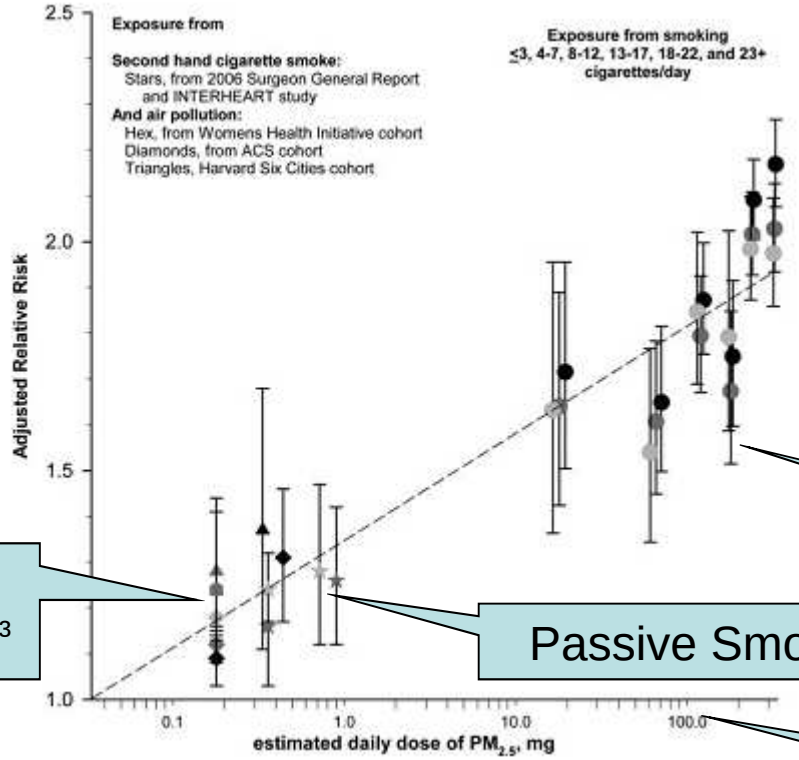


Figure 2. Adjusted relative risks (and 95% CIs) of ischemic heart disease (light gray), cardiovascular disease (dark gray), and cardiopulmonary disease (black) mortality plotted over baseline estimated daily dose (using a log scale) of $PM_{2.5}$ from current cigarette smoking (relative to never smokers), SHS, and air pollution.

Air Quality
≈10%/10µg/m³

Passive Smoking

Active Smoking

Logarithmic Scale

Cardiovascular Mortality and Exposure to Airborne Fine Particulate Matter and Cigarette Smoke: Shape of the Exposure-Response Relationship
C. Arden Pope, III, Richard T. Burnett, Daniel Krewski, Michael Jerrett, Yuanli Shi, Eugenia E. Calle and Michael J. Thun
Circulation 2009;120;941-948; originally published online Aug 31, 2009;
DOI: 10.1161/CIRCULATIONAHA.109.857888

