



**COST Action 633 Particulate matter:
properties related to health effects**

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**Importance of source-specific characterization
of urban air particulate exposures and
health effects for future policies**

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**Clean Air for Europe (CAFE) assessment on
health impacts of PM_{2.5} in EU25 (2000)**

Premature death cases	347 900
Life years lost	3 618 700
Infant death cases (0-1 y)	677
New cases of chronic bronchitis	163 800
Hospital admission cases (lung + heart)	100 300
Lower respiratory symptom days (5-14 y)	192 756 400
Restricted activity days in adults (15-64 y)	347 687 000
Value of health damage	268 - 781 billion € / year





State-of-the-art knowledge on health effects of urban particulate air pollution

- Thoracic particles (PM₁₀; diameter < 10 μm) and fine particles (PM_{2.5}; diameter < 2.5 μm) consistently associated with mortality, hospital admissions and functional decrements in respiratory and cardiovascular patients
- Mass-based PM exposure-response relationships vary
 - in different regions of Europe
 - stronger with enhanced contribution of certain sources to PM mass (traffic, domestic heating with coal and wood, poorly controlled metal industry)
- Coarse thoracic particles (PM_{10-2.5}; diameter 2.5-10 μm) and ultrafine particles (diameter < 0.1 μm) show health effects independent of PM_{2.5}



Major uncertainties and gaps in scientific knowledge from policy point-of-view

- Reasons for the observed heterogeneities in PM exposure-response relationships in Europe are not known
 - Are they due to differences in PM sources, climate and/or socioeconomic factors?
- Causal associations between PM sources, chemical composition and health effects poorly understood
 - Is local source PM (e.g. traffic, domestic heating with coal and wood, industries) more or less harmful than regional and long-range transported aged PM?
- Little known about cumulative health impacts from long-term PM exposures in Europe
 - respiratory and cardiovascular disease prevalence and mortality, developmental effects on children
 - important to know responsible PM sources and compositions





Research priorities from policy point-of-view

- **Pan-European INTEGRATED STUDY APPROACHES**
covering the whole impact pathway of *emission sources - atmospheric dispersion & transformation - human exposure - toxicity mechanisms - health outcomes*
 - physicochemical characterization of complex PM mixtures
 - source apportionment with chemical / statistical methods
 - microenvironmental and personal exposure characterization in association with major local emission sources
 - short-term and long-term epidemiological studies
 - toxicological studies to support assessment of causal relationships of PM sources and compositions with health effects
- **Utilization of the new scientific knowledge**
 - 5-yearly revisions of PM regulation in Air Quality Directive
 - closer linkage in future between ambient air PM regulation and emission source PM regulation
 - promotion and verification of local and regional air quality improvements
 - development of new technologies and modelling tools
 - reduction of social inequality in environmental health

