NEWSLETTER

WHO COLLABORATING CENTRE FOR AIR QUALITY MANAGEMENT
AND AIR POLLUTION CONTROL at the GERMAN ENVIRONMENT AGENCY

No. 56 - December 2015

EDITORIAL

Taking Global Action on Climate Change to Improve Human Health

Climate change is one of the greatest threats to global health in the 21st century. Global warming, induced by climate change, affects some of life's essential requirements for human health: water, food, and air.

Air pollution is a good example of the link between climate change and health. Fuel combustion of fossil fuels and biomass creates health-relevant gases (e.g. SO_2, NO_2) and particulate air pollution (e.g. PM_{10}, $PM_{2.5}$). Furthermore, such anthropogenic processes generate long-lasting climate-relevant pollutants (e.g. the greenhouse gas CO_2), which remain for decades in the atmosphere, as well as so-called short-lived climate air pollutants/SLCPs (e.g. black carbon, methane and ozone). The latter ones produce strong warming effects and persist in the atmosphere only for periods ranging from days to about one decade. Because SLCPs both are responsible for a substantial fraction of climate change and for a significant proportion of air-pollution related diseases and deaths, global actions on climate change to improve human health have to be taken as soon as possible.

Thus, the WHO support within its Health and Climate Change campaign "Road to COP21" clean air initiatives to abate emissions of greenhouse gases (GHG) and SLCPs, as well as to invest in low-carbon technologies (e.g. renewable energy production). Even the health system is responsible for GHG emissions from various sources, such as health care facility infrastructures, health system related transports and procurement of food, medical devices, medicine and services. The health sector has the challenge and opportunities to improve critical health facilities, in particular for clean and more reliable energy and power systems, and to switch to a new green health care system. Respective GHG mitigation measures should be addressed to and incorporated into relevant national health system policies and plans where the health sector has primary control and responsibility of GHG emissions. Co-benefits to health from climate change mitigation and national responses have been described in WHO's first climate change and health country profiles (http://www.who.int/global-change/resources/countries/en/), which had been issued in advance of the 2015 United Nations Conference on Climate Change in Paris (COP21) this month.

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2015 is the hottest year on record ever, and will see nations attempt to reach a new COP21 global agreement to address climate change. More than 25,000 official delegates from across the world, including health and finance ministers and civil society negotiators will gather in Paris to agree on the global response to climate change. The health profession is mobilising to let the decision makers know that global health matters, and that any response must ensure protection and promotion of human security and wellbeing for us and future generations. WHO supports all COP21 efforts to reach an important agreement for improving global health. The Paris conference is a unique opportunity not only to reduce climate change and its consequences, but to promote actions that can yield large and immediate health benefits, and reduce costs to health systems and communities.

Further information on this topic can be obtained from:

http://www.who.int/globalchange/en/
http://www.who.int/globalchange/global-campaign/en/
http://www.who.int/mediacentre/factsheets/fs266/en/
http://www.ourclimateourhealth.org/
http://www.climateandhealthalliance.org/
http://www.cop21.gouv.fr/en
http://www.worldhealthsummit.org/fileadmin/downloads/2015/WHS/Documents/M8_Alliance_Statement_WHS_Berlin_2015.pdf

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ABOUT

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HEALTH BURDEN OF AIR POLLUTANT EXPOSURE IN BELGRADE: A EUROPEAN REGION WITH HIGH CIRCULATORY AND MALIGNANT MORTALITY RATES

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Background

Institute of Public Health of Belgrade (IPH) was established in 1961, and is currently the leading institution for preventive healthcare in Serbia, employing over 400 people. Its mission is to promote health, protect the environment, improve life quality of its community, conduct research on issues related to public health in Belgrade and provide support and guidance to public authorities. The Laboratory for Human Ecology and Ecotoxicology operates as part of IPH. It has been accredited according to ISO 17025 for performing over 350 analyses of food and environmental samples, with air pollution being one of the leading issues. Daily air quality monitoring, initiated in Belgrade area 30 years ago, is nowadays conducted on 30 measuring sites and comprises regular measurements of SO_2, NO_x, CO, O_3, BTEX, formaldehyde, acrolein, volatile organic compounds (VOC), PM_{10} and $PM_{2.5}$ concentrations, as well as determination of heavy metal, polycyclic aromatic hydrocarbons (PAH), organic and elemental carbon content of particulate matter. Over the past decades, IPH has established cooperation with some renowned global organizations, such as the World Health Organization, the World Meteorological Organization, the European Comission's Joint Research Center, as well as with many regional research institutions dealing with complex environmental and health issues affecting this region. As a result of the research conducted by the scientific consortium lead by IPH, the monograph on Air Quality Plan for Belgrade was published in 2014, as the first document presenting the comprehensive multi-year analysis of air pollution in the Serbian capital.

Based on the data on air pollutants provided by the Laboratory for Human Ecology and Ecotoxicology, the researchers at the Environmental Physics Laboratory, Institute of Physics, University of Belgrade (IPB) have conducted several studies aimed at comprehensive analysis of emission sources, pollutant spatio-temporal distribution and relationship with mortality caused by circulatory, respiratory and malignant diseases in Belgrade area. An overview of the main findings of these studies shall be presented below. The main goal of the research is to emphasize the existing issue of air quality deterioration in Belgrade and provide information for designing environmental protection strategies that could contribute to mitigating adverse effects on public health.

Air pollution in Belgrade urban area

Considerable scientific attention has been devoted to the role of air pollution in impairment of the respiratory and circulatory system functions, aggravation of the pre-existing chronic

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diseases and related mortality rates, particularly among susceptible populations (Hoek et al., 2013). As the public health burden is growing in urban areas, a series of epidemiological studies have been performed in order to evaluate the health effects of pollutant exposure and provide guidelines for further refinement of air quality recommendations and standards. The levels of air pollutants in Serbia are higher than in most of the European countries, with a significant number of air quality standard (AQS) exceedances in urban and suburban areas. Considering the progress of WHO member states in improving air quality, Héroux (2015) reported that the population-weighted 2012 mean annual PM_{10} exposure level in 32 countries of the European region was in the range from 8.7 to 71 µg m^{-3}, with Serbia ranked fourth, behind FYR Macedonia, Turkey and Bulgaria, with highest observed concentrations.