American Heart Association
Learn and Live

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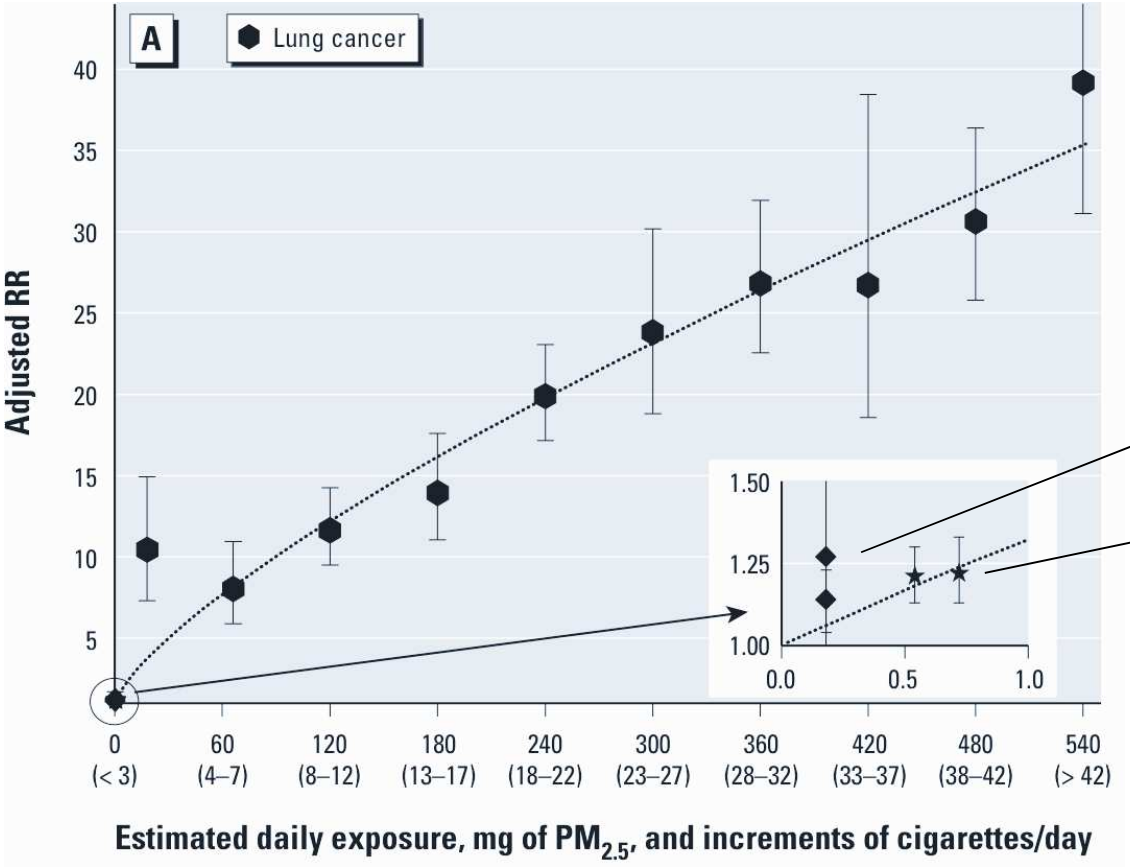
ACS Study III: Lung Cancer



Nahezu linearer Anstieg des Risikos für Lungenkrebs mit Zigarettenzahl

PM2.5

SHS

The Aphekom project

- 3-year EU project (2008-2011)
  - Coordinated by InVS in collaboration of Umea University
  - 12 countries, 25 cities
  - 60 scientists
  - co-funded by the EC Programme on Community Action in the field of Public Health (Grant Agreement n° 2007105)

Q1. What are the latest findings on the health impacts and monetary costs of air pollution in European cities?

Christophe Declercq, Mathilde Pascal, Magali Corso, InVS

Olivier Chanel, CNRS

on behalf of the Aphekom WP5 team and of all the Aphekom centres

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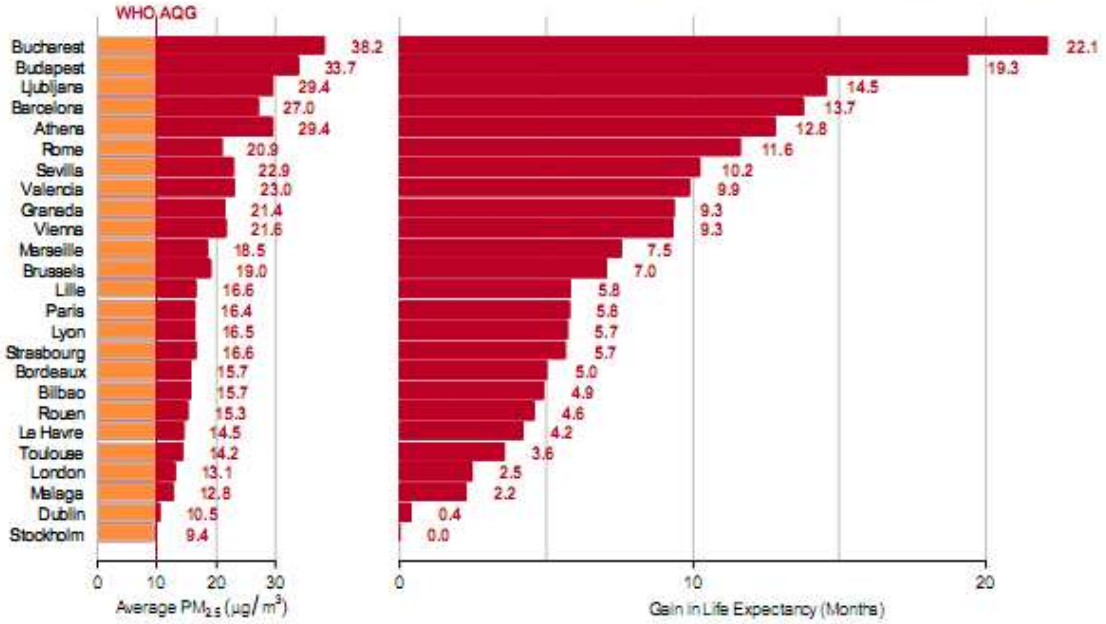
INSTITUT DE VEILLE SANITAIRE

