



## Editorial

### Particle Emissions from Wood Combustion

Wood combustion is considered as renewable and sustainable energy source. Wood is worldwide one of the most used fuel for heating and cooking. In residential areas of industrial countries several people use wood as fuel in boilers for central heating or for additional heating mainly in manually fed chimney stoves, tiled stoves and open fire places. Depending on the firing design, the fuel properties and the users' behaviour, the smoke of such wood-firings can cause high particle emissions [1], resulting in significant PM<sub>10</sub> concentrations in the ambient or even in the indoor air, which might cause considerable annoyance, complaints among the inhabitants and short and long term negative health effects.

More than 80 to 90% of the particles emitted from wood combustion are smaller than 1 µm aerodynamic diameter [2] and therefore inhalable and they are penetrating into the alveoles of the human breathing system comparable to fine particles of cigarette smoke. The particles consist of fly ashes on the one hand. They are originating from mineral contents of the burned wood and contain metal oxides and salts. On the other hand organic particles - soot and tar - are emitted during incomplete combustion of the wood. This can happen during manual and discontinuous feeding and operation of open fires, stoves and boilers operated with fuel wood. Reasons for incomplete combustion are instationary burning conditions caused by too much wood filled in the furnace, reduced combustion air supply or too low local combustion temperatures. In such cases, the volatile wood compounds do not burn properly but merely vaporise or pyrolyse partially and then condense in the flue gases. The condensate consists of high-molecular-weight hydrocarbons, including large numbers and high concentra-

## Table of Contents

### Editorial

Particle Emissions from Wood Combustion ... 1

### Wood Combustion in Residential Areas

Impact of particulate emissions from wood combustion on urban particulate matter concentrations ..... 3

**Publications and Resources** ..... 5

**Literature** ..... 7

**Event Announcements** ..... 22

**Message Board** ..... 24

tions of polycyclic aromatic hydrocarbons (PAHs) that not only settle on the heat exchanger surfaces but also on emitted particles, particularly on soot. Therefore, smoke emitted from wood combustion can generate high concentrations of PAHs; for example total PAHs concentrations of 3000 µg/m<sup>3</sup> and benzo(a)pyrene concentration of 60 µg/m<sup>3</sup> have been measured in the flue gas emissions from small residential stoves [3] and total particulate matter (PM) emissions up to more than 1000 mg/m<sup>3</sup>. In contrast of that, modern residential wood boilers, which are automatically fed and controlled, as well as modern pellet stoves with continuous fuel feeding create particulate matter emissions that are formed mainly by vaporisation of ash particles; consequently, they have lower PAH emissions than manually fed boilers and wood stoves [1, 4].

Studies with PAH and other wood combustion tracer fingerprints showed that a considerable part of organic particles in the ambient air of residential areas has its origin in wood combustion [5, 6]. These particles contain several compounds of PAHs, half of them with carcinogenic

potential. Because of their carcinogenic effects, PAHs are now considered to be priority pollutants by both the United States Environmental Agency (USEPA) and the European Environmental Agency (EEA). In a German village with considerable wood combustion contribution for heating in winter months under strong inversion conditions relatively high total PAH concentrations from 30 ng/m<sup>3</sup> as average up to 100 ng/m<sup>3</sup> as peak values had been detected. The according benzo(a)pyrene concentrations ranged between 2 and 7 ng/m<sup>3</sup> during these situations [7]. Finally it can be concluded that wood is a renewable fuel and its potential should be used

for heating. But the most modern combustion techniques should be applied to avoid uncontrolled emissions of particulate matter containing unhealthy compounds.

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## Further literature

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WHO: *Air Quality Guidelines for Europe*, Second Edition. WHO regional publications. European series; No. 91, World Health Organization, Geneva, Switzerland 2000.

WHO: *Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide*, Global update 2005, World Health Organization, Geneva, Switzerland 2006).

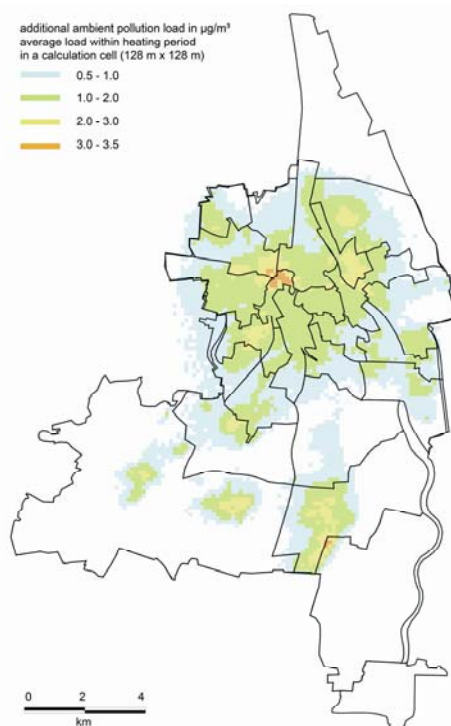
## Impact of particulate emissions from wood combustion on urban particulate matter concentrations

Jürgen Schnelle-Kreis, Helmholtz Zentrum München – German Research Center for Environmental Health. Email: [juergen.schnelle@helmholtz-muenchen.de](mailto:juergen.schnelle@helmholtz-muenchen.de), Robert Kunde, Bavarian Center for Applied Energy Research (ZAE Bayern), and Gerhard Schmoeckel, Bavarian Environment Agency, Germany.