As the capital of Serbia and the second largest urban centre in the Balkans after Athens, Belgrade is an important regional traffic hub and one of the most endangered areas in terms of air quality. A population of 1.6 million of its residents experiences the pollution-related health burden on a daily basis. Therefore, several studies have been carried out over the past few years in order to better understand PM_{10} origin and spatio-temporal distribution in the urban city area. According to the results of the study based on a 10-year (2003–2013) measurements, the mean annual PM_{10} concentrations were in the range from 30.0 to 58.9 µg m^{-3}, and exceedances of EU AQS (40 µg m^{-3}) limit were registered for all years with the exception of 2008 and 2010 (Perišić et al., 2014). When compared to other study findings, the observed values were similar to or lower than those registered in large industrial centers or overpopulated metropolis of Asia and Africa, but higher than those measured in most of the major cities in developed European countries and the USA.

By means of the Unmix receptor model, four major PM_{10} sources were identified and their relative contributions were estimated. Unsurprisingly, the results showed that the use of sulfur-rich locally-produced lignite for heating operations was associated with the highest contribution of 29.8 % to the observed PM_{10} levels in the last few years (Stojić et al., 2015a). Besides that, burning of low-grade coal during the heating season was also assumed to result in high concentrations of benzo[a]pyrene (BaP), as an indicator of carcinogenic PAH. The registered BaP levels increased during the heating season 17 times on average and ranged from 1.69 to 4.62 ng m^{-3}, thus significantly exceeding the WHO reference level of 0.12 ng m^{-3}.

As part of the comprehensive analysis of PM_{10} levels, estimation of emission source reductions required to comply with AQS was performed, based on general probability distribution and rollback equation. The results suggested that for some years of the previous period, the total reduction of local emission sources in the urban area of Belgrade would be still insufficient to comply with the current regulations (Perišić et al., 2014; Todorović et al., 2015), **Figure 1**.

Combustion of biomass and fossil fuels results in gaseous and particulate emissions, and a number of species, with inorganic gaseous oxides undergoing stringent regulatory requirements due to their abundance and adverse health effects. The concentrations of SO_2, CO, NO_2 and soot are regularly registered on an hourly basis at a great number of monitoring stations located within the IPH measuring network throughout the city area. Time-series analysis showed that SO_2 and soot exhibit clear seasonal pattern, with highest concentrations observed in cold season, which could be attributed not only to the use of high-sulfur fuel, outdated technology and equipment in the public heating system, but also to stable atmospheric conditions typical for winter and autumn season, referring to low planetary boundary layer height and wind of low to moderate speed. In contrast to this, the NO_2 occasional limit value exceedances were equally observed in both seasons, particularly in severely congested streets. Even though it could be treated as an indicator of secondary air pollution (Zheng et al., 2013), the fact that NO_2 exhibits

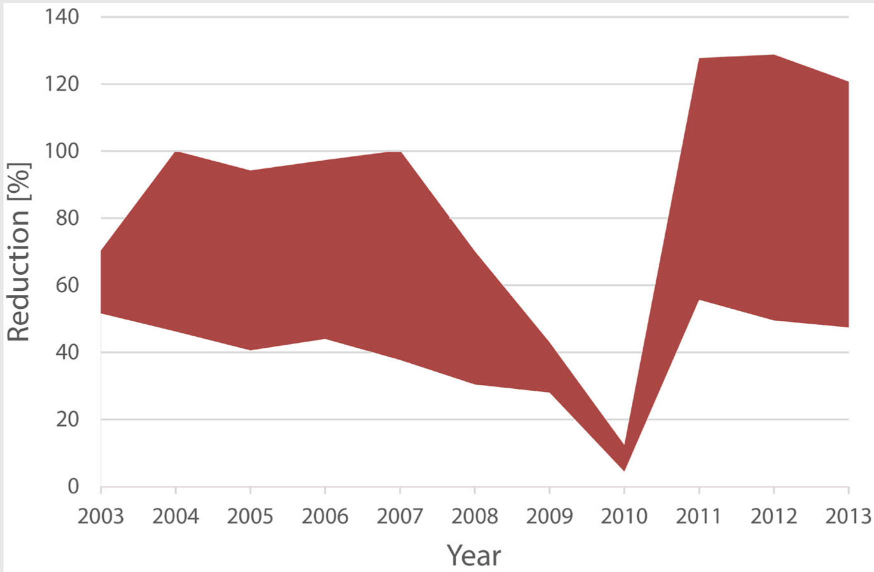

Figure 1: Estimated extent of emission source reduction. Source: Slightly modified, based on Air Quality Plan for Belgrade, 2014.

no seasonal pattern points to its local origin, most likely related to traffic-related emissions. The densely populated suburban area of Belgrade is home to a variety of industrial facilities, including oil refinery, petrochemical refining and chemical industry, all known to be strong sources of VOC and their most abundant representatives comprising benzene, toluene, ethylbenzene, and xylenes (BTEX), which are often used as indicators of man-made pollution (Šoštarić et al., 2015). The studies (Stojić et al., 2015b; Stojić et al., 2015c) aimed at source apportionment and description of VOC spatio-temporal distribution in the urban area of Belgrade present the first in-depth analysis of VOC pollution in Western Balkan countries. The measurements were carried out by the use of the Proton Transfer Reaction Mass Spectrometry (PTR-MS), a highly sensitive, real-time technique, available at IPB. According to the research findings, the major VOC sources resolved by the use of Unmix and Positive Matrix Factorization included solid fuel burning, traffic-related emissions, gasoline evaporations and oil refineries, petrochemical industry, biogenic emissions, aged plumes, and local laboratories. As in most populated areas, traffic-related emissions were assessed to be the most important contributor to VOC pollution. Moreover, this issue was particularly pronounced in the case of Belgrade, due to a rapidly growing number of old and poorly-maintained vehicles. The bivariate cluster analysis revealed that the major portion of almost all source profile contributions was related to low-speed wind blowing from all directions, thus indicating that most of the VOC emissions were of strictly local origin, **Figure 2**.

