MED-PARTICLES - Particles size and composition in Mediterranean countries: geographical variability and short-term health effects.
LIFE10 ENV/IT/000327

Project description

Background

Knowledge of the effects of air pollution on human health has grown in recent decades as a result of the enormous scientific effort to design and conduct large epidemiological studies. At present, most scientists agree that airborne particles with a diameter of less than 10 micrometre (μm) have the most significant short-term effects on human health, with fine particulate matter (PM) being the fraction responsible for the most severe effects. The coarser fraction (PM2.5-10) has a predominantly natural origin, while the finer fraction (PM2.5) is produced by combustion (vehicles, industry and power stations) and is mostly responsible for the increase in mortality due to respiratory and heart diseases. Epidemiological data is scarcer for European Mediterranean countries, which differ from other European countries in having a characteristic combination of air temperature, particle composition and a higher frequency of Saharan dust episodes.

Objectives

The MED-PARTICLES project aimed to improve the understanding of the characteristics of particulate air pollution for 14 cities in the Mediterranean area (three cities in Spain, one in France, eight in Italy, two in Greece), as well as the relationship between those air pollution characteristics and public health. In
particular, the project sought to evaluate the geographical differences in particles size and composition in different areas of Mediterranean countries, the frequency of Saharan dust and forest fire days, and the short-term effects of fine and coarse particulate matter on daily mortality and emergency hospitalisations for cardiovascular and respiratory diseases. In addition, the project aimed to educate young scientists in epidemiological and statistical analyses, and to disseminate the scientific information available to multiple stakeholders (e.g. policy-makers, environmental and health authorities, academic institutes and industry).

Results

The MED-PARTICLES project produced protocols, reports and a database describing daily concentrations of particulate matter (PM) of different sizes and sources for 14 European cities and different Mediterranean areas, along with intra- and inter-country variations. This led to the adoption of standardised procedures enabling cities to pool their results. A protocol for statistical data analysis was developed to examine effects of air pollutants on mortality and short-term morbidity in multiple cities, which gained power from the pooling of city-specific results and increased representativeness over a wider geographical area. By providing extensive data on pollutants and meteorological parameters, along with tools to address the problems of air pollutants, the project produced new evidence on the short-term health effects of fine and coarse PM, and Saharan dust and forest fire episodes, on mortality and hospital admissions in the 14 Mediterranean cities. Large differences in the distribution of PM fractions were found across locations, mainly depending on meteorological patterns. Some cities were characterised by a higher proportion of PM components due to traffic, and others by prevalent industrial or domestic heating components. This was one of the first times that such a comparison was performed in multiple locations in Europe. The project’s report on estimates of the short-term health effects of fine and coarse PM on daily mortality and morbidity for cardiovascular and respiratory diseases showed clear evidence of the effects of fine PM on both mortality and morbidity; whereas the association with coarse PM was weaker and limited to hospital admissions. These results were cited by the WHO (World Health Organisation) in two influential reports (‘Review of evidence on health aspects of air pollution – REVIHAAP’ and ‘Health Risks of Air Pollution in Europe – HRAPIE’), aimed at supporting the revision of Air Quality policy. The frequency of Saharan dust days and forest fire days in the 14 cities was assessed using a unified methodology. It was observed that the frequency of desert dust days differed across locations, with highest values in southern Italy. Also, the contribution of Saharan dust on PM concentrations was different, with highest values in Greece and Cyprus. Forest fire episodes were found to be generally low. Evidence of high effects of PM on mortality and emergency hospitalisations during dust days or forest fire days was reported. There are no specific policy measures to tackle Saharan dust and forest fire days. Project results clearly indicated that particles arising from natural events are not harmless. Methods to forecast Saharan dust episodes are available, and could be used to time mitigations aimed at reducing local source emissions on high-risk days. A project report on specific PM components (e.g. Elemental Carbon, Organic Carbon, nitrates, sulphates and metals) was useful in helping estimate their relative effects on health. Traffic-related PM, in particular, was found to be
correlated to short-term mortality and hospitalisations. However, at present, the European Union has no daily standard limits for PM2.5. Therefore, there is a need for a specific air quality policy objective for fine particulate matter. A WHO report based its conclusions on a daily standard limit for PM2.5 on MED-PARTICLES results. The project was the first Mediterranean area-wide model application to demonstrate the feasibility of assessing the environmental and health impact of particulate air pollution. It is highly replicable in different urban contexts and is therefore a demonstration of how an EU-wide assessment could be conducted. The project demonstrated that its tools and methods could be used in other settings, locations and study periods. MED-PARTICLES methodology could be used in the same areas to evaluate the beneficial effects (if any) of new policies, for example, in other geographical areas, and to evaluate the effects of air pollution from various sources. Further information on the project can be found in the project's layman report and After-LIFE Communication Plan (see "Read more" section).