This work was supported by the Bavarian State Ministry of the Environment and Public Health under grant U47.

The use of wood as renewable energy source is discussed contradictorily. On one hand the favourable CO<sub>2</sub> balance does not enhance the global warming problem, whereas on the other hand biomass combustion significantly contributes to ambient particulate matter (PM) mass loading. Local wood combustion emits about the same amount of PM<sub>10</sub> (collective of particles smaller than or equal to 10 µm in an aerosol) as road traffic (combustion-derived emissions). While the tailpipe emissions are decreasing, the particulate emissions from wood combustion are further increasing.

The aim of the study presented here was to quantify the impact of wood combustion on urban PM<sub>10</sub> levels and composition [1, 2]. The investigation was carried out in Augsburg, Germany during the heating period 2007/2008. It consisted of four main parts: update of emission inventory for domestic heating, emission measurements, emission and aerosol dispersion modelling and ambient monitoring. As a result from the updated emission inventory for domestic heating we registered about 14,200 fireplaces for solid fuel within Augsburg. The annual wood consumption within the city was calculated to add up to about 60,000 piled meters. The energy equivalent 395 TJ/a equates to 2.1 % of the annual energy consumption for domestic heating in the city. On the other hand, the total PM emissions from these sources accounted for about 38 t/a, which was about 35 % of total PM<sub>10</sub> emissions in Augsburg. An emission model and a wind field model were created for the modelling of the dispersion of emitted PM from wood combustion. The results of the dispersion calculation concurred with the ambient PM<sub>10</sub> monitoring data. One result was that in residential areas with a high density of stoves the observed maximum concentration from wood combustion particles was 9 µg/m<sup>3</sup>. This is up to 50 % higher than in the city centre. In average over the heating period in the residential area additional PM from wood combustion sources within the city was estimated to be 3 – 3.5 µg/m<sup>3</sup>, whereas in the city centre averages of 1 – 2 µg/m<sup>3</sup> were found (Figure 1).

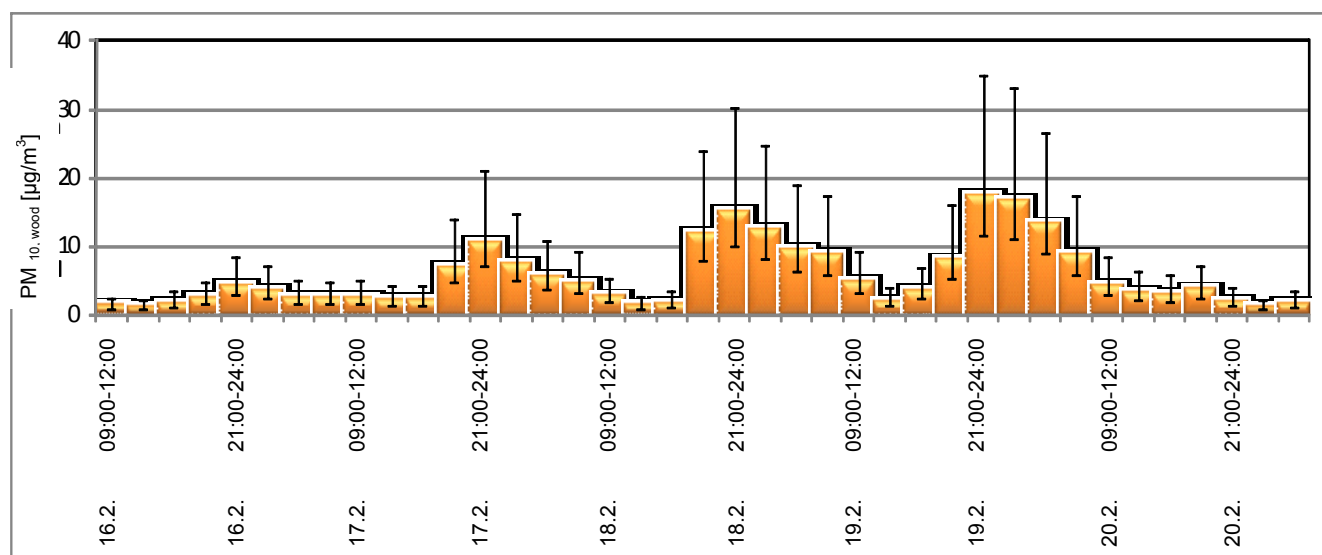


**Figure 1:** Calculated additional ambient PM<sub>10</sub> load from wood combustion in Augsburg, Germany. Shown are average values in calculation cells (128 m x 128 m) during the heating period (November 2007 to March 2008). Dispersion model based on emission inventory for wood combustion stoves within the city area of Augsburg.