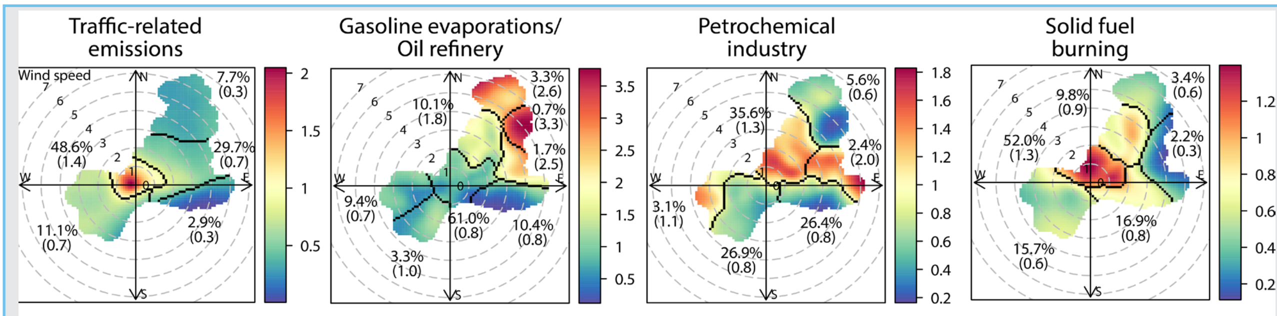

Figure 2: The relationship between source contributions and wind characteristics, together with bivariate cluster plot (percentage and average contribution). Source: Slightly modified, based on Stojić, A., Stojić, S. S., Mijić, Z., Šoštarić, A., & Rajšić, S. (2015). Spatio-temporal distribution of VOC emissions in urban area based on receptor modeling. Atmospheric Environment, 106, 71-79.

Besides the impact of local sources, VOCs are also considered to be of influence in remote regions, at spatial scales of several hundred kilometers and temporal scales on the order of several days, depending on their atmospheric lifetimes and meteorological conditions. Regional and long-range transport pathways were examined by the use of HYSPLIT model-derived air back trajectories, whereas trajectory sector analysis, trajectory cluster analysis, potential source contribution function and concentration weighted trajectory models were used for identification of potential remote VOC source areas. According to the results, the industrial sources from the peripheral city zone, as well as those from remote regions of Central and Eastern Europe, have been evidenced as the second largest contributor in shaping the air quality in Belgrade urban area, immediately after the local traffic-related emissions.

The observed complex interplay between local emissions and transported air masses suggests that the issue of air pollution should not be observed as a local and time-limited problem. Conversely, it is evident that only broader cooperation and control of emission sources in all countries within the region is required for effective abatement measures.

Timely information on occurrence of hazardous air pollutant levels would be extremely important for safeguarding people's health, particularly for protection of susceptible population categories. In the study (Stojić et al., 2015d) aimed at forecasting the contributions of different emission sources to the observed VOC mixing ratios in the urban area, classification and regression multivariate methods (MVA) were employed in two separate cases, relying on meteorological data, and meteorological data and concentrations of inorganic gaseous pollutants, respectively. The results indicate a high level of forecasting accuracy of the best performing methods (lowest relative error of only 6 %), particularly when forecasts were based on both meteorological parameters and concentrations of inorganic gaseous pollutants, **Figure 3**.

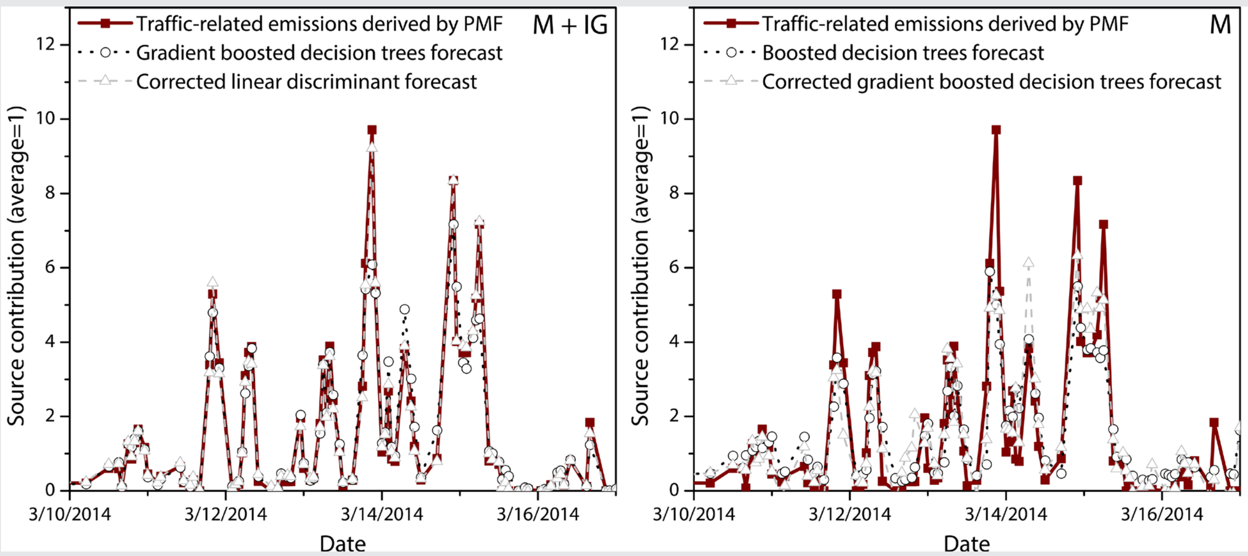

Figure 3: The comparison of receptor model-derived traffic-related source contribution and contributions obtained by the use of the best performing MVA methods. Meteorological parameters and inorganic gaseous pollutant concentrations (M + IG) and meteorological parameters (M) are used as input data. Source: Slightly modified, based on Stojić, A., Maletić, D., Stojić, S. S., Mijić, Z., & Šoštarić, A. (2015). Forecasting of VOC emissions from traffic and industry using classification and regression multivariate methods. Science of The Total Environment, 521, 19-26.

