NEWSLETTER

WHO COLLABORATING CENTRE FOR AIR QUALITY MANAGEMENT
AND AIR POLLUTION CONTROL at the FEDERAL ENVIRONMENT AGENCY, GERMANY

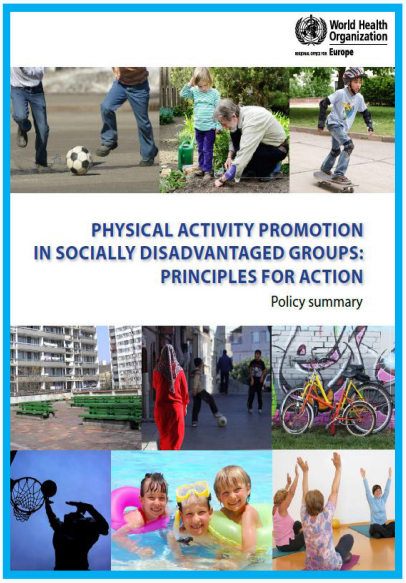
No. 53 - June 2014

EDITORIAL

Urban health – a unique chance of combined environmental health actions

In the WHO European Region, about 2/3 of the population live in urban areas. Urban living is associated with many health challenges. Some are related to environmental burdens, such as air and noise pollution. People in cities and towns experience increased rates of non-communicable diseases, violence, injuries, alcohol and substance abuse and infectious disease outbreaks.

Within the European Region over 92 % of urban populations live in cities with levels of air pollution (with particulate matter) that exceed the WHO air quality guideline value. Environmental noise is perceived as the most common stressor in urban areas. Besides theses, urban health is linked to lifestyle factors like unhealthy diet and physical inactivity too. The prevalence of overweight (including obesity) in 11- to 13-year-olds ranges from 5 % to more than 25 % in some countries. 50 % of most car journeys are under 5 km, a distance that can be easily covered in 15–20 minutes by bicycle or 30 to 50 minutes briskly walking.



The WHO Regional Office for Europe has agreements with several countries to work on urban health in this context. Its work on urban health, however, centers on local governments across the European Region through the WHO European Healthy Cities Network (started in 1987). Healthy cities are all about local involvement. They continually explore ways to implement WHO strategies at the urban and local level. They have the potential to provide essential public health leadership, to create the preconditions for healthier living and participatory governance and to facilitate intersectoral action. Within Phase V of the WHO Healthy Cities project (until 2013/2014) cities had been focused on the core themes: (1) caring and supportive environments, (2) healthy living, and (3) healthy urban design (http://www.euro.who.int/en/health-topics/environment-and-health/urban-health/activities/healthy-cities/who-european-healthy-cities-network/phases-ivi-of-the-who-european-healthy-cities-network/phase-v).

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In conjunction to this the 'Transport, Health and Environment (THE PEP)' can be seen as another contribution to improve urban health. THE PEP run jointly by WHO/EURO and the United Nations Economic Commission for Europe (UNECE), which is a unique policy platform that seeks to encourage transport policy-makers and urban planners to consider the health and environmental impacts of transport and address these through shared policy approaches for a healthy and sustainable mobility. Emphasis is given to people-centered policies, making safe, healthy and green efficient transport choices accessible and affordable to all. Besides, THE PEP will contribute to the benefits of physical activity for health and well-being and aims to develop a safe and healthy infrastructure for walking and cycling as viable means of urban mobility, as well as reducing emissions of transport-related greenhouse gases, air pollutants and noise.

THE PEP also counts on active involvements from science too. Recently the Institute of Sport Science at Friedrich-Alexander University Erlangen-Nuremberg (FAU), Germany, has been officially designated as the WHO Collaborating Centre on Physical Activity and Public Health. It is the first collaborating centre in the WHO European Region to deal with this issue specifically. The Institute will support WHO in monitoring and research on physical activity and health. Such activities could give a considerable contribution to THE PEP as well.

Andreas Gies and Hans-Guido Mücke
WHO Collaborating Centre for
Air Quality Management and Air Pollution Control

ABOUT

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PARTICULATE MATTER AND SAHARAN DUST IN SOUTHERN EUROPE – RESULTS FROM THE EU LIFE+ "MED-PARTICLES" PROJECT

Massimo Stafoggia and Francesco Forastiere for the MED-PARTICLES collaborative group*

Background

European air policy is under scrutiny, and the European Union (EU) is revising the Thematic Strategy on Air Pollution designed to make progress towards the long-term EU objective "to achieve levels of air quality that do not result in unacceptable impacts on, and risks to, human health and the environment" (http://ec.europa.eu/environment/air/review_air_policy.htm). As part of this process, the EU has indicated several specific issues of concern. Among the open issues are: 1) the extent of health effects of airborne particulate matter (PM) concentrations in Europe, 2) the geographical distribution and related health effects of Saharan dust episodes and forest wildfires, 3) the relative toxicity of different PM components and sources, and their distribution across the Mediterranean area.

These issues are especially relevant in Southern Europe, an area characterized by specific peculiarities, such as highly urbanized areas with intense traffic congestion, elevated sea traffic due to touristic and shipping activities over the Mediterranean area, enhanced formation of secondary pollutants owing to intense solar radiation, high frequency of wildfires and Saharan dust advection episodes, especially during summer and spring.

The project MED-PARTICLES: "Particles size and composition in Mediterranean countries: geographical variability and short-term health effects" aimed at addressing all these aspects demonstrating the feasibility of an integrated health assessment. Well-experienced epidemiological institutions in Italy, Spain, Greece and France were partners of the project, together with high expertise in the field of atmospheric chemistry, measurements and modelling.

Objectives of the project

The MED-PARTICLES project was funded by the EU Life+ framework. It started on September 2011 and involved different environmental and epidemiological institutions from Italy, Spain, Greece and France. The project aimed to evaluate and compare particles sizes and composition in the different areas of the Mediterranean countries, according also to the presence of Saharan dust and forest fires days. The project is providing evidence of the effects of particulate matter and its components on daily mortality and morbidity outcomes, identifying possible effect modification of Saharan dust days and forest fires events on these associations. Priority of the project has been to share competences, methodologies and achieved results to stake-holders and to young epidemiologists, through dissemination activities and a dedicated summer course.