Within the study, emission measurements (different stoves, fuels and burning conditions) were carried out. According to these measurements the average potassium and levoglucosan concentrations in PM emissions from domestic heating were 58 mg/g and 126 mg/g respectively. Based on these tracer concentrations, the fraction of ambient PM<sub>10</sub> originating from (primary) wood combustion particles was calculated. The impact of wood combustion on ambient PM concentration and composition has been monitored simultaneously at five different characterised sites within the urban area and three sites in the suburban area on a daily basis.

At the traffic site in the city centre in average 3.4 µg/m<sup>3</sup> (range 0.2 - 15.2 µg/m<sup>3</sup>) of PM<sub>10</sub> derived from wood combustion. This corresponded to 8.4 % of the average PM concentrations at this site (range 1.9 - 30 %). Highest concentrations of PM from wood combustion were found during periods with low air exchange (low wind speed and low mixing layer height). In these periods up to 4 µg/m<sup>3</sup> higher concentrations of particles from wood combustion were found in an inner city residential area compared to the city centre. Based on the measurements near the city and in 100 m above ground level, up to 75 % of the wood combustion particles could be assigned to local sources, depending on the meteorological conditions in the atmospheric boundary layer. The measurements supported the findings from dispersion modelling, which clearly demonstrated the coherence of high number of single-room stoves in the proximity and high concentrations of PM from wood combustion.

Measurements with time resolution of 3 h showed a clear diurnal variation with highest concentrations from primary wood combustion particles between 9 p.m. and midnight. Peak concentrations of up to 17.5 µg/m<sup>3</sup> PM<sub>10</sub> from wood combustion have been found in periods with low air exchange (Figure 2).



**Figure 2: Diurnal variation of concentrations of PM<sub>10</sub> from primary wood combustion particles during a period with low air exchange. The error bars are indicating the uncertainty in the calculation which is based on tracer concentrations in PM emissions and ambient PM.**

Together with high impact of PM from wood combustion, high concentrations of polycyclic aromatic hydrocarbons have been found. For benzo[a]pyren, a known carcinogen, average concentrations of 0.3 – 0.5 ng/µg PM<sub>10</sub> from wood combustion have been found. This benzo[a]pyren/PM<sub>10</sub>-ratio consists both with measurements, which carried out the Bavarian Environment Agency in a northern provincial town in the heating period 2009/2010 [3] and the State Institute for Environment, Measurements and Nature in Tübingen in the heating period 2008/2009 [4]. The results enable to estimate, that the ambient air annual target value of 1 ng/m<sup>3</sup> for benzo[a]pyren being effective from 2013 might be exceeded in regions with increased wood combustion installations and bad conditions of pollutant dispersion.

## References

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- [3] Schmoeckel, G., *Immissionen durch Holzfeuerungen*. Presentation of first results within the conference "Anforderungen der neuen 1. BImSchV" of the Bavarian Environment Agency, Oct 2010.
- [4] LUBW Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg *Bestimmung des Beitrags der Holzfeuerung zum PM10-Feinstaub*, Bericht Nr. 64-01 /2010.

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## Publications and Resources

### [Healthy and Safe Homes. Research, Practice, and Policy](#)

In November 2010, the National Center for Healthy Housing (NCHH), the Centers for Disease Control, and the Home Safety Council unveiled *Healthy and Safe Homes: Research, Practice, and Policy* at the American Public Health Association (APHA) Annual Meeting & Exposition in Denver, CO, USA. The book is the first of its kind, exploring connections between housing conditions and health, and proposing holistic, sustainable strategies for making healthy housing a reality for people of all income levels. "A healthy home is a first step in creating a nation of healthier people and we hope the strategic solutions offered in this book will help make healthy housing available for all," said Rebecca Morley, executive director of the National Center for Healthy Housing and one of the book's editors. *Healthy and Safe Homes: Research, Practice, and Policy* is published by American Public Health Association (APHA) Press and was selected as APHA's November Book of the Month. *Healthy and Safe Homes: Research, Practice, and Policy* is available online at the APHA Bookstore, [www.apha.org/publications/bookstore/](http://www.apha.org/publications/bookstore/).

### [National Center for Healthy Housing Joins Leading National Organizations to Launch Energy-PlusHealth to Support Low-Income Homeowners](#)

*New partnership aims to make healthy housing repairs and energy efficiency a reality for families in greatest need*

The National Center for Healthy Housing (NCHH) is joining forces with Habitat for Humanity International, Rebuilding Together, and CLEARCorps to form *EnergyPlusHealth*, a coalition that will work towards making healthy and energy efficient housing more accessible to low income homeowners who can't afford necessary repairs.

The coalition will provide volunteers with the training and resources needed to make healthy and energy efficient repairs to homes in need, including repairs for structural issues, lead paint hazards, and mold and moisture issues.