Pollution-related health risk

About 3.7 million of deaths worldwide were associated with exposure to elevated air pollutant concentrations in 2012, out of which 88 % occurred in developing countries (WHO, 2012). Despite the fact that the Western Balkan countries represent a region in Europe with high mortality rates, there is very little information available on the population's health, airborne exposure and associated health risks for this region (Bartoš et al., 2009). Numerous indicators show that even though Western Balkan countries belong to developing countries, their demographic trends are much less favourable than expected in modern Western countries. According to our data, the death rates attributed to chronic non-infectious diseases in Belgrade area have been among the highest in Europe over the last 15 years, ranging from 635 to 677 per 100,000 inhabitants for circulatory system-related mortality, i.e., from 260 to 323 per 100,000 inhabitants for mortality caused by malignant diseases.

The share of malignant-related deaths among the persons aged between 45 to 65 years was up to 37 %, which is quite worrying considering the data from other European countries, such as the findings of the Center for Cancer Research (2012) showing that 78 % of cancer-related diseases in Great Britain are observed among the persons older than 65 years. Contrary to the average life expectancy of 80.6 years in the European Union (Mortality and life expectancy statistics, 2013), the life expectancy in Belgrade area reported by the Statistical Office of the Republic of Serbia (2015) was approximately 6 years shorter.

Recent retrospective epidemiological studies which analyze large-sample statistics are aimed at investigating the association between environmental risk factors and mortality attributed to circulatory and respiratory diseases in Belgrade area. In the first of them, single and combined effects of exposure to elevated PM_{10}, NO_2, SO_2 and soot concentrations on death rates were investigated on the basis of the mean daily pollutant concentrations and mortality administrative records in the period 2009–2014 (Stanišić Stojić et al., 2015a). Besides considering the short-term effects of air pollutants using lags of 0, 1, and 2 days, a slightly modified approach was introduced in order to estimate the effects of cumulative exposure within 3, 30 and 90 days preceding death, whereas nonlinear exposure–response dependencies and delayed temperature effects were captured using distributed lag nonlinear models (Gasparrini et al., 2011). According to the results, the death outcomes triggered by air pollution events are not immediate, whereas the excess risk of long-term exposure was shown to be significant, particularly for respiratory-related mortality. The 90-day cumulative exposure to PM_{10} correlated with a significant increase in the number of daily deaths attributed to circulatory diseases, whereas an increase of 10 $\mu g\ m^{-3}$ of SO_2 appeared to be more associated with respiratory mortality. The effects of long-term exposure to soot were also found to be significant. Regarding this, medical studies have evidenced that the presence of PAH in soot particles can induce oxidative stress in cells, tissue and living systems, further leading to inflammation and permanent cellular damage (Ghio et al., 2012). The latest study that is on the point to be released aims to estimate the temperature-mortality associations, after accounting for the effects of air pollution. The results indicate that simplified interpretations that "cold weather kills far more people than hot weather" are not valid. However, upon accounting for the effects of air pollutants in a suitable way, the opposite seems to be true (Stanišić Stojić et al., 2015b).

Conclusions

There is a long-standing commitment in developed countries towards safeguarding people's health from the effects of air pollution. Although the conformity of the Serbian environmental legal framework with the EU acquis communautaire and the requirements of the Aarhus

Convention is a prerequisite for its accession to the EU, limited progress has been achieved within the environmental policy domain. End-of-pipe solutions and failure to implement current laws and regulations still pose a major barrier to air quality improvement. We hope that our findings will provide a solid basis for future regulatory actions.

Acknowledgements
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UNECE joins Climate and Clean Air Coalition

Since September 2015, UNECE joins a coalition of international partners working to reap the benefits of addressing air pollution and climate change at the same time. The Climate and Clean Air Coalition (CCAC), which was established in 2012 under the auspices of UNEP to promote action on reducing black carbon, methane, ozone and other target substances, now has more than 100 partners all around the world. Known as short-lived climate pollutants (SLCPs) because of their strong warming potential and short atmospheric lifetime, these target substances can be reduced quickly after emissions are cut, avoiding further warming in the near term. At the same time, many of these substances contribute to air pollution, causing severe effects on health and the environment. Taking action to mitigate SLCPs therefore helps improve air quality while at the same time providing climate co-benefits.

At a Working Group meeting in Paris (8–9 September), CCAC welcomed UNECE to the Coalition. By joining the Coalition, UNECE gains access to a broad network of experts and partners. Drawing on its long-standing expertise, UNECE will contribute through exchanges of experiences, knowledge and best practices, particularly as they relate to the work under e.g. the Convention on Long-Range Transboundary Air Pollution, including its amended Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol). The Gothenburg Protocol is the first legally binding agreement containing obligations to reduce the broader spectrum of SLCPs, notably fine particulate matter ($PM_{2.5}$), including black carbon and ground-level ozone precursors: nitrogen oxides and volatile organic compounds.

http://www.unece.org/info/media/presscurrent-press-h/climate-change/2015/unece-joins-climate-and-clean-air-coalition/unece-joins-climate-and-clean-air-coalition.html

News on air quality assurance and control at EU level

Revised European legislation setting improved rules on collection, sampling and analyses of air pollution data entered into force recently. It amends rules and procedures on the measurement of air pollutants outdoors, and aims to prevent or reduce harmful effects on human health and the environment. The Joint Research Centre/JRC had been entrusted with the organisation and evaluation of mandatory quality assurance programmes for EU Member States.

The new Commission Directive (EU) 2015/1480 sets more detailed and stringent rules on collecting data and prescribes newer reference methods for the sampling and analysis of arsenic, cadmium, nickel, polycyclic aromatic hydrocarbons, mercury in ambient air, and their deposition. It also prescribes more recent reference methods for the assessment of concentrations of sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter (PM_{10} and $PM_{2.5}$), lead, benzene, carbon monoxide and ozone.

To ensure accuracy of measurements and compliance with data quality objectives, the JRC will organise and evaluate air quality assurance programmes. Member States' national air quality reference laboratories are now obliged to participate at least every three years and to report to the JRC on measures taken to remediate unsatisfactory results. These intercomparison programmes are already organised regularly by the JRC in collaboration with the network of national Air Quality Reference Laboratories, known as the AQUILA network, but until now participation had been on a voluntary basis. Member States are required to bring into force the laws, regulations and administrative provisions necessary to comply with the new Directive by the end of 2016 at the latest.