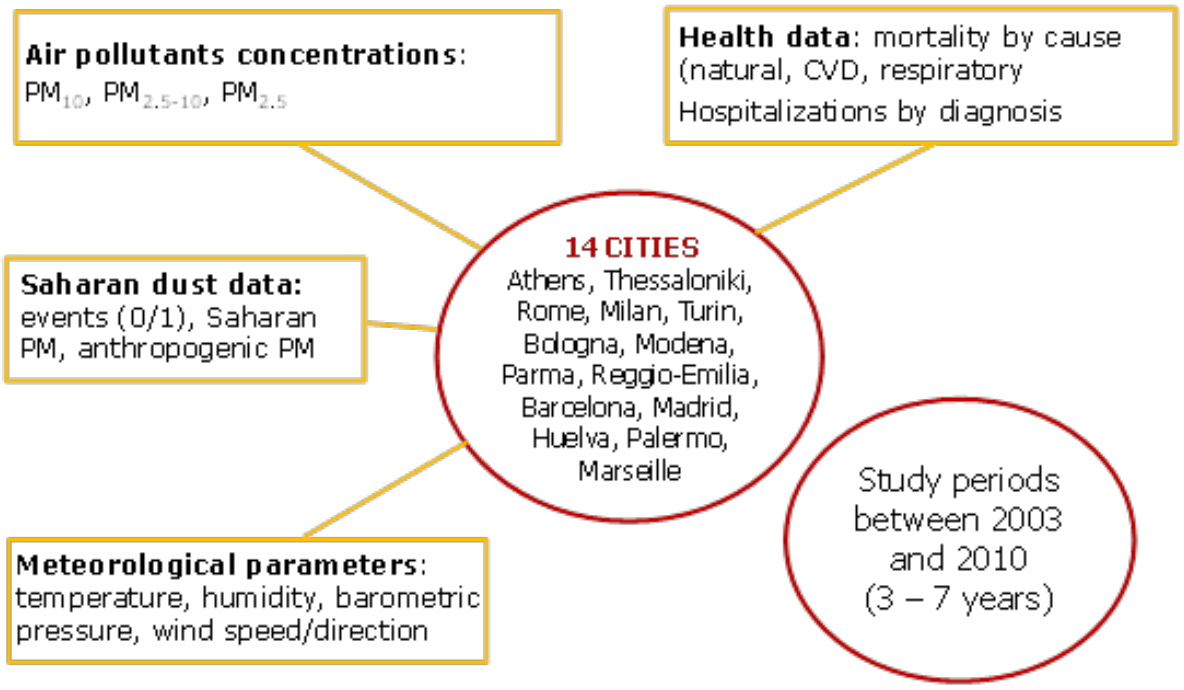
In order to achieve these goals, specific aims were designed in the original proposal and pursued over the entire course of the project. In summary, these include: 1) the collection of environmental and health data in 14 Mediterranean cities, using standardized protocols for collection, cleaning and pooling of database; 2) the definition of operative protocols of data analysis, in order to estimate health effects of different environmental stressors at the city level, followed by pooling of results at the Med area level; 3) the application of the above mentioned protocols with successive publications of results on international scientific journals with high impact factor and wide public target; 4) the organization of public events for dissemination of the project's objective and results to the general public, the scientific community, and

different stakeholders at the EU, national and local level; 5) the organization of a summer course to educate young researchers as a guarantee for fruitful reproducibility of the proposed methodology in other contexts.

Methodological solution

The project adopted an interdisciplinary and innovative approach of integrating data collection under strict developed protocols, modelling development and application, and data analysis techniques.

In the first stages of the project, the partners collaborated to ensure the collection of environmental, meteorological and health data of the cities involved. This has been a very important aspect of the project, because the application of standardized protocols was a guarantee of comparability across locations and reproducibility of the methodology in other settings, locations and periods. The picture below displays the data collection:



Data on Saharan dust days and forest fires events were estimated by using innovative and multiple tools of detection for the entire Mediterranean area. Such tools, including atmospheric models, satellite images and back-trajectories, were applied for the first time in a wide area encompassing the entire Mediterranean basin, so considerably increasing the statistical power and the generalizability of results in all cities involved in the project. Furthermore, data on Saharan dust days and forest fires were collected for a very long period (from 2001 to 2011), allowing to detect longer time trends in addition to spatial contrasts.

Data on daily concentrations of fine and coarse particles were retrieved by the local Environmental Protection Agencies. The length of the study periods matched with the availability of mortality and hospitalizations data allowed to compare the temporal and spatial distribution of particulate matter across multiple Mediterranean areas, and investigate the adverse health effects.

A lot of resources were devoted to dissemination and education activities. In particular, all the actions and their products were promptly disseminated to the policy makers, environmental officers and the general public through multiple dissemination strategies. The dissemination

activities included a Mid-term workshop and a Final Conference aimed to communicate and discuss the results of the project, several publications in online journals and peer-reviewed scientific journals, presentations at international conferences and seminars, interviews and production of dissemination materials available on the website of the project. The dissemination activities were targeted to reach and inform policy makers at different levels, environmental officers, and the general public. Dissemination materials can be downloaded from the project website: http://www.epidemiologia.lazio.it/medparticles/index.php/en/.

Results achieved by the project

Saharan dust episodes in Southern Europe

The occurrence of African dust outbreaks over the whole Mediterranean Basin has been studied on an 11-year period (2001–2011). In order to evaluate the impact of such mineral dust outbreaks on ambient concentrations of particulate matter, PM_{10} data from regional and suburban background sites across the Mediterranean area were collected. After identifying the daily influence of African dust, a methodology for the estimation of the natural dust contributions on daily PM_{10} concentrations has been applied. We found that African dust outbreaks are sensibly more frequent in southern sites across the Mediterranean, from 30 to 37 % of the annual days, whereas they occur less than 20 % of the annual days in northern sites. The central Mediterranean emerges as a transitional area, with slightly higher frequency of dust episodes in its lower extreme when compared to similar latitudinal positions in western and eastern sides of the Basin (Figure 1). A decreasing south to north gradient of African dust contribution to PM_{10} is patent across the Mediterranean. In the Eastern part, higher annual dust contributions are encountered due to the elevated annual occurrence of severe episodes of dust but also because of inputs from Negev and Middle Eastern deserts (Figure 2).