NCHH is leading the effort by developing a 2-day training course, which includes an assessment checklist for volunteers to use when evaluating homes for health hazards or energy deficiencies. The training will provide instructional worksheets with step-by-step instructions for repair, maintenance, or rehabilitation work that can be done onsite by volunteers and identify which tasks require skilled professionals.

To learn more about the National Center for Healthy Housing, please visit, [www.NCHH.org](http://www.NCHH.org).

### [Cities and Climate Change](#)

In November 2010, OECD (Organisation for Economic Co-operation and Development) has published a book on Climate Change that highlights the role of cities in delivering cost-effective policy responses to climate change. Cities are central to the climate policy challenge, as they are home to the majority

of global energy use and thus a large source of emissions. Also, their prevalent coastal locations, exposed infrastructure, and large number of poor and elderly residents make cities particularly vulnerable to sea level rise, storms and heat waves.

This book draws on the findings of a number of projects at the OECD that have advanced the understanding of the roles that cities can play to respond efficiently and effectively to climate change. The executive summary and other relevant material from the book can be downloaded from the OECD website: [www.oecd.org/gov/cities](http://www.oecd.org/gov/cities).

### [WHO | Health in the Green Economy](#)

Many strategies to reduce climate change have large, immediate health benefits. Others may pose health risks or tradeoffs. Examined systematically, a powerful new dimension of measures to address climate change emerges.

WHO's Health in the Green Economy Project, to be completed in Spring 2011, is reviewing the evidence about expected health impacts of greenhouse gas mitigation strategies - in light of those mitigation options that have been reviewed by the Intergovernmental Panel on Climate Change (IPCC) for key sectors of the economy. The aim is to suggest important health co-benefits for health and sectoral policy-makers, and for consideration in the next round of IPCC mitigation reviews. Opportunities for potential health and environment synergies are identified here for health sector facilities. The policy briefings summarize initial key findings from this project and can be downloaded from the WHO website: [http://www.who.int/hia/green\\_economy/en/index.html](http://www.who.int/hia/green_economy/en/index.html).

### [Heating with wood](#)

The revised brochure "heating with wood", published by Umweltbundesamt (UBA), gives advice for save and sound heating with wood and informs about the new regulations, which have been available since march 2010. These regulations will contribute to the reduction of air pollutants when heating with wood. It gives advice for the low-polluting running of wood stoves or small wood boilers. The brochure can be download or ordered free of charge:

[http://www.umweltbundesamt.de/uba-info-presse/2010/pd10-050\\_weniger\\_schadstoffe\\_aus\\_kamin\\_und\\_kacheloefen.htm](http://www.umweltbundesamt.de/uba-info-presse/2010/pd10-050_weniger_schadstoffe_aus_kamin_und_kacheloefen.htm).

### [Electronic Faucets Unsafe for Use in High-Risk Patient Hospital Settings](#)

Study Shows Automatic Faucets Carry High Levels of Bacteria - Researchers at The Johns Hopkins University School of Medicine have determined that electronic faucets are more likely to become contaminated with unacceptably high levels of bacteria, including *Legionella* spp., compared with traditional manually operated faucets. Exposure to *Legionella* spp. is dangerous for chronically ill or immune compromised patients because it may cause pneumonia in vulnerable patients. However, the levels found at Johns Hopkins Hospital were still within the level that is well tolerated by healthy individuals. Following the study, Johns Hopkins Hospital is replacing electronic faucets in clinical areas with manual faucets, and has decided not to install electronic faucets in clinical areas of its new hospital building now under construction.

<http://www.shea-online.org/Portals/0/Sydnor%20Final%203%2022%2011.pdf>.



### [German cabinet adopts act on special provisions for noise caused by children.](#)

On February 16, 2011, the German cabinet adopted a draft act presented by the Federal Environment Ministry on special provisions for noise caused by children at childcare centres and play areas. "This act, which establishes special provisions for noise caused by children, sends a clear signal in support of a child-friendly society. A certain degree of tolerance for such noise can be expected from society. It is not acceptable to treat noise caused by children in the same way as noise caused by industrial installations", commented Minister Röttgen.

The aim of this act is to further develop existing noise protection law. An amendment to the Federal Immission Control Act (BImSchG) will ensure that noise caused by children at childcare centres, play areas and at other such establishments is generally not classified as having "harmful effects on the environment".

[http://www.bmu.de/english/current\\_press\\_releases/pm/47035.php](http://www.bmu.de/english/current_press_releases/pm/47035.php).

## Literature

In this section we will provide a collection of recent housing and health publications from a variety of backgrounds. Literature published in German or French, respectively, is indicated with the German flag  or the French flag .

If you have suggestions for interesting journals that we should screen for the literature collection, please let us know!