Long-term impacts of $PM_{2.5}$

Predicted average gain in life expectancy (months) for persons 30 years of age in 25 Aphekom cities for a decrease in average annual level of $PM_{2.5}$ to 10 µg/m³



- Compliance with WHO AQG (10 µg/m³) would result in:
  - nearly 19,000 premature deaths avoided per annum (15,000 from cardiovascular causes)
  - €31,5 billion saved annually

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INVS INSTITUT DE VEILLE SANITAIRE

Q2. Health Impact and Policy: novel approaches

How can we make HIAs more meaningful and actionable for developing policies and recommendations on air pollution for urban populations?

Nino Künzli, Laura Perez
Swiss Tropical and Public Health Institute, Basel, Switzerland
And University of Basel, Switzerland

Olivier Chanel, CNRS

on behalf of the Aphekom WP4 team and of all the Aphekom centres

Swiss TPH
Swiss Tropical and Public Health Institute
Schweizerisches Tropen- und Public Health-Institut
Institut Tropical et de Santé Publique Suisse

Objectives
for 10 European cities

- Estimate the number and fraction of population that may have developed their chronic disease due to chronic exposure to local traffic-related pollution, represented by living at proximity of busy roads
  - children with asthma
  - older adults with chronic obstructive pulmonary disease (COPD) and
  - older adults with coronary heart disease (CHD)

- Among those, estimate the number and fraction of exacerbations (i.e. hospitalisations and symptoms) due to both chronic exposure from local traffic-related pollution and additional day-to-day exposure to urban air pollutants above WHO recommended levels

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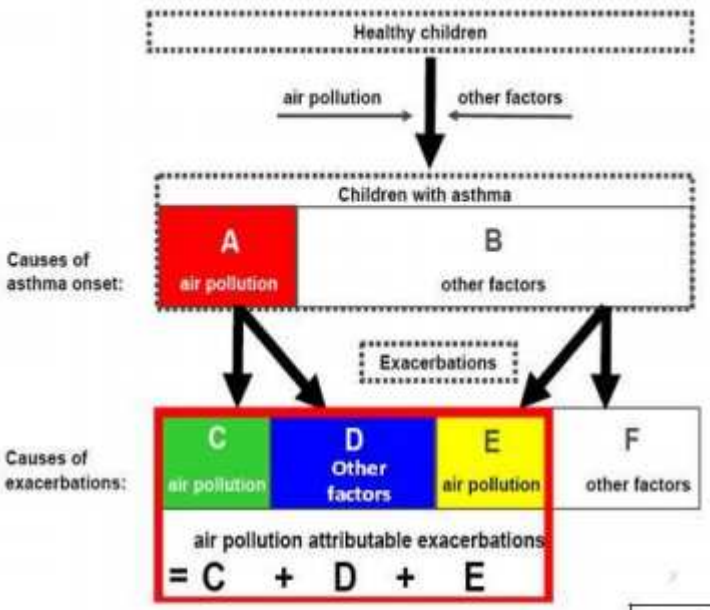