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Environmental issues addressed:

Themes

Air & Noise - Air pollutants
Air & Noise - Air quality monitoring
Risk management - Human health protection

Keywords

public health, urban area, air pollution, environmental assessment, risk management

Natura 2000 sites

Not applicable

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Beneficiaries:

Coordinator
Azienda Sanitaria Locale Roma E - Dipartimento di Epidemiologia

Type of organisation
Research institution
**Description**  
The Department of Epidemiology in the ASL-RME (Rome E Local Health Authority) is a public health and research institution in charge of regional epidemiologic monitoring of some five million inhabitants, including the city of Rome.

**Partners**  
CNR-Istituto Inquinamento Atmosferico, Italy  
Agenzia per la Protezione Ambientale (ARPA) Piemonte, Italy  
National and Kapodistrian University of Athens, Greece  
Fundació Centre de Recerca en Epidemiologia Ambiental (CREAL), Spain  
Agenzia Regionale per la Prevenzione e l'Ambiente dell'Emilia Romagna, Italy

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**Administrative data:**

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<th><strong>Project reference</strong></th>
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<td><strong>Duration</strong></td>
<td>01-SEP-2011 to 31-AUG -2013</td>
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<td><strong>Total budget</strong></td>
<td>1,836,016.00 €</td>
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<td><strong>EU contribution</strong></td>
<td>901,579.00 €</td>
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<td><strong>Project location</strong></td>
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**Read more:**

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<tr>
<td><strong>Project web site</strong></td>
<td><a href="#">Project's website</a></td>
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<tr>
<td><strong>Publication: After-LIFE Communication Plan</strong></td>
<td>Title: After-LIFE Communication Plan Year: 2014 No of pages: 19</td>
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<tr>
<td><strong>Publication: Article-Paper</strong></td>
<td>Title: &quot;Which specific causes of death are associated with short term exposure to fine and coarse particles in Southern Europe? Results from the MED-PARTICLES project&quot; Author: Samoli E et al Year: 2014 Editor: Environ Int. (67:54-61) No of pages: 8</td>
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Title: "Short-term Associations between Fine and Coarse Particulate Matter and Hospitalizations in Southern Europe: Results from the MED-PARTICLES Project"
Author: Massimo Stafoggia et al Year: 2013
Editor: Environmental Health Perspectives No of pages: 8

Title: "Associations between Fine and Coarse Particles and Mortality in Mediterranean Cities: Results from the MED-PARTICLES Project"
Author: Evangelia Samoli et al Year: 2013
Editor: Environmental Health Perspectives No of pages: 7

Title: "African dust outbreaks over the Mediterranean Basin during 2001–2011: PM10 concentrations, phenomenology and trends, and its relation with synoptic and mesoscale meteorology"
Author: J. Pey et al Year: 2013
Editor: Atmospheric Chemistry and Physics No of pages: 16

Title: Layman report Year: 2014 No of pages: 12

Title: Project's Final technical report Year: 2014 No of pages: 59