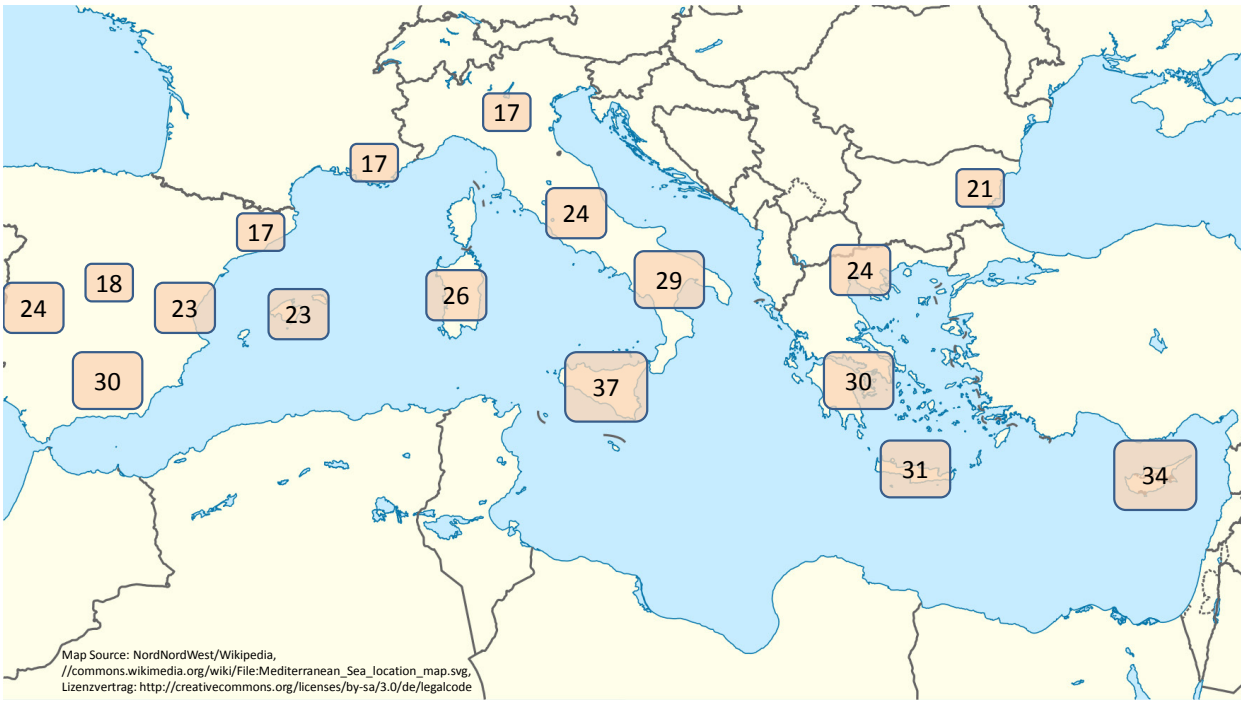


Figure 1: Frequency of African dust outbreaks (% of dust days per year)

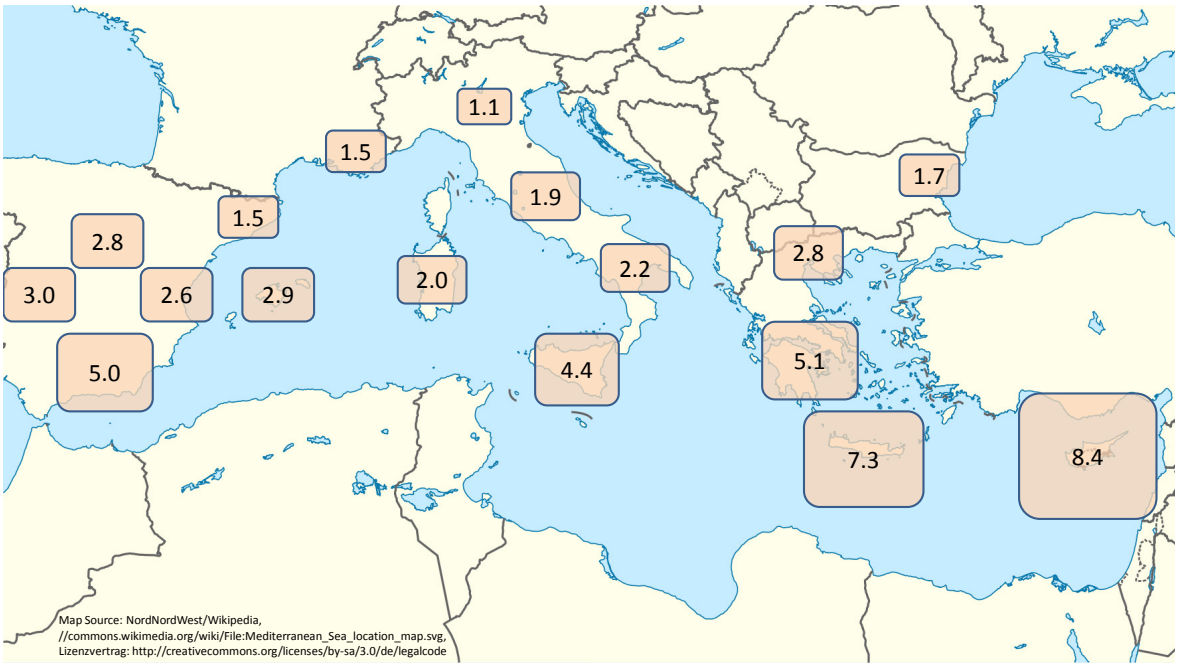


Figure 2: Mean African dust contributions to annual PM_{10} concentrations (in µg/m³)

The slightly higher frequency of African dust episodes observed over southern sites in the central Mediterranean Basin is compensated by its moderately lower intensity. Concerning seasonality patterns and intensity characteristics, figure 3 shows that a clear summer prevalence is observed in the western part, with low occurrence of severe episodes (daily dust averages over 100 µg/m³ in PM_{10}); no seasonal trend is detected in the central region, with moderate-intensity episodes; and significantly higher contributions are common in autumn-spring in the eastern side, with occurrence of various severe episodes throughout the year. Overall, African dust emerges as the largest PM_{10} source in regional background southern sites of the Mediterranean (35–50 % of