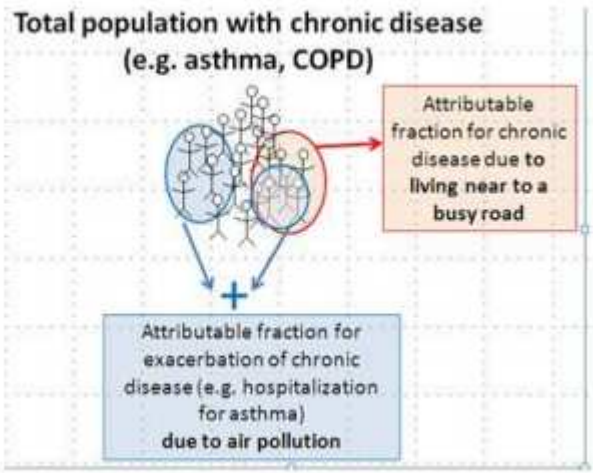
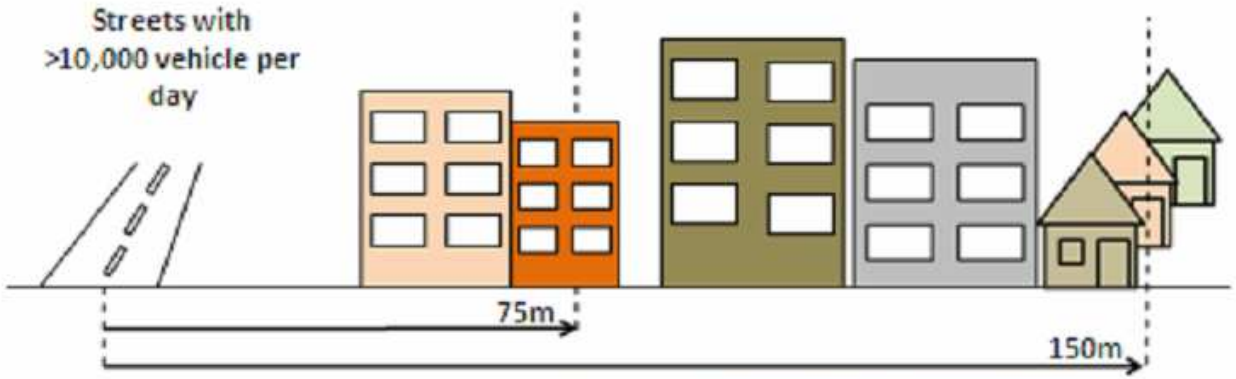


Fig 1. Approach for estimating the total burden of air pollution that considers a causal relationship between living at proximity of busy roads and onset of chronic disease. Example for asthma in children (Künzli et al. 2008).

Health Impact Assessment method	Traditional approach	Revised approach
Onset of asthma attributable to air pollution (represented by traffic proximity)	Not evaluated	Box A
Exacerbation of asthma attributable to air pollution	Boxes C+E	Boxes C+D+E

Percentage of population living near busy roads in 10 Aphekom cities



City	Population (Million. Hab)	PM_{10} annual average (ug/m^3)	% population within 75m (average 29%)	% population within 150m (average 52%)
Granada	0.24	34	14%	28%
Ljubljana	0.27	32	23%	47%
Bilbao	0.31	27	29%	59%
Sevilla	0.7	41	20%	38%
Valencia	0.74	46	44%	71%
Brussels	1.03	29	37%	64%
Stockholm	1.3	17	14%	30%
Barcelona	1.53	33	56%	77%
Vienna	1.66	25	36%	62%
Rome	2.81	37	22%	43%