### Table of Topics

Allergies and Respiratory Diseases .....	7
Indoor Air .....	8
Mould and Dampness .....	13
Light and Radiation .....	13
Smoking / Environmental Tobacco Smoke .....	14
Home Safety .....	15
Housing and Ageing Society .....	16
Housing Conditions .....	16
Thermal Comfort / Energy .....	17
Urban Planning / Built Environment .....	18
Climate Change .....	20
Social Inequality .....	20
Noise .....	21
Miscellaneous .....	22

### Allergies and Respiratory Diseases

#### [Determinants of eczema: population-based cross-sectional study in Germany.](#)

Apfelbacher CJ, Diepgen TL, Schmitt J.  
Allergy. 2011 Feb;66(2):206-13.

#### [Domestic cooking fuel exposure and tuberculosis in Indian women.](#)

Behera D, Aggarwal G.  
Indian J Chest Dis Allied Sci. 2010 Jul-Sep;52(3):139-43.

#### [Gender differences in indoor allergen exposure and association with current rhinitis.](#)

Bertelsen RJ, Instanes C, Granum B, Lødrup Carlsen KC, Hetland G, Carlsen KH, Mowinckel P, Løvik M.  
Clin Exp Allergy. 2010 Sep;40(9):1388-97.

#### [Association between attendance of day care centres and increased prevalence of eczema in the German birth cohort study LISApplus.](#)

Cramer C, Link E, Bauer CP, Hoffmann U, von Berg A, Lehmann I, Herbarth O, Borte M, Schaaf B, Sausenthaler S, Wichmann HE, Heinrich J, Krämer U; LISApplus study group.  
Allergy. 2011 Jan;66(1):68-75.

#### [Asthma and allergic diseases in school children from 1992 to 2007 with incidence data.](#)

Demir AU, Celikel S, Karakaya G, Kalyoncu AF.  
J Asthma. 2010 Dec;47(10):1128-35.

#### [Exposure to Environmental Microorganisms and Childhood Asthma.](#)

Ege M, Mayer M, Normand A-C, Genuneit J, Cookson W, Braun-Fahrlander C, Heederik D, Piarroux R, von Mutius E, for the GABRIELA Transregio 22 Study Group.  
N Engl J Med 2011 Feb 24;364:701-709.

[Indoor air pollution and childhood asthma: variations between urban and rural areas.](#)

Hulin M, Caillaud D, Annesi-Maesano I.  
Indoor Air. 2010 Dec;20(6):502-14.

[Intrauterine exposure to lead may enhance sensitization to common inhalant allergens in early childhood: a prospective prebirth cohort study.](#)

Jedrychowski W, Perera F, Maugeri U, Miller RL, Rembiasz M, Flak E, Mroz E, Majewska R, Zembala M.  
Environ Res. 2011 Jan;111(1):119-24.

[PVC--as flooring material--and its association with incident asthma in a Swedish child cohort study.](#)

Larsson M, Hägerhed-Engman L, Kolarik B, James P, Lundin F, Janson S, Sundell J, Bornehag CG.  
Indoor Air. 2010 Dec;20(6):494-501.

[IgE response to \*Ascaris lumbricoides\* in Russian children indicates IgE responses to common environmental allergens.](#)

Koskinen JP, Laatikainen T, von Hertzen L, Vartiainen E, Haahtela T.  
Allergy. 2011 Mar 3. [Epub ahead of print].

[The National Asthma Survey--New York State: association of the home environment with current asthma status.](#)

Nguyen T, Lurie M, Gomez M, Reddy A, Pandya K, Medvesky M.  
Public Health Rep. 2010 Nov-Dec;125(6):877-87.

[Quality-of-Life and Cost-Benefit Analysis of a Home Environmental Assessment Program in Connecticut.](#)

Nguyen KH, Boulay E, Peng J.  
J Asthma. 2011 Mar;48(2):147-55.

[Pet dander and difficult-to-control asthma: The burden of illness.](#)

Ownby DR.  
Allergy Asthma Proc. 2010 Sep;31(5):381-4. *Review.*

[Respiratory disease associated with solid biomass fuel exposure in rural women and children: systematic review and meta-analysis.](#)

Po JY, FitzGerald JM, Carlsten C.  
Thorax. 2011 Mar;66(3):232-9. Epub 2011 Jan 19. *Review.*

[Socioeconomic factors and home allergen exposure in children with asthma.](#)

Ungar WJ, Cope SF, Kozyrskyj A, Paterson JM.  
J Pediatr Health Care. 2010 Mar-Apr;24(2):108-15.

[Indoor allergen levels in Guangzhou city, southern China.](#)

Zhang C, Gjesing B, Lai X, Li J, Spangfort MD, Zhong N.  
Allergy. 2011 Feb;66(2):186-91.

[Home air-conditioning, traffic exposure, and asthma and allergic symptoms among preschool children.](#)

Zuraimi MS, Tham KW, Chew FT, Ooi PL, Koh D.  
Pediatr Allergy Immunol. 2011 Feb;22(1 Pt 2):e112-8.