National Air Quality Reference Laboratories are legally responsible for the quality assurance of air pollutant measurements in their respective Member States. Following calls for further collaboration on measuring and monitoring air quality in Europe, the national laboratories and the JRC set up the network of Air Quality Reference Laboratories (AQUILA) in 2002. Managed by the JRC, the AQUILA network provides expert judgment and promotes the harmonisation of air quality measurements among European countries and partners by activities such as coordinating quality assurance and quality control programmes, method development and validation, participating in standardisation activities, developing common research projects and pilot studies, as well as offering a forum for information exchange though training courses, workshops and conferences.

https://ec.europa.eu/jrc/en/news/revised-air-quality-directive?r=dnl.

'AIRUSE' - Testing and Development of air quality mitigation measures in Southern Europe

Particulate matter (PM) is a major environmental and human health problem. The EU is moving towards implementation of the Thematic Strategy on Air Pollution, through the most recent Directive 2008/50/EC on ambient air quality and cleaner air for Europe. Lower limit values for particulate matter in air will come into effect, creating significant challenges for the implementation of effective mitigation measures. A number of urban and industrial areas in Europe are not capable of meeting EU thresholds on airborne PM. Southern European and Mediterranean countries in particular suffer from a combination of diverse emission sources – including industry, traffic and dust intrusions - with a climate characterised by arid conditions – as well as high radiation and photochemical conversion rates – that significantly enhance particle levels in the air. A great deal of improvement can be made with respect to mitigation strategies and competent air quality management. For this it is important not just to monitor ambient air pollutant concentrations, but also to better understand the causes when PM limits are exceeded in specific areas.

Accordingly, the EU LIFE project 'AIRUSE' (LIFE11 ENV/ES/000584; 10/2012 - 09/2016) has been established to develop, demonstrate and adapt cost-effective and appropriate measures to ensure better air quality in urban areas. It aims to identify the most effective mitigation measures to reduce PM levels to within acceptable limits and thus to contribute to meeting current and future EU targets around air quality. Specific actions to achieve this overall goal include (a) harmonizing methods for identifying the sources of PM in the air; (b) identifying those sources that are responsible for exceeding PM limits in specific areas; (c) determining the relative contribution of different emission sources of PM; (d) evaluating the effect of current air quality mitigation measures; (e) developing targeted mitigation measures for the most important and relevant PM sources in Southern European urban areas; (f) assessing how different mitigation measures impact on PM sources and overall air quality; and (g) further adapting and optimising targeted mitigation measures. The project thus hopes to identify the most practical and cost-effective strategies for reducing PM in ambient air in southern European urban areas. This should support and encourage concrete actions to reduce PM exposure levels at local levels and assist national and regional authorities in implementing the "Thematic strategy on Air Pollution" and meeting the requirements of the EU Air Quality Directive (2008/50/EC).

More information can be obtained from: http://airuse.eu/.

'LIFE+ RESPIRA' - Reduction of exposure of cyclists to urban pollutants

Cities produce a wide array of air pollutants, mainly from the burning of fuel for heating and from motor vehicles. Many of these pollutants (e.g. NOx, black carbon) are also powerful greenhouse gases that contribute to global warming. Cycling generates no significant air pollution, causes negligible noise and has a relatively low ecological footprint from bicycle manufacture, compared to motor vehicles. Promoting bicycles as a means of everyday transportation, e.g. to and from work, is economically viable and environmentally sound. It contributes to improved quality of life, reduces traffic congestion and improves the overall health of cyclists (as a direct effect of exercise) and non-cyclists (through cleaner air).

The main goal of EU LIFE+ project 'RESPIRA' (LIFE13 ENV/ES/000417; 06/2014 - 05/2017) is to demonstrate that the urban air pollution intake by cyclists and pedestrians can be reduced by using new technologies and other options in urban planning, urban design and mobility management. The project will carry out the following actions in the city of Pamplona: (a) analysis of air quality and urban cycling; (b) design and development of data processing tools (modeling, GIS, data management plan) to process information gathered in the previous step; (c) development of air-quality monitoring sensor-based prototypes to quantify the amount of air pollutants (gaseous and particulate components) inhaled by cyclists; (d) development of a "healthy route planner" app that will assist cyclists in choosing less-polluted routes; (e) assessment of the efficacy of protective masks currently on the market; and (g) the preparation of a cycling mobility plan, which will establish air quality criteria and recommendations for future urban planning.

Read more: http://www.liferespira.eu/.

'AIS LIFE' - Aerobiological Information Systems and allergic respiratory disease management

The most important biological component of ambient air is pollen, and its allergen is the main cause of airborne allergic respiratory diseases. Reasons for the increase in allergic responses to pollen allergen exposure are elusive, but environmental and lifestyle factors appear to drive the trend. In Europe, emissions of many air pollutants have decreased over past decades, resulting in some improved air quality. Nevertheless, this does not always produce a corresponding drop in atmospheric concentrations; especially for particulate matter (PM) and ozone (O3), which have significant impact on human health. A growing body of evidence shows that chemical air pollutants and anthropogenic aerosols can alter the impact of allergenic pollen and that pollen production rises in higher atmospheric CO_2 concentrations. Changes in the plant flowering season due to climate change will probably mean an increase in the duration and severity of the pollen season, alongside a higher frequency of episodes of urban air pollution. These elements indicate that environmental factors involved in exacerbations of allergic respiratory diseases will have a more pronounced effect in coming decades.

The overall objective of the EU LIFE project 'AIS LIFE' (LIFE13 ENV/IT/001107; 06/2014 – 05/2017) is to develop an information base, in order to enable policy-makers dealing with environment and health issues to better manage pollen-related allergic respiratory diseases.

The project's specific objectives are: (a) to improve pollen-related allergic respiratory disease management in the general population, through the permanent implementation of AIS in Europe, contributing to disease control, improved quality of life and direct/indirect reductions in health system costs; (b) to assess exposure to pollen at the general population level, by considering pollen and allergen quantities and their interaction with PM pollution; (c) to provide a comprehensive evaluation of the use and effectiveness of AIS in different contexts, in terms of environmental, social and economic impact (including potential reduction of socio-economic costs of respiratory allergies in Europe); (d) to increase awareness among target groups identified across Europe to the importance of integrated information on aerobiological, chemical and clinical forecasts for health improvement among people suffering from pollen allergies; and (e) to increase awareness of possible changes in lifestyle and preventative measures among sufferers of pollen-related allergic respiratory diseases, through the use of AIS and related educational initiatives.