Figure 9 – Estimated percentage of people leaving near busy r

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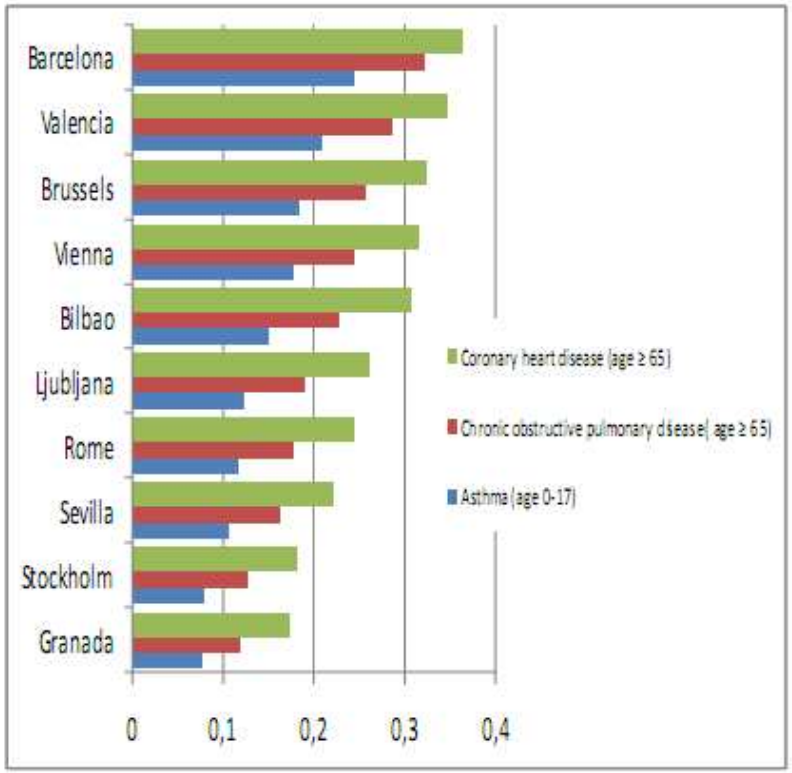
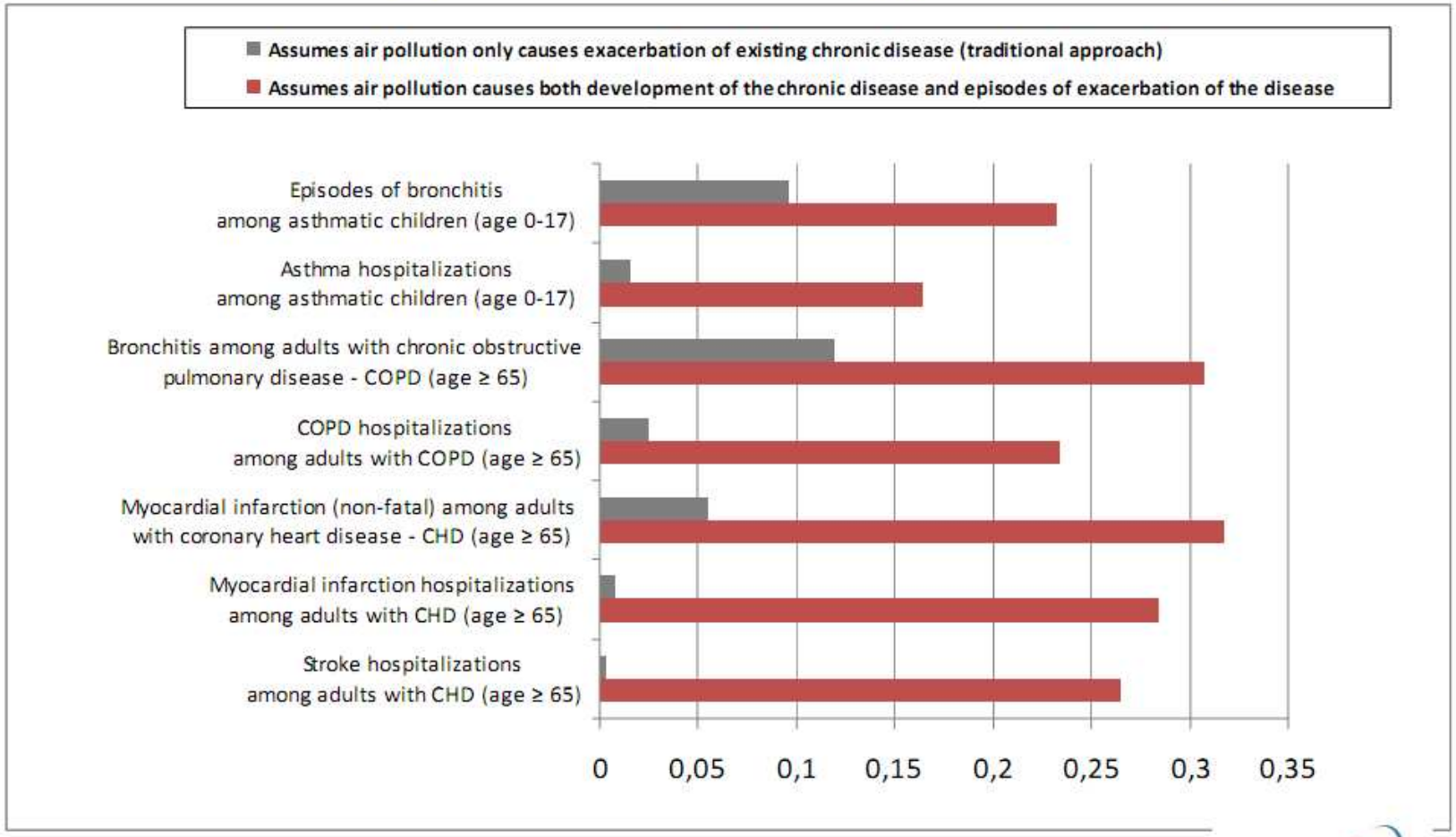
Taking traffic into account in HIA