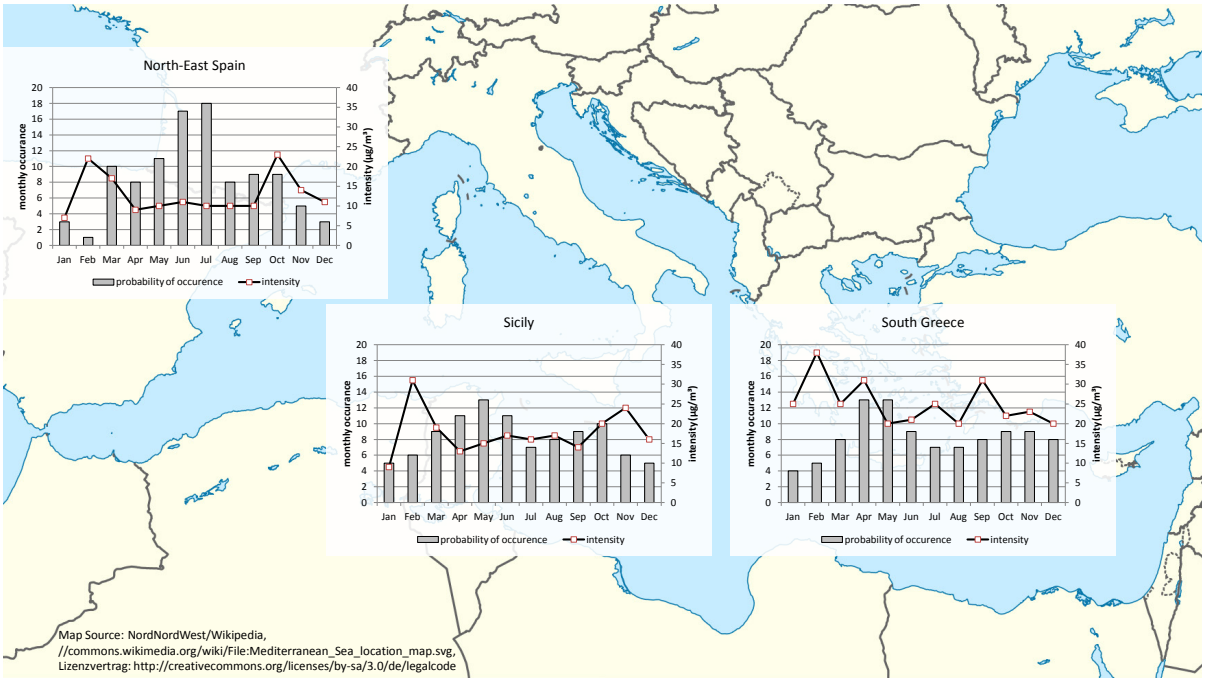


Figure 3: Monthly occurence of African dust episodes (grey bars, in %) and intensity (black line, in µg/m³)

PM_{10}), with seasonal peak contributions to PM_{10} up to 80 % of the total mass. The multi-year study of African dust episodes and their contributions to PM_{10} concentrations reveals a consistent decreasing trend in the period 2006/2007 to 2011 in 4 of the 17 studied regions, all of them located in the NW of the Mediterranean.

Such decrease is almost parallel to that of the NAO (North Atlantic Oscillation) index for the summer period, progressively more negative since 2006. Therefore, a sharp change in the atmospheric circulation over the last 5 year has affected the number of African dust episodes and consequently the annual dust inputs to PM_{10} observed in the North-West part of the Mediterranean. More details on this study are reported in Pey et al. 2013.

Short-term effects of particles on mortality and hospital admissions

The associations between daily concentrations of fine and coarse particles with daily mortality and hospital admissions have been studied in 12 cities (excluded Huelva and Palermo) between 2003 and 2010. Time-series methods adjusted for time trends and meteorology have been applied in each city, and city-specific results have been pooled to obtain association estimates representative of the whole South Europe. MED-PARTICLES found adverse effects of particles on mortality, especially for cardiovascular and respiratory causes. Fine particles originating mainly from traffic had stronger impact on health compared with larger ones. Effects for both size fractions were stronger in the warm period than in the cold period of the year. Fine particles affected mainly the elderly (Samoli et al. 2013; Samoli et al. 2014).

For hospitalizations, the associations were similar between fine and coarse particles. The effect on respiratory admissions was also more pronounced for the warm than for the cold period. All the effects were present at low PM concentrations, below the current daily limit values (Stafoggia et al. 2013).

The table below summarizes the main findings of the project. Association estimates are reported as % increases of risk (% IR), and 95 % confidence intervals (95 % CI) per 10 μg/m^3 increases of the pollutants.

Study outcome	Fine PM			Coarse PM			PM_{10}		
	% IR	95 % CI		% IR	95 % CI		% IR	95 % CI	
Mortality by cause:									
Natural	0.55	0.27	0.84	0.30	-0.10	0.69	0.32	0.13	0.52
Cardiovascular	0.86	0.15	1.57	0.33	-0.78	1.46	0.54	0.09	0.99
Cardiac	1.33	0.27	2.40	0.48	-1.49	2.48	0.79	0.08	1.50
Cerebrovascular	0.78	-0.86	2.45	-0.04	-2.26	2.23	0.06	-0.86	0.99
Respiratory	1.91	0.71	3.12	0.76	-0.70	2.25	1.12	0.29	1.95
Low-respiratory tract infections	1.37	-1.94	4.78	-0.97	-6.54	4.93	0.80	-1.10	2.75
Chronic obstructivepulmonary disease	2.53	-0.01	5.14	0.01	-4.91	5.20	1.15	-0.57	2.90
Diabetes	2.02	-1.51	5.68	0.22	-10.39	12.08	0.93	-1.88	3.82
Hospitalizations by cause:									
Cardiovascular	0.51	0.12	0.90	0.73	0.16	1.30	0.36	0.04	0.69
Respiratory	1.36	0.23	2.48	1.95	-0.51	4.48	0.80	0.14	1.85
The following lags have been considered for all PM metrics: lag 0-1 for natural mortality and cardiovascular admissions, lag 0-5 otherwise									

Work in progress

Health effects of desert dust particles

Particulate matter originated from desert dust outbreaks displays strong effects on both mortality and cardio-respiratory admissions, with associations of the same magnitude as those estimated for the anthropogenic sources of particles.

Forest fires in Southern Europe

MED-PARTICLES identified several days as affected by forest fires, with the most affected cities being Thessaloniki (6 % of forest fires days per year), Athens (4 %) and Rome (3 %). Most fire days occurred in summer in all cities, except in Barcelona, with a clear winter peak. During forest fires days, there was a marked increase in cardiovascular mortality, up to 8 %, while no increment was observed in respiratory mortality. There was a clear short-term effect of PM_{10} on cardiovascular mortality during fire days in the European Mediterranean cities.

Components of particulate matter

MED-PARTICLES collected information on the PM composition and the sources for Barcelona, Madrid, Huelva (Spain), Rome and Bologna (Italy). There were adverse health effects on mortality and hospitalizations for: 1) a specific marker for traffic: elemental carbon (EC); 2) some markers of road dust: iron (Fe), manganese (Mn), titanium (Ti); 3) secondary pollutants: sulfate (SO42-); 4) a marker of fuel oil combustion: Nickel (Ni).

Conclusions

The results of MED-PARTICLES provide a valuable and timing piece of information to better target policies on air pollution in Europe during a period of revision of the Thematic Strategy on Air Quality.

MED-PARTICLES provides the following suggestions:

- The only daily PM available limit value in Europe is PM_{10}. The strong evidence of harmful health effects of both fine and coarse particles clearly indicate the need of introducing a limit value for daily concentrations of $PM_{2.5}$ in Europe;
- Stricter mitigation measures at the local level should be undertaken on days with desert dust advection to reduce the anthropogenic sources of air pollution;
- Forest fires are an important source of air pollution at local level with a sizeable health effect;
- Some PM components, especially those originating from traffic exhausts and dust resuspension, seem particularly toxic;
- A EU wide PM speciation program should be launched to better understand the health effect of air pollution.

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New policy package to clean up Europe's air

Many EU Member States are still falling short of agreed EU air quality standards, and the WHO Air Quality Guidelines are generally not being met. While EU air quality policy has brought significant reductions in concentrations of harmful pollutants such as particulate matter, sulphur dioxide (the main cause of acid rain), lead, nitrogen oxides, carbon monoxide and benzene, major problems remain. Fine particulates and ozone, in particular, continue to present significant health risks and safe limits for health are regularly exceeded. EU air quality standards and targets are breached in many regions and cities, and public health suffers accordingly, with rising costs to health care and the economy. The situation is especially severe in urban areas, which are now home to a majority of Europeans.