## Indoor Air

[Better burning, better breathing: improving health with cleaner cook stoves.](#)

Adler T.  
Environ Health Perspect. 2010 Mar;118(3):A 124-9.

[Effect of an air cleaner with electrostatic filter on the removal of airborne house dust mite allergens.](#)

Agrawal SR, Kim HJ, Lee YW, Sohn JH, Lee JH, Kim YJ, Lee SH, Hong CS, Park JW.  
Yonsei Med J. 2010 Nov 1;51(6):918-23.



[Characterization of particulate matter size distributions and indoor concentrations from kerosene and diesel lamps.](#)

Apple J, Vicente R, Yarberry A, Lohse N, Mills E, Jacobson A, Poppendieck D.  
Indoor Air. 2010 Oct;20(5):399-411.

[Organophosphate and phthalate esters in air and settled dust - a multi-location indoor study.](#)

Bergh C, Torgrip R, Emenius G, Ostman C.  
Indoor Air. 2011 Feb;21(1):67-76.

[Endocrine damper? Flame retardants linked to male hormone, sperm count changes.](#)

Betts KS.  
Environ Health Perspect. 2010 Mar;118(3):A 130. *Free Article.*

[Health ranking of ingested semi-volatile organic compounds in house dust: an application to France.](#)

Bonvallot N, Mandin C, Mercier F, Le Bot B, Glorennec P.  
Indoor Air. 2010 Dec;20(6):458-72.

[Effects of socioeconomic factors and human activities on children's PM\(10\) exposure in inner-city households in Korea.](#)

Byun H, Bae H, Kim D, Shin H, Yoon C.  
Int Arch Occup Environ Health. 2010 Dec;83(8):867-78.

[Lead and bisphenol A concentrations in the Canadian population.](#)

Bushnik T, Haines D, Levallois P, Levesque J, Van Oostdam J, Viau C.  
Health Rep. 2010 Sep;21(3):7-18. *Review. Free Article.*

[Isolation and characterization of Acanthamoeba spp. from air-conditioners in Kuala Lumpur, Malaysia.](#)

Chan LL, Mak JW, Low YT, Koh TT, Ithoi I, Mohamed SM.  
Acta Trop. 2011 Jan;117(1):23-30.

[Exploring variation and predictors of residential fine particulate matter infiltration.](#)

Clark NA, Allen RW, Hystad P, Wallace L, Dell SD, Foty R, Dabek-Zlotorzynska E, Evans G, Wheeler AJ.  
Int J Environ Res Public Health. 2010 Aug;7(8):3211-24. *Free Article.*

[Effects of HUD-supported lead hazard control interventions in housing on children's blood lead.](#)

Clark S, Galke W, Succop P, Grote J, McLaine P, Wilson J, Dixon S, Menrath W, Roda S, Chen M, Bornschein R, Jacobs D.  
Environ Res. 2011 Feb;111(2):301-11.

[Influence of air flow rate on emission of DEHP from vinyl flooring in the emission cell FLEC: Measurements and CFD simulation](#)

Clausen A, Liu Z, Xu, Y, Kofoed-Sorensen, Little JC.  
Atmospheric Environment 2011 Jul;44:2760-2766.

[Where's the dust? Characterizing locations of azinphos-methyl residues in house and vehicle dust among farmworkers with young children.](#)

Coronado GD, Griffith WC, Vigoren EM, Faustman EM, Thompson B.  
J Occup Environ Hyg. 2010 Dec;7(12):663-71.

[Oxidative Stress, DNA Damage, and Inflammation Induced by Ambient Air and Wood Smoke Particulate Matter in Human A549 and THP-1 Cell Lines.](#)

Danielsen PH, Møller P, Jensen KA, Sharma AK, Wallin H, Bossi R, Autrup H, Mølhav L, Ravanat JL, Briedé JJ, de Kok TM, Loft S.  
Chem Res Toxicol. 2011 Jan 14. [Epub ahead of print].

[Carcinogenic potential, levels and sources of polycyclic aromatic hydrocarbon mixtures in indoor and outdoor environments and their implications for air quality standards.](#)

Delgado-Saborit JM, Stark C, Harrison RM.  
Environ Int. 2011 Feb;37(2):383-92.

[Relationship of personal exposure to volatile organic compounds to home, work and fixed site outdoor concentrations.](#)

Delgado-Saborit JM, Aquilina NJ, Meddings C, Baker S, Harrison RM.  
Sci Total Environ. 2011 Jan 1;409(3):478-88.

[Chemical speciation and bioaccessibility of lead in surface soil and house dust, Lavrion urban area, Attiki, Hellas.](#)

Demetriades A, Li X, Ramsey MH, Thornton I.  
Environ Geochem Health. 2010 Dec;32(6):529-52.

[Estimation of daily intake of organohalogenated contaminants from food consumption and indoor dust ingestion in Romania.](#)

Dirtu AC, Covaci A.  
Environ Sci Technol. 2010 Aug 15;44(16):6297-304.