- Exploratory HIA in 10 cities
  - % of population living near roads travelled by 10,000 or more vehicles per day
  - influence on the development and exacerbation of chronic diseases
- Living close to traffic is responsible for:
  - 15 to 30% of all new asthma cases in children
  - 15 to 30% of asthma attacks in children
  - Similar or larger percentages for COPD and coronary heart diseases in adults >65 years
  - Added cost of €310 millions every year



Comparison of impact of air pollution on chronic diseases using two different HIA approaches in Aphekom



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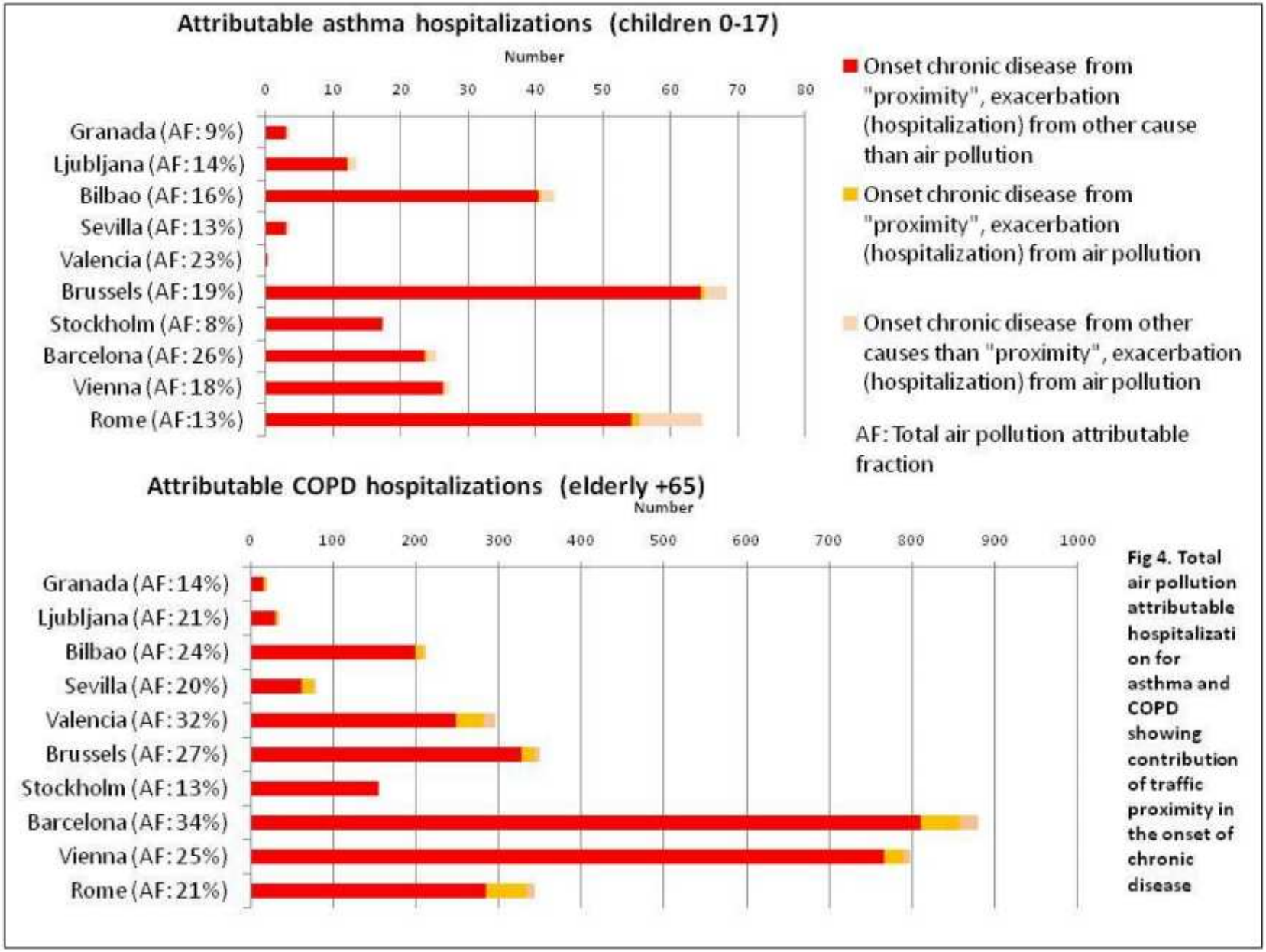

Fig 4. Total air pollution attributable hospitalization for asthma and COPD showing contribution of traffic proximity in the onset of chronic disease

Q3. Do policies designed to reduce air pollution and its health impacts really work?