The European Commission is responding with new measures to reduce air pollution. The clean air policy package is the culmination of a major review of air policy that began in early 2011, and updates existing legislation and further reduces harmful emissions from industry, traffic, energy plants and agriculture, with a view to reducing their impact on human health and the environment. Air pollution causes also lost working days, and high healthcare costs, with vulnerable groups such as children, asthmatics and the elderly the worst affected. It also damages ecosystems through excess nitrogen pollution (eutrophication) and acid rain.

The package adopted in December 2013 has a number of components. They include:

- A new Clean Air Programme for Europe with measures to ensure that existing targets are met in the short term, and new air quality objectives for the period up to 2030. The package also includes support measures to help cut air pollution, with a focus on improving air quality in cities, supporting research and innovation, and promoting international cooperation
- A revised National Emission Ceilings Directive with stricter national emission ceilings for the six main pollutants , and
- A proposal for a new Directive to reduce pollution from medium-sized combustion installations, such as energy plants for street blocks or large buildings, and small industry installations.

By 2030, and compared to business as usual, the clean air policy package is estimated to:

- avoid 58.000 premature deaths,
- save 123.000 km^2 of ecosystems from nitrogen pollution (more than half the area of Romania),
- save 56.000 km^2 protected Natura 2.000 areas (more than the entire area of Croatia) from nitrogen pollution,
- save 19.000 km^2 forest ecosystems from acidification.

Health benefits alone will save society € 40-140 billion in external costs and provide about € 3 billion in direct benefits due to higher productivity of the workforce, lower healthcare costs, higher crop yields and less damage to buildings. The proposal will also add the equivalent of around 100.000 additional jobs due to increased productivity and competitiveness because of fewer workdays lost. It is estimated to have a positive net impact on economic growth.
The proposal is based on the conclusions of a comprehensive review of existing EU air policy. It comes after extensive consultations that found broad support for EU-wide action in this area.

For more information:

This information is based on the EC press release of 18 December 2013 (IP/13/1274 18/12/2013).
Link to the draft proposal and to the study (with the figures for MS, as mentioned above):
http://ec.europa.eu/environment/air/clean_air_policy.htm

UFIREG – Health effects of ultrafine particles in five European cities

While ultrafine particles – the smallest constituents of airborne particulate matter – appear likely to negatively affect human health, a clear understanding of their impact on people's health is still lacking. The project „Ultrafine Particles – an evidence based contribution to the development of regional and European environmental and health policy" (UFIREG) is intended to increase our understanding of the short-term effects of ultrafine particles (UFP) and other air pollutants on human morbidity and mortality, including their influence on cardiovascular and respiratory diseases. It is implemented through the INTERREG IV B CENTRAL EUROPE Programme, co-financed by the ERDF (7/2011 – 12/2014).

UFP measurements within UFIREG are performed using custom-made mobility particle size spectrometers in five European cities: Dresden, Augsburg, Prague, Ljubljana, and Chernivtsi. The measurement stations are partly integrated in local air quality monitoring networks and are located at urban background sites. At these sites, other air pollution parameters such as PM_{10}, $PM_{2.5}$, NOx, SO_2, O_3, as well as meteorological parameters are determined. An extensive quality assurance program is an essential part of UFIREG aiming at a high and comparable data quality. It comprises staff training, an initial comparison of the UFP measuring instruments, frequent on-site comparisons against reference instruments and automatic control units at two sites. Besides these quality assurance measures, instrument maintenance as well as data validation was optimised and harmonised within the project.

The analyses of the air pollution data within UFIREG include determination of temporal and spatial variation of (ultrafine) particle number concentrations, meteorological cluster analyses based on backtrajectories and source apportionment by applying Positive Matrix Factorization to particle number size distributions. The results obtained so far indicate a strong similarity between the UFP measurements in Dresden and Prague, regarding temporal variation, correlation with gas concentrations but also regarding the influence of air mass origin. Due to a slight decrease in particle number concentrations in German and Czech cities in 2013, the annual means in 2013 differed more among the UFIREG cities than in 2012. The highest particle number concentrations in the UFIREG region could be observed in Chernivtsi. In summary, the results demonstrate that particle number concentrations in urban areas depend strongly on different factors such as meteorological conditions, different sources (traffic, domestic heating, long-range transport, etc.), everyday life of people and cityscape.

On the basis of the air quality data, the UFIREG project investigates the short-term effects of ambient air pollution on morbidity and mortality in all participating cities. Official statistics are used to determine the association between air pollution concentration and (cause-specific) hospital admissions and daily mortality. City-specific statistical models are adjusted for long-term trend, indicator variables for weekdays and holidays, influenza epidemics and meteorological parameters. The city specific estimates will be pooled using meta-analyses methods. Currently, the analyses are ongoing.

More detailed results will be presented at the UFIREG final conference on 28 November 2014.

Further information: http://www.ufireg-central.eu

Burden of disease due to air pollution in the WHO European Region

Air pollution is the largest contributor to the burden of disease from the environment. Recent estimates from WHO show that exposure to air pollution accounted for almost 600.000 deaths (482. 000 attributable to ambient air and 117.200 to household air pollution) in the WHO European Region in 2012 (http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/news/news/2014/03/almost-600-000-deaths-due-to-air-pollution-in-europe-new-who-global-report). Health effects are due to exposure to fine particulate matter, which causes cardiovascular and respiratory disease, as well as cancer. The new estimates highlight that exposure to air pollution is a more important risk factor for major noncommunicable diseases (such as ischaemic heart disease and stroke) than previously thought.

Evidence published by WHO/Europe in 2013, as part of the international project to review evidence on health aspects of air pollution/REVIHAAP (see chapter WHO publication), confirms that outdoor air pollution is an important risk factor for health. These findings support the scientific conclusions of the WHO air quality guidelines from 2005 and indicate that health effects can occur at air pollution concentrations lower than the guideline levels. Further, in October 2013, the International Research Agency on Cancer, classified air pollution mixture and PM as carcinogenic to human beings (Group 1). In the 2010 Parma Declaration on Environment and Health, Member States in the WHO European Region committed themselves to preventing disease by improving outdoor and indoor air quality. The overall compelling scientific evidence and significant burden of disease from air pollution provide convincing arguments for the need to take further action to reduce emissions and improve air quality.