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Database on source apportionment of particulate matter

Particulate matter in the air can penetrate deep into the lungs and enter the body systematically, affecting the cardiovascular and other major organ systems. Chronic exposure to particulate matter leads to increased risks of pre-mature mortality from heart attack, stroke, respiratory infections, and lung cancer. Measurements of PM_{10} and $PM_{2.5}$, i.e. particles with aerodynamic diameter smaller than 10 or 2.5 microns respectively, serve as indicators of air quality.

For reducing health impacts from air pollution, it is important to know what sources (e.g. transportation, power generation) contribute to human exposure, and by how much. The source apportionment database is a systematic collection of available source apportionment studies on particulate matter in from cities all over the world.

A detailed description of the database is available in the "Notes" worksheet of the database, and in the article of F. Karagulian and co-authors "Contributions to cities' ambient particulate matter (PM): a systematic review of local source contributions at global level", recently published in Atmospheric Environment Volume 120, November 2015, Pages 475–483.

This database was developed in cooperation with the Joint Research Centre (JRC) of the European Commission in Ispra, Italy.

Download
- Database on source apportionment studies xls, 157kb,
- Article on database source apportionment studies.

"AIR PROTECTION 2015"
9th CROATIAN SCIENTIFIC AND PROFESSIONAL CONFERENCE with international participation
8–12 September 2015, Poreč, Croatia

This year, the Croatian Air Pollution Prevention Association (CAPPA) organized the Croatian scientific and professional conference with international participation "Air Protection 2015" for the ninth time, in cooperation with the Institute for Medical Research and Occupational Health, Zagreb, Croatian Meteorological and Hydrological Service, Ekonerg and the European Federation of Clean Air and Environmental Protection Associations – EFCA. The Conference was organized under the auspices of the Ministry of Environmental and Nature Protection and Environmental Protection and Energy Efficiency Fund. It was held 8–12 September 2015 in the Valamar Diamant Hotel, Poreč, Croatia.

The large number of participants and the 53 submitted presentations (44 oral presentations and 9 posters) has shown that both the international and domestic professional public are more than interested to learn about and discuss the ever-growing and threatening impact of air pollution on human health and the environment.

After four introductory lectures:

- Air quality legislation – status, amendments, and implementation (S. Krmpotić, Ministry of Environmental and Nature Protection);
- International inter-comparison exercises for PM mass concentration determination (K. Šega, Institute for Medical Research and Occupational Health);
- Experiences in obtaining accreditation for the Institute for Medical Research and Occupational Health (Z. Franić, Institute for Medical Research and Occupational Health);
- Air quality monitoring and related particulate matter research in Serbia (M. Radenković, Vinča Institute of Nuclear Sciences, Serbia);

the participants of the Air Protection 2015 conference presented their experiences and the issues they encounter in their work through the following topics:

1. Managing air quality – inspection and control;
2. Atmospheric emissions of pollutants;
3. Monitoring ambient air pollution;
4. Developing and testing measuring methods;
5. Estimating exposure to air pollutants and impact on health and the environment;
6. Asbestos in the air;
7. EFCA session "Particulate matter – sources, levels, content, policies".

As in the year 2013, a special session of the European Federation of Clean Air and Environmental Protection Associations was organized during the Conference. This year, the session was themed "Particulate matter – sources, levels, content, policies". This topic was chosen because airborne particles represent a major air quality problem in the atmosphere of all larger Croatian cities, as are they in many other European cities. Eight presentations in this session were given by experts from Great Britain, Germany, Slovenia, Serbia, Hungary and Croatia. J. Murlis, vice-president of the EFCA, from Environmental Protection, UK, presented the fraction-by-fraction approach for reducing harmful health effects of particulate matter (PM), taking into account not only fractions presently in use (PM_{10} and $PM_{2.5}$) but also the ultrafine particle fraction and its chemical composition. The presentation by H.-G. Mücke from the WHO Collaborating Centre for Air Quality Management and Air Pollution Control, Berlin, Germany dealt with the current Task Force on health activities within the Convention on Long-range Transboundary Air Pollution. Z. Kertész from the Institute for Nuclear Research, Hungary presented the experiences of Hungarian scientists in atmospheric aerosol analysis, including elemental composition, size distribution, seasonal and long-term variations and determination of sources. The presentation by J. Čretnik from RACI, Slovenia dealt with case studies of dust AMS calibration at extreme conditions, discussed measuring principles, quality assurance requirements and requirements of EU legislation. M. Radenković from the Vinča Institute of Nuclear Sciences, Serbia, presented the results of a source apportionment study at a residential urban area, in which several complementary analytical techniques were used for elemental and secondary aerosol analysis. R. Godec from the Institute for Medical Research and Occupational Health, Croatia presented results of particle concentrations and content measured near Zagreb road intersections. The investigation showed that traffic was a major source of pollution with carbon and polycyclic aromatic hydrocarbons. J. Turšič from the Slovenian Environment Agency presented results of saccharide measurements; saccharides and their derivates are important constituents of atmospheric particles, especially levoglucosan, used as a tracer for biomass burning.

A round table discussion on the last day of the Conference dealt with the new European Commission Directive 2015/1480 from 28 August 2015, conformity of Croatian legislation (Air Protection Act and other accompanying regulations) with new EU legislation, the role of national reference laboratories, the quality of data from the Croatian air pollution monitoring network, and problems in applying legislation related to measurements of air pollutants from stationary emission sources, especially related to frequency of measurements. Furthermore, the participants discussed the problem of elevated ozone levels in cities along the Adriatic coast and made suggestions for preparing of an action plan at the national level. Regarding the small number of investigations in Croatia connecting air pollution and health effects, some suggestions were given to improve communication between experts dealing with air pollution measurements and health workers.

Discussing and elaborating complaints and proposals, the participants concluded to prepare a brief with conclusions and recommendations for the Ministry of Environmental and Nature Protection on behalf of CAPPA.

An abstract book (eds. J. Doko Jelinić and S. Žužul) containing presentation abstracts, both in Croatian and English, was distributed to the participants along with other materials. The Book of Abstracts can be found at the CAPPA web-page: http://www.huzz.hr/index.html.