[Blood lead levels of refugee children resettled in Massachusetts, 2000 to 2007.](#)

Eisenberg KW, van Wijngaarden E, Fisher SG, Korfmacher KS, Campbell JR, Fernandez ID, Cochran J, Geltman PL.  
Am J Public Health. 2011 Jan;101(1):48-54.

[Indoor and outdoor air concentrations of BTEX and determinants in a cohort of one-year old children in Valencia, Spain.](#)

Esplugues A, Ballester F, Estarlich M, Llop S, Fuentes-Leonarte V, Mantilla E, Iñiguez C.  
Sci Total Environ. 2010 Dec 1;409(1):63-9.

[Indoor Coal Use and Early Childhood Growth.](#)

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### Smoking / Environmental Tobacco Smoke

Smoking and Environmental Tobacco Smoke play an important role in housing and health topics. However, it would go beyond the scope of this newsletter to present here all relevant literature on ETS. We therefore decided to list only selected literature. For further information, we wish you to refer to [WHO Collaborating Centre on Tobacco Control](#).

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Lee CC, Middaugh NA, Howie SR, Ezzati M.  
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Exposure to second-hand smoke is common in many countries, and affects one third of all non-smokers worldwide. It is estimated that around one in 100 deaths globally is due to second-hand smoke, which causes more than 600 000 people to die each year. Some 165 000 of these deaths are among children. Some developing regions are among the most affected by health impacts from second-hand smoke. The study was coordinated by WHO and is the first to estimate the global impact of second-hand smoke. It concludes by suggesting that substantial health gains could be made by creating completely smoke-free environments in all indoor spaces, public places and public transport, complemented by educational strategies such as voluntary smoke-free home policies. The article is available on the WHO website [http://www.who.int/quantifying\\_ehimpacts/publications/smoking.pdf](http://www.who.int/quantifying_ehimpacts/publications/smoking.pdf).

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[Carcinogenic PAH in waterpipe charcoal products.](#)

Sepetdjian E, Saliba N, Shihadeh A. Food Chem Toxicol. 2010 Nov;48(11):3242-5.

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[Outdoor temperature is associated with serum HDL and LDL.](#)

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**Event Announcements**

In this section we will inform you about upcoming events with relevance to housing and health. If you know of any international event, please let us know!

**Tag gegen Lärm - International Noise Awareness Day 2011 **

Date: April 27, 2011

Venue: Germany

Further Information: [TAG GEGEN LÄRM - Aktionen 2011](#)

**18. WaBoLu-Innenraumtage **

Energiesparlampen und andere Innenraumfragen

Date: May 30 - June 1, 2011

Venue: Berlin, Germany

Further Information: [18. WaBoLu-Innenraumtage](#)

**Indoor Air 2011**

International Society of Indoor Air Quality and Climate (ISIAQ)

Date: June 5-10, 2011

Venue: Austin, Texas, USA

Further Information: [ISIAQ](#)

**Urban Transport 2011**

**15th International Conference on Urban Transport and the Environment**

Date: June 6-8, 2011

Venue: Pisa, Italy

Further Information: [Urban Transport 2011 | 11 Conferences](#)

**Global Health Council 2011 - Annual Conference on Global Health**

Securing a Healthier Future in a Changing World

Date: June 13, 2011

Venue: Washington D.C., USA.

Further Information: [Global Health Council 2011 Conference](#)

**Healthy Buildings 2012**

The International Society of Indoor Air Quality and Climate

Date: July 8-12, 2012

Venue: Brisbane, Australia

Further Information: [Healthy Buildings 2012 |](#)

**International Medical Geography Symposium**

Date: July 10-15, 2011

Venue: Venue: Durham, United Kingdom

Further Information: [International Medical Geography Symposium - Durham University](#)

**10<sup>th</sup> International Conference on Mercury as a Global Pollutant**

Date: July 24-29, 2011

Venue: Halifax, Nova Scotia, Canada

Further Information: [Mercury 2011 Conference - Halifax - Nova Scotia | Air, Land, Sea, and Me](#)

**Environmental Health Risk 2011**

6<sup>th</sup> International Conference on the Impacts of Environmental Factors on Health

Date: July 25-27, 2011

Venue: Riga, Latvia

Further Information: [Environmental Health Risk 2011 | 11 Conferences](#)

**10<sup>th</sup> International Congress on Noise as a Public Health Problem**

Date: July 24-28, 2011

Venue: London, United Kingdom

Further Information: [International Commission on the Biological Effects of Noise \(ICBEN\)](#)

**6. Deutscher Allergie Kongress **

Date: September 8-10, 2011

Venue: Wiesbaden, Germany

Further Information: [Deutscher Allergiekongress](#)

**Air Pollution 2011**

19<sup>th</sup> Conference on Modelling, Monitoring and Management of Air Pollution

Date: September 19-21, 2011

Venue: Malta

Further Information: [Air Pollution 2011 | 11 Conferences](#)