Compounding effects on health of poor air quality during extreme heat

Heat waves have caused a substantial amount of excess deaths in Europe in the recent years. With climate change, heat waves are expected to become longer, more frequent and intense in the future. Several studies provide evidence, that higher morbidity and mortality in heat waves is not only caused by high temperatures, but is also modified by air pollution. Especially, particulate matter ($PM_{10/2.5}$) and tropospheric ozone are suspected to increase mortality during heat events. This is also highlighted in the Report of Working Group II of IPCC Fifth Assessment Report (AR5 WGII 2014).
As a selection of some further examples of published evidence, Fisher et al. (2004) calculated that half of the excess deaths in the 2003 heat wave could be assigned to the effects of ozone and PM_{10}. Effect modification of heat-related deaths by ozone was also found in Munich, Nürnberg and Augsburg in Germany (Breitner et al. 2014); however, they did not find an effect modification by PM_{10}.

An important additional factor that can co-occur with extreme heat events is wildfires. They cause a significant increase in concentration of different air pollutants, therefore wildfires not only pose immediate threats to human health and livelihoods in the areas where they occur, but also in areas affected by the higher air pollution concentration. During the 44-day heat wave and the wildfires in the Russian Federation in 2010, about 11.000 excess deaths occurred in Moscow, of which 2.000 were attributed to the wildfire air pollution (PM_{10}) (Shaposhnikov et al. 2014). The WHO Regional Office for Europe notes a few simple measures that can be taken to protect oneself during periods of extreme heat which may be exacerbated by poor air quality in the WHO publication "Wildfires and heat-wave in the Russian Federation" (http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/publications/2010/wildfires-and-heat-wave-in-the-russian-federation-public-health-advice3). This evidence of the compounding effect of poor air quality with extreme heat on mortality and morbidity highlights the potential for substantial gains in health through integrating climate change mitigation and air pollution management strategies.

TRANSPHORM: Quantifying Health Impacts of PM over Europe 6 May 2014 in Brussels, Belgium

This is a report on some of the messages from a recent TRANSPHORM project meeting held specifically for invited stakeholders. TRANSPHORM (http://www.transphorm.eu) is an international research project financed by the EC FP7 Programme. Lasting from 2010 to 2014, over 100 scientists from 21 organisations across Europe worked jointly to develop and implement an integrated methodology to assess the health impacts of airborne particulate matter (PM). The focus was laid on particles generated from transport activities like road traffic, shipping, railways and aviation and the research approach covered the whole chain from emissions to disease burden while looking both at the regional and the city scale.

During the workshop, about 40 invited participants from business associations, national and regional authorities, from NGOs and the Commission, discussed the results presented by the scientists. Several key messages derived from TRANSPHORM were summarized from a stakeholder's perspective. Source apportionment studies from detailed measurements of PM_{10} and $PM_{2.5}$ at traffic sites in some selected cities showed that about one half of traffic generated PM_{10} can arise from non-exhaust emission sources. These sources contribute mainly to the coarse fraction and should be integrated into PM_{10} control strategies.

Results from modelling studies showed that on a European scale transport emissions are responsible for 15 % of regional $PM_{2.5}$. The importance of regional background was highlighted as it can account for up to 70 % of $PM_{2.5}$ concentrations in cities. Although there is still work to be done to resolve the underprediction of PM concentrations by regional models, important consequences for management strategies can be derived from these results: Effectiveness of local measures to reduce PM concentrations depends on the regional contribution to cities and reduction strategies have to include various sources and sectors. It was argued that local measures are not particularly effective to lower long term levels of PM, but instead technological changes in emissions will have the most important impact. Because local exhaust emissions have only a fairly small contribution to PM, elemental carbon (EC) and particle number (PN) concentrations are better indicators for exhaust emissions. Benzo(a)pyrene (BaP) is emitted by sources such as, e.g., coal and wood burning in Eastern Europe and wild-land fires. Emissions of PM, EC and PN are projected to decline in future. It has been shown that the introduction of new emissions standards for road traffic will be the most effective measure to reduce air pollution health effects. Due to the new standards, emissions from road traffic will be considerably reduced, leading to an increase of the relative contribution from shipping and aviation. Also non-transport related sources (e. g. domestic wood burning, small combustion processes and agriculture) will become more important. Sophisticated exposure models, taking into account the population's activity in different micro-environments during a day, gave more realistic results of exposure to PM. Such exposure studies are the basis for an improved understanding of health effects. But there is still the need for further refinement, e.g. the consideration of morbidity outcomes and the determination of specific risk factors for different particle metrics such as EC and PN.

The presentations from the workshop are available at
http://transphorm.eu/language/en-GB/Home/Stakeholders/StakeholdersMeetingPresentations.aspx

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MEETINGS AND CONFERENCES — MEETINGS AND CONFERENCES

"AIR QUALITY – SCIENCE AND APPLICATION"
24 – 28 March 2014 in Garmisch-Partenkirchen, Germany

The 9th international Air Quality conference was held in Garmisch-Partenkirchen jointly hosted by the University of Hertfordshire/UK and the Institute of Meteorology and Climate Research of the Karlsruhe Institute of Technology/Germany. As in previous years, the conference has continued to build upon the series which began at the University of Hertfordshire in July 1996, with this year being the biggest conference yet.

Air quality has continued to be a key issue for achieving sustainable development, and for its impacts on our health and environment, and the Air Quality conference has become one of the most prominent forums for scientists and other stakeholders from the air pollution, climate change, policy and health communities to discuss the latest research developments, and its implications for policy and other users. Air Quality 2014 welcomed nearly 300 delegates from 45 countries to a programme of 180 oral presentations and 110 post presentations, which covered various air quality topics. Additionally, the conference was proud to support six young researchers with conference bursaries, as well as presenting two awards for the best poster presentation, in a young researcher category, and an open category.

Special sessions have been held to following topic areas:
- Air pollution in cities
- Air Quality and Climate/Meteorology Interactions and Feedbacks
- Air quality forecasting and early warning systems
- Local and regional air quality services (PASODOBLE)
- Transport related emissions and air quality – Science, Impacts and Response (TRANSPHORM).

These special sessions were well attended, with good interaction and fruitful discussions between the panels, presenters, and audience. With an important focus of the conference on bridging the gap between 'science' and 'application', interaction between researchers and stakeholders at the conference was a particular success. There were also a number of presentations showing results from large scale cross-disciplinary projects PASODOBLE (www.myair.eu), ES1004 EuMetChem COST Action (http://eumetchem.info/) and TRANSPHORM (www.transphorm.eu).

From the large number of papers submitted and presented at the conference, the dynamism of the community was clearly evident. Research in the wider community continues to extend the boundaries of air quality science and is providing solutions to reduce the health and environmental impact of air pollution.

Networking and collaboration was a prominent theme, both during the panel discussions and poster sessions, and at the social events. This included:
- Cooperation between scientists from different disciplines
- Consultation with communities and policy makers throughout some research projects and the sharing of results
- Interactions between users and scientists working on local, urban, regional and global scale problems
- Bringing together of air quality and climate communities.