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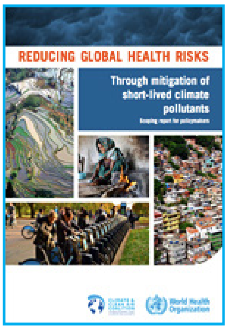
Reducing global health risks through mitigation of short-lived climate pollutants Scoping report for policymakers

by Noah Scovronick, 2015. ISBN: 978 92 4 156508 0. Available in English (PDF), 5 MB.



Short-lived climate pollutants (SLCPs), including black carbon, methane, and ozone, are responsible for a substantial fraction of climate change as well as for a significant proportion of air-pollution related deaths and diseases that kill some 7 million people per year. Reducing emissions of short-lived climate pollutants (SLCPs), which produce strong warming effects but only persist in the atmosphere for periods ranging from days to about a decade, can provide health benefits in three key ways:

- directly from reduced air pollution and related ill-health;
- indirectly from reduced ozone and black carbon effects on extreme weather and agricultural production (affecting food security);
- and from other types of health benefits that are not associated with air pollution but may accrue as a result of certain SLCP mitigation actions, such as improved diets or more opportunities for safe active travel and physical activity.

http://www.who.int/phe/publications/climate-reducing-health-risks/en/

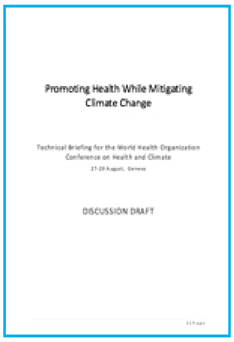
Promoting health while mitigating climate change Discussion paper

by WHO (World Health Organization), 2015. Available in English (PDF), 708 kB.

This is one of two technical background papers prepared as a basis for discussion at the WHO Health and Climate Conference. It provides a brief summary of the available evidence on the health impacts (co-benefits and risks) of climate change mitigation strategies, and an outline of the necessary health sector responses that may contribute to optimizing co-benefits while mitigating risks. The accompanying paper provides a brief summary of the available evidence on the health impacts of climate change and responses needed to protect health from these evolving risks, including areas of health system strengthening.
http://www.who.int/globalchange/publications/briefing-health-mitigating/en/

Strengthening health resilience to climate change Technical briefing

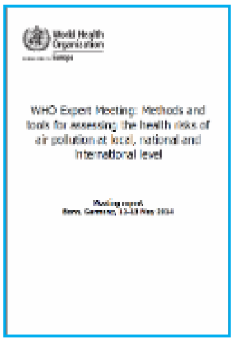
by WHO (World Health Organization), 2015. Available in English (PDF), 897 kB.



This is one of two technical background papers prepared as a basis for discussion at the WHO Health and Climate Conference. It provides a brief summary of the available evidence on the health impacts of climate change, and an outline of the necessary response to protect health from these evolving risks. Specifically, it considers the need for overall strengthening of the health system, specific functions both within and outside the health sector that require strengthening and modification to address climate risks, and introduces some of the main areas and opportunities for future progress.
http://www.who.int/globalchange/publications/briefing-health-resilience/en/

WHO Expert Meeting Methods and tools for assessing the health risks of air pollution at local, national and international level

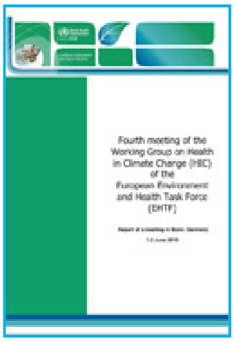
by WHO (World Health Organization), 2014. Available in English (PDF), 1.1 MB.



In May 2014, the WHO Regional Office for Europe organized a technical meeting to discuss the evidence for air pollution health effects and propose expert advice on the best options and methods to estimate health risks from air pollution and its sources. The workshop proposed an overview of available indoor and outdoor air pollution health risk assessment methods and tools and identified general principles as well as appropriate methods and tools for conducting air pollution health risk assessment for various scenarios and purposes. The meeting provided relevant advice to inform a variety of health risk assessment efforts at local, national and international scales.
http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/publications/2014/who-expert-meeting-methods-and-tools-for-assessing-the-health-risks-of-air-pollution-at-local,-national-and-international-level

Fourth meeting of the Working Group on Health in Climate Change (HIC) of the European Environment and Health Task Force (EHTF) (2015)

by WHO (World Health Organization), 2015. Available in English (PDF), 790.4 kB.



The fourth meeting of the Working Group on Health in Climate Change (HIC) gave an update of national and international climate change and health activities in the WHO European Region. The meeting also served as an opportunity to discuss, communication needs, key messages to health professionals and climate negotiators, climate services, country profiles and the road map towards the UNFCCC 21st Conference of the Parties (COP21) in Paris, 2015.
http://www.euro.who.int/en/health-topics/environment-and-health/Climate-change/publications/2015/fourth-meeting-of-the-working-group-on-health-in-climate-change-hic-of-the-european-environment-and-health-task-force-ehtf-2015

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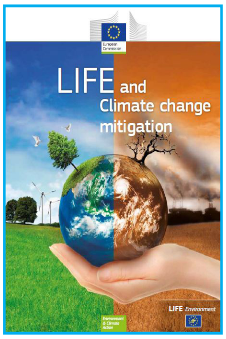
Other Publications:

LIFE and Climate change mitigation

by European Commission, 2015.

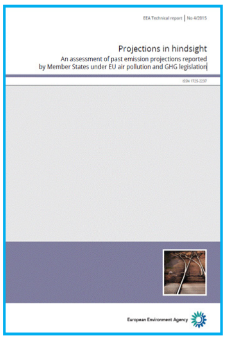


Luxembourg: Publications Office of the European Union, 2015. ISBN 978-92-79-43945-2, ISSN 2314-9329. doi:10.2779/59738. © European Union, 2015. 90 pp.

http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/climate_change_mitigation.pdf

Projections in hindsight (EEA Technical report No 4/2015)

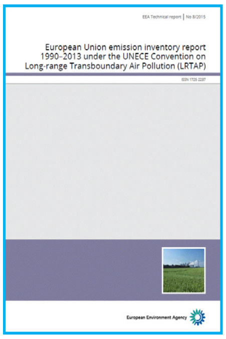
by EEA (European Environment Agency), 2015.