Air Pollution health impact assessment and monetary costs of a strategy already implemented to reduce air pollution in Europe

Patrick Goodman, Susann Henschel,
Dublin Institute of Technology, Ireland

Olivier Chanel
CNRS

on behalf of the Aphekom WP6 team and of all the Aphekom centres

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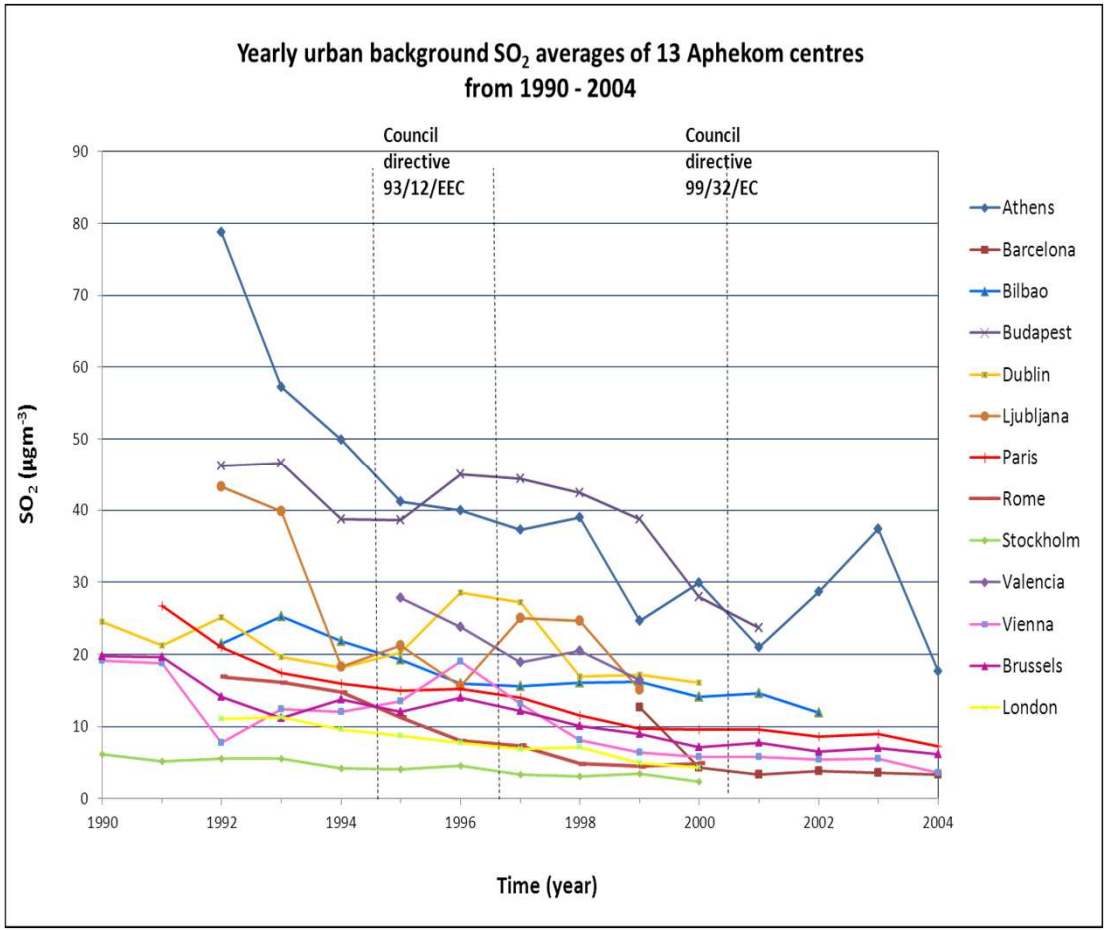
Effectiveness of EU policies: review of air quality legislation with respect to sulphur content in fuels

- SO_2 mean levels decreased by about -66%
- Associated HIA :
  - 2,200 premature deaths avoided annually
  - €192 millions saved each year



Q4. How can we improve communication both among and between stakholders concerned with the impact of air pollution on health?