**19<sup>th</sup> International Congress of Biometeorology**

Date: December 5-9, 2011

Venue: Auckland, New Zealand

Further Information: [ICB 2011](#)

**Healthy Buildings 2012**

10<sup>th</sup> International Conference on Indoor Air Quality and Climate

Date: July 8-12, 2012

Venue: Brisbane, Queensland, Australia

Further Information: <http://www.isiaq.org/events/healthy-buildings-2012>

**Air Quality Eight**

Date: October 24-27, 2012

Venue: Arlington, Virginia, USA

Further Information: [Air Quality VIII](#)

## Message Board

In this section we will inform you about activities and projects related to housing and health that are being carried out by WHO or the WHO CC. This may relate to ongoing activities and projects, as well as invitations to participate in data collections or case study projects.

### **WHO work on indoor and built environments**

#### **WHO to develop guidelines on housing and health**

WHO Headquarter has started a project to develop policy and technical guidance on healthy housing in the coming years. A first meeting took place in WHO Headquarter in mid-October 2010, bringing together a variety of experts on housing and health from countries all over the globe. The expert group made a call for the development of international guidelines that can be accessed at <http://www.who.int/hia/housing/en/index.html>

Currently, the Guideline Development Group is being established to meet for the first time in June 2011 and identify the topics to be covered in detail.

#### **WHO Indoor Air Quality Guidelines: selected pollutants**

In late 2010, WHO has published the second volume of the Indoor Air Quality Guideline series, dealing with selected pollutants and chemicals. The guidelines address indoor concentrations of various pollutants (benzene, carbon monoxide, formaldehyde, naphthalene, nitrogen dioxide, polycyclic aromatic hydrocarbons, radon and tri- and tetrachloroethylene). The guidelines can be accessed at [http://www.euro.who.int/\\_data/assets/pdf\\_file/0009/128169/e94535.pdf](http://www.euro.who.int/_data/assets/pdf_file/0009/128169/e94535.pdf) and a German and Russian executive summary is available.

German: [http://www.euro.who.int/\\_data/assets/pdf\\_file/0008/132956/e94535\\_exsumG.pdf](http://www.euro.who.int/_data/assets/pdf_file/0008/132956/e94535_exsumG.pdf)

Russian: [http://www.euro.who.int/\\_data/assets/pdf\\_file/0009/132957/e94535\\_exsumR.pdf](http://www.euro.who.int/_data/assets/pdf_file/0009/132957/e94535_exsumR.pdf)

Ongoing work on the IAQ Guidelines addresses the problem of indoor air pollution from household fuel use, which will become the third volume of the IAQ Guideline series.

#### **Housing and health in relation to climate change mitigation**

WHO's *Health in the Green Economy* series is reviewing the evidence about expected health impacts of greenhouse gas mitigation strategies in light of mitigations options for key economic sectors, one of them being housing. Policy briefings have been developed for the United Nations Framework Convention on Climate Change (COP16) in December 2010 to summarise initial key findings from this project and identify expected health impacts from policies to mitigate climate change in the housing, transport, household energy and the health sector. The policy brief on housing can be accessed at [http://www.who.int/hia/hgebrief\\_housing.pdf](http://www.who.int/hia/hgebrief_housing.pdf)

#### **Housing conditions: a major component of environmental inequalities**

Housing is one of the major aspects covered by a HO project to report on the magnitude of environmental health inequalities in the WHO European region. Started in 2010, the project identified 14 environmental health inequality indicators, six of which relate to housing conditions (such as hygiene, water supply, thermal comfort and crowding). In 2011, these indicators will be implemented and developed into a first WHO European report on environmental health inequalities. For further details, see [http://www.euro.who.int/\\_data/assets/pdf\\_file/0013/130243/e94628.pdf](http://www.euro.who.int/_data/assets/pdf_file/0013/130243/e94628.pdf)

#### **Water safety in buildings – training and information material**

Poor design and management of water systems in buildings can cause outbreaks of disease but the health risks are preventable and can be readily controlled. However, evidence from outbreak detec-



tion suggests that the overall trend is increasing. WHO Headquarter has now addressed the issue of water safety in buildings by the publication of training and information material, providing guidance for managing water supplies in buildings where people may consume or use water. For further details, see [http://www.who.int/water\\_sanitation\\_health/publications/2011/9789241548106/en/index.html](http://www.who.int/water_sanitation_health/publications/2011/9789241548106/en/index.html)

### WHO Publication “Burden of disease from environmental noise”

The health impacts of environmental noise are a growing concern. At least one million healthy life years are lost every year from traffic-related noise in the western part of Europe.

This publication summarizes the evidence on the relationship between environmental noise and health effects, including cardiovascular disease, cognitive impairment, sleep disturbance, tinnitus, and annoyance. For further details, see <http://www.euro.who.int/en/what-we-publish/abstracts/burden-of-disease-from-environmental-noise.-quantification-of-healthy-life-years-lost-in-europe>

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