Together with addressing many of the questions and issues regarding air quality, a number of future research challenges were also identified from the presentations and panel discussions. These including:

1. Exposure and Health Impacts
- The need to increase interaction between air quality and health scientists
- Use of state of the art air quality measurement and modelling methodologies to ben efit health studies
- Details populate exposure assessments needed for major cities, allowing for micro-environmental concentrations.

2. Particulate Matter and Source Apportionment
- A need for composition and size differentiated data on particulate matter species
- Further research into the importance of particle number on health and climate studies
- The need to evaluate uncertainties and special representativeness associated with air quality measurements and modelling
- Address the underestimation of PM predictions by regional models and the implications for health impacts and policy formulation.

3. Emissions
- Improved estimates of emissions from small scale combustion, non-exhaust, and suspension are needed
- Information on the magnitude and spatial distributions of sources needs to improve.

4. Air Pollution in Cities
- Contrasting experiences in world regions and cities will provide important insight into the health related impacts
- Significant challenges in many cities, such as Beijing, Delhi remain and focussed action is needed to improve our knowledge and tools for quantifying health and environmental impacts in megacities
- European cities are still experiencing exceedances (e.g. local scale NO_2) and high levels of pollution of PM and Ozone especially during episodic conditions.

The Conference Committee express their appreciation to all the supporting organisations, co-operators and the participants who made the conference a success. As well the attendance and support of international exhibitors are gratefully acknowledged.

For more information on the conference, please see http://www.airqualityconference.org/.

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Review of evidence on health aspects of air pollution – REVIHAAP project: final technical report

by WHO (World Health Organization). 2013. Available in English, Russian (PDF), 2.6 MB.

This document presents answers to 24 questions relevant to reviewing European policies on air pollution and to addressing health aspects of these policies. The answers were developed by a large group of scientists engaged in the WHO project Review of Evidence on Health Aspects of Air Pollution/REVIHAAP. The experts reviewed and discussed the newly accumulated scientific evidence on the adverse effects on health of air pollution, formulating science-based answers to the questions. Extensive rationales for the answers, including the list of key references, are provided. The review concludes that a considerable amount of new scientific information on adverse health effects of particulate matter, ozone and nitrogen dioxide, observed at levels commonly present in Europe. This new evidence supports the scientific conclusions of the WHO Air Quality Guidelines, last updated in 2005, and indicates that the effects in some cases occur at air pollution concentrations lower than those serving to establish these guidelines. It also provides scientific arguments for taking decisive actions to improve air quality and reduce the burden of disease associated with air pollution in Europe. This publication arises from the project REVIHAAP and has been co-funded by the European Union.
http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/publications/2013/review-of-evidence-on-health-aspects-of-air-pollution-revihaap-project-final-technical-report

Health risks of air pollution in Europe – HRAPIE project. Recommendations for concentration–response functions for cost–benefit analysis of particulate matter, ozone and nitrogen dioxide

by WHO (World Health Organization). 2013. Available in English (PDF), 1.1 MB.

This document presents recommendations for concentration–response functions for key pollutants to be included in cost–benefit analysis supporting the revision of the European Union's air quality policy. It provides a response to a question posed by the European Commission in the framework of the WHO "Health risks of air pollution in Europe – HRAPIE" project.
The essential background to this response was developed through a review of evidence on health aspects of air pollutants summarized by an earlier WHO project, "Review of evidence on health aspects of air pollution – REVIHAAP". This report recommends concentration–response functions and associated background information for several mortality and morbidity effects associated with short- and long-term exposure to particulate matter, ozone and nitrogen dioxide. This publication arises from the HRAPIE project and was co-funded by the European Union.
http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/publications/2013/health-risks-of-air-pollution-in-europe-hrapie-project.-recommendations-for-concentrationresponse-functions-for-costbenefit-analysis-of-particulate-matter,-ozone-and-nitrogen-dioxide

Research for universal health coverage: World health report 2013

by WHO (World Health Organization), 2013. ISBN: 978 92 4 156459 5. Available in English, Arabic, Chinese, French, Portuguese, Spanish, Russian (PDF), 4.29 MB.

Universal health coverage ensures everyone has access to the health services they need without suffering financial hardship as a result. In December 2012, a UN resolution was passed encouraging governments to move towards providing universal access to affordable and quality health care services. As countries move towards it, common challenges are emerging -- challenges to which research can help provide answers. The current report focuses on the importance of research in advancing progress towards universal health coverage. In addition, it identifies the benefits of increased investment in health research by low- and middle-income countries using case studies from around the world, and proposes ways to further strengthen this type of research.

Report on the European Environment and Health Process (2010-2013)

by WHO (World Health Organization), 2013, Available in English (PDF), 771.3 KB, Russian 961.8 KB.

The WHO Regional Committee for Europe and the UNECE Committee on Environmental Policy represent the first report back to the governing bodies on progress in implementing the commitments of the Member States, made at the Fifth Ministerial Conference on Environment and Health (Parma, March 2010). This is a full report documenting the implementation of the European Environment and Health Process since 2010. It was adopted by the European Environment and Health Ministerial Board (EHMB) in 2013, and reflects inputs and contributions received by the EHMB from Member States and stakeholders represented in the European Environment and Health Task Force (EHTF).
http://www.euro.who.int/de/health-topics/environment-and-health/report-on-the-european-environment-and-health-process-2010-2013

Developing national action plans on transport, health and environment

by WHO (World Health Organization), 2014, viii + 55 pages. ISBN 978 92 890 5021 0. CHF 20.00, in developing countries: CHF 14.00. Available in English (PDF), 37.5 MB, Francais 13.7 MB.

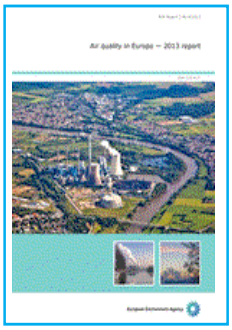
A national transport, health and environment action plan (NTHEAP) is a key mechanism for developing sustainable and healthy transport in a country. It provides a comprehensive and intersectoral way to plan and take action on transport, environment and health at the national level. This manual was developed to guide NTHEAP development by countries. It proposes four phases: planning, development, implementation and evaluation. It does not provide specifics on how to establish general policies or strategies on sustainable and healthy transport, an activity that usually precedes the development of NTHEAPs. The manual provides practical advice on each of the phases (and the steps that comprise them) in an NTHEAP and highlights good practices from the European Region.

Other Publications:

Air Quality in Europe - 2013 report (EEA-Report 9/2013)

by EEA (European Environment Agency), 2013. ISBN: 978-92-9213-406-8. Available in English (PDF), 13.4 MB.

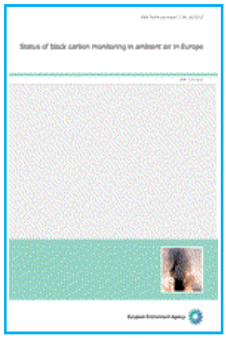
This report presents an overview and analysis of air quality in Europe from 2002 to 2011. It reviews progress towards meeting the requirements of the air quality directives and gives an overview of policies and measures introduced at European level to improve air quality and minimise impacts. An overview of the latest findings and estimates of the effects of air pollution on health and its impacts on ecosystems is also given.