This report provides a comparison of the differences between past emission projections for 2010 and the final emission data now available for that year. Over the past decade, EU Member States overestimated their greenhouse gas (GHG) and air pollutant emission projections for the year 2010. Estimations of future air pollutant and GHG emission levels allow for the regular evaluation of 'progress to target' and assessment of policy effectiveness. Between 2000 and 2010, EU Member States were required to report emission projections for the year 2010 under EU air pollution (National Emission Ceilings Directive) and GHG legislation (Monitoring Mechanism Decision). An increased focus on implementation and compliance with reporting obligations is needed to allow a more detailed understanding of the projections reported by Member States.
http://acm.eionet.europa.eu/reports/EEA_TR_4_2015_emission_proj_hindsight

European Union emission inventory report 1990–2013 under the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP) (EEA Technical report No 8/2015)

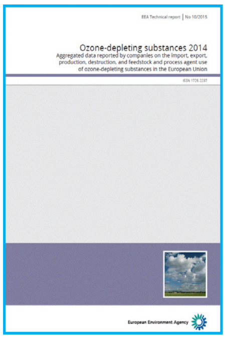
by EEA (European Environment Agency), 2015.



This document is the annual European Union emission inventory report under the United Nations Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution (LRTAP). The report and its accompanying data constitute the official submission by the European Commission (EC) on behalf of the EU as a Party to the Executive Secretary of UNECE. The report is compiled by the European Environment Agency (EEA) in cooperation with the EU Member States.
http://acm.eionet.europa.eu/reports/EEA_TR_8_2015_EU_CLRTAP_em_inv

Ozone-depleting substances 2014 (EEA Technical report No 10/2015)

by EEA (European Environment Agency), 2015.

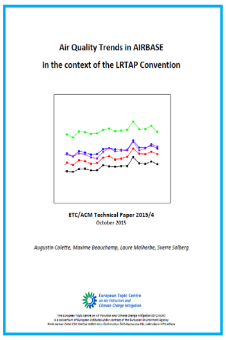


This report has been published to coincide with the International Day for the Preservation of the Ozone Layer. It covers the chemicals' production, destruction, import and export. Over the last few decades, chemicals known to harm the ozone layer have been successfully substituted in most parts of the world since 1989 when the Montreal Protocol came into force, controlling more than 200 chemicals. Within the EU these substances are covered by the ODS Regulation, which is more stringent than the rules of the Protocol and covers additional substances. The report shows that consumption in the EU was negative in 2014, as was the general trend over the last years. These negative values are the result of a phase-out in combination with rather high destruction and low stocks.

http://acm.eionet.europa.eu/reports/EEA_TR_10_2015_ODS2014

Air Quality Trends in AIRBASE in the context of the LRTAP Convention (ETC/ACM Technical Paper 2015/4)

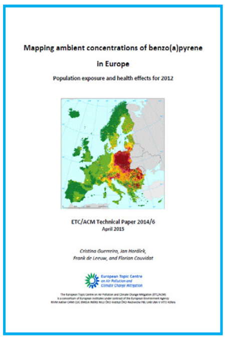
by ETC/ACM, October 2015, 35 pp.



The AirBase repository is used for an assessment of air quality trends over the past 20 years in support of the Trend Assessment performed by the Task Force on Measurement and Modelling under the LRTAP Convention. Novel quality screening procedures are applied to the regulatory monitoring data. Air quality improvements are found for NO2 and PM10, but the findings are less clear for ozone trends.
http://acm.eionet.europa.eu/reports/ETCACM_TP_2015_4_AQtrends

Mapping ambient concentrations of benzo(a)pyrene in Europe (ETC/ACM Technical Paper 2014/6)

by ETC/ACM, November 2015, 54 pp.



This study estimated current benzo(a)pyrene (2012 BaP) concentration levels, population exposure and potential health impacts, and analysed the main emission sources of BaP. Current BaP concentration levels across Europe were estimated using the ETC/ACM mapping methodology, which combines monitoring data with modelling data and other supplementary data (e.g. altitude and meteorology). The estimated concentration maps have been compared to the EU target value. Furthermore, the European population exposure to BaP background ambient air concentrations and subsequent health impact were estimated.
http://acm.eionet.europa.eu/reports/ETCACM_TP_2014_6_BaP_HIA

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2016

12th International Conference - INDOOR AIR QUALITY (IAQ) 2016
3–4 March, Birmingham, UK, http://www.icom-cc.org/51/news/?id=353

10th International Conference on Air Quality – Science and Application
14–18 March, Milan, Italy, http://www.airqualityconference.org/

4th International Climate Change Adaption Conference
10–13 May, Rotterdam, The Netherlands, http://www.adaptationfutures2016.org/

11th Annual International Symposium on Environment
23–26 May 2016, Athens, Greece, http://www.atiner.gr/environment

21th International Transport and Air Pollution Conference
24–26 May, Lyon, France, http://tap2016.sciencesconf.org/

24th International Conference on Modelling, Monitoring and Management of Air Pollution (Air Pollution 2016)
20–22 June, Crete, Greece, http://www.wessex.ac.uk/16-conferences/air-pollution-2016.html?utm_source=wit&utm_medium=email&utm_campaign=air16cfp&uid=7041

14th International Conference on Indoor Air Quality and Climate
3–8 July, Ghent, Belgium, http://www.indoorair2016.org/

17th IUAPPA World Clean Air Congress - Mega-City Perspectives
28 August–2 September, Busan, South Korea, http://www.iuappa2016.org/

28th Conference of the International - Society for Environmental Epidemiology
1–4 September, Rom, Italy, http://www.iseepi.org/Conferences/future.htm

26th Annual ISES Conference - Interdisciplinary Approaches to Health and the Environment
9–13 October, Utrecht, The Netherlands, http://www.isesweb.org/Meetings/mtgs_cur.htm

2017

29th Conference of the International - Society for Environmental Epidemiology
24–28 September, Sydney, Australia, http://www.iseepi.org/Conferences/future.htm

19th International Conference on Air Pollution and Control - ICAPC 2017
23–24 February, Paris, France, https://www.waset.org/conference/2017/02/paris/ICAPC