Yorghos Remvikos
UVSQ, France

on behalf of the Aphekom WP7 team and of all the Aphekom centres

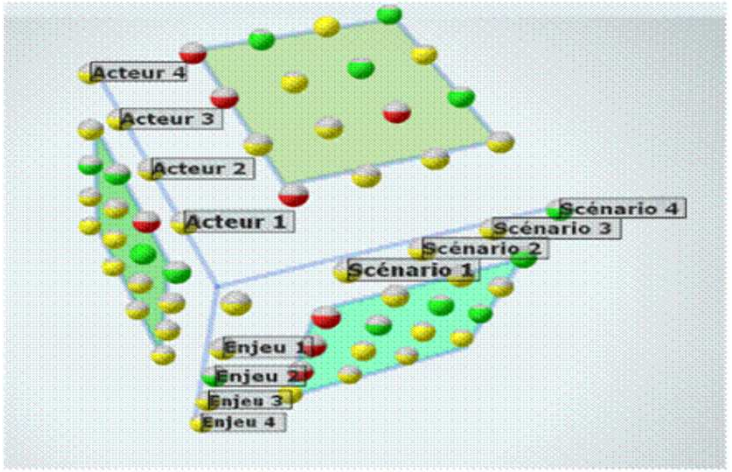
Stakeholder involvement

- Decision-support tool to help decision-making by
  - Sharing opinions on uncertainties associated to the HIAs
  - Choosing common criteria to identify and prioritize stakeholder's needs and interests

    http://aphekom.kertechno.net

- Case studies in Paris Ile-de-France area and Brussels

Performance issue	sub-categories	Options		
		Agrofuels	Types of vehicles	Low emission zones
Equity and social aspects	Vulnerable or deprived sub groups	0 0 0 -1 0 0 0	0 1 0 1 -1 0 2	0 2 2 -1 -1 -1 1
	Equitable access to measures and services	0 0 -1 1 0 1 0	-1 1 2 1 -1 0 1	-1 -1 1 0 0 1 1
	Environmental justice	0 0 0 1 0 1 0	0 1 1 0 0 0 2	0 -1 2 NR -1 1 1
	Distant consequences	-1 -1 -1 -1 -1 -1 -1	1 1 0 1 0 0 1	2 -1 0 NR 0 0 0
Economic development	Creation of wealth	1 0 1 1 1 2 1	1 2 0 1 -1 0 2	1 2 0 1 0 1 1
	Job opportunities	1 1 1 1 1 2 1	1 2 0 1 2 1 2	1 2 0 0 0 1 1
	Economic attractivity	0 0 0 0 1 0 0	1 1 1 1 0 0 2	2 2 2 2 1 2 1
Health and quality of life	Impacts on living environments	0 0 -1 -1 -1 0 0	1 1 0 1 1 2 2	2 2 2 1 1 2 2 1
	Attractivity of the living environment	0 0 0 -1 0 0 0	1 2 2 0 1 1 2	2 2 2 1 2 2 1
	Individual aspects	0 -1 0 0 0 0 1	1 0 0 1 0 1 1	2 2 2 -1 2 2 2
Equilibrium of the environment	Direct impacts	0 -1 -1 0 0 1 0	1 0 2 1 0 1 2	2 1 1 1 2 2 2
	Indirect impacts	-1 -1 0 -1 -1 0 1	1 1 2 0 1 1 2	1 1 1 0 0 1 1
Institutional aspects	Incomplete responsibility	1 -1 1 -1 -1 -1 1	1 0 -1 0 -1 -1 1	2 2 2 0 0 2 1
	Strategies and political priorities	2 -1 1 -1 -1 1 1	2 0 0 0 0 1 1	2 -1 1 0 -1 1 1
	Implementation	2 NR 2 0 -1 1 1	2 0 NR 0 -1 1 1	2 2 2 NR 0 2 1



Relevance

- At national and city levels
  - communication on the benefits of reducing air pollution
  - contribution to national and local plans for better air quality
  - dissemination of methods and tools
- At the EU levels and beyond
  - contribution to current revision of EU directive on air quality
  - dissemination of methods and tools

To learn more

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