Status of black carbon monitoring in ambient air in Europe (EEA Technical-report 18/2013)

by EEA (European Environment Agency), 2013. Available in English (PDF), 2.4 MB.

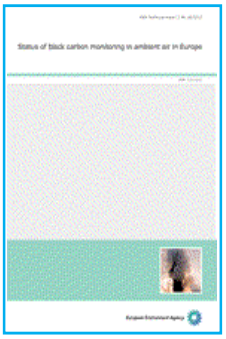
This report provides a summary of black carbon (BC) definitions as discussed in the air quality monitoring community. Secondly, it provides a summary of the current status of BC-related monitoring in Europe. Information presented in the report includes an overview of available measurement techniques and associated technical issues, monitoring networks and current data reporting practices.
http://www.eea.europa.eu/publications/status-of-black-carbon-monitoring



Air pollution by ozone across Europe during summer 2013 (EEA Technical-report 3/2014)

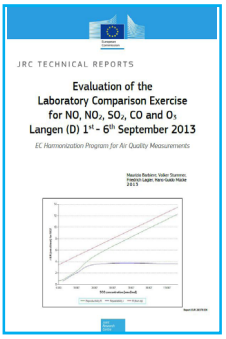
by EEA (European Environment Agency), 2014. Available in English (PDF), 13.3 MB.

The report provides an overview of exceedances of EC ozone threshold values for April - September 2013. Ground-level ozone exceeded legal limits in every Member State and at many individual measurement sites during summer 2013. Although the number of exceedances is high, they have decreased over recent decades.
http://www.eea.europa.eu/publications/air-pollution-by-ozone-across-1



Evaluation of the Laboratory Comparison Exercise for NO, NO_2, SO_2, CO and O_3 Langen (D), 1st - 6th September 2013

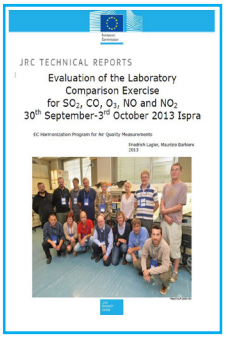
EUR 26578 EN, ISBN 978-92-79-36781-6 (PDF), ISSN 1831-9424 (online), DOI: 10.2788/43930, 2014.



Seven Laboratories of the World Health Organization (WHO) European Region met for another joint JRC-ERLAP/WHO inter-laboratory comparison exercise (IE). They met at the National Air Quality Reference laboratory at the German Federal Environment Agency in Langen, Germany, to evaluate their proficiency in the analysis of inorganic gaseous pollutants (NO, NO_2, SO_2, CO and O_3) covered by the European Air Quality Directive 2008/50/EC. Most of the laboratories participating in the IE used automated instruments while one laboratory performed analysis using manual methods. The technical report describes and discusses the result.

Evaluation of the Laboratory Comparison Exercise for SO_2, CO, O_3, NO and NO_2 Ispra (I), 30th September-3rd October 2013

EUR 26604 EN , ISBN 978-92-79-37796-9 (PDF), ISSN 1831-9424 (online), doi: 10.2788/52182 , 2014.



Within the harmonization program of Air Quality monitoring in Europe ERLAP Laboratories are organizing Inter-Laboratory Comparison in the facility of Ispra (Italy). From the 30th of September to the 3rd of October 2013 eight laboratories of AQUILA (Network of European Air Quality Reference Laboratories) met for a laboratory comparison exercise in Ispra (IT) to evaluate their proficiency in the analysis of inorganic gaseous pollutants (SO_2, CO, NO, NO_2 and O_3) covered by the European Air Quality Directive 2008/50/EC.

Results of the first EC/OC comparison exercise for EU National Air Quality Reference Laboratories (AQUILA)

EUR 25213 EN, ISBN 978-92-79-23085-1 (print), ISBN 978-92-79-23086-8 (PDF), ISSN 1018-5593 (print), ISSN 1831-9424 (online), doi: 10.2788/97054, 2012.

The JRC-IES European Reference Laboratory for Air Pollution (ERLAP) has organized an inter-laboratory comparison for the measurement of elemental carbon (EC) and organic carbon (OC) in particulate matter sampled on filters. To this comparison European Union National Reference Laboratories for air quality or delegated organizations have participated, all using instrumentation of the same make (Sunset Laboratories Inc.1). The objectives of this comparison have been to evaluate the performances of participants but also to study the effects of the use of different thermal analysis protocols currently used for analysis.

COMING EVENTS — COMING EVENTS — COMING EVENTS — COMING EVENTS — COMING EVENTS — COMING EVENTS

2014

Air Pollution 2014 - 22nd International Conference on Modelling, Monitoring and Management of Air Pollution
7-9 July, Opatija, Croatia, http://www.wessex.ac.uk/14-conferences/air-pollution-2014.html

Indoor Air 2014 - 13th International Conference on Indoor Air Quality and Climate
7-12 July, Hong Kong, China, http://www.indoorair2014.org/

International Aerosol Conference
21 August-5 September, Busan, Republic of Korea, http://www.iac2014.net

26th Conference of the International Society for Environmental Epidemiology
24-28 August, Seattle / Washington, USA, http://www.iseepi.org

Sustainable City 2014 - 9th International Conference on Urban Regeneration and Sustainability
23-25 September, Sienna, USA,
http://www.wessex.ac.uk/14-conferences/sustainable-city-2014.html

Ultrafine particles and health - UFIREG final conference
28 November, Dresden, Germany, http://www.ufireg-central.eu

11th International Seminar on Medical Geography "Health Management"
18-20 December, Roma, Italy, E-Mail: giovanni.desantis[at]unipg.it

2015

ICEPPHI 2015 - International Conference on Environmental Pollution, Public Health and Impacts
26-27 January, Istanbul, Turkey, http://www.waset.org/conference/2015/01/istanbul/ICEPPHI/call-for-papers

ICAPC 2015 - International Conference on Air Pollution and Control
23-24 February, Paris, France, https://www.waset.org/conference/2015/02/paris/ICAPC

10th Annual International Symposium on Environment
11-14 May 2015, Athens, Greece, http://www.atiner.gr/environment.htm

ECCA 2015 - European Climate Change Adaptation Conference
12-15 May, Copenhagen, Denmark, http://www.burchardt-apps.dk/ecca2015.eu/

Air Pollution 2015 - 23rd International Conference on Modelling, Monitoring and Management of Air Pollution
1-3 June, Valencia, Spain, http://www.wessex.ac.uk/15-conferences/air-pollution-2015.html

EAC 2015 - European Aerosol Conference
6-11 September, Milan, Italy, http://www.eac2015.it/