Baden-Württemberg

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Newsletter

WHO Collaborating Centre for Housing and Health
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Editorial

Residential heating with wood and coal: Health impacts and policy options

Wood, coal and other solid fuels continue to be used for residential cooking and heating by nearly 3 billion people worldwide at least part of the year, including many in Europe. Residential heating with wood and coal is an important source of ambient (outdoor) air pollution; it can also cause substantial household (indoor) air pollution through either direct exposure or infiltration from outside. The specific magnitude of the problem varies greatly by geography, prevalence of solid fuel use and the technologies used.

WHO recently published guidelines for indoor air quality on household fuel combustion, which set for the first time emission targets to address the serious health risks from burning fuels. They also recommend against the use of unprocessed coal and kerosene, which severely pollutes indoor air and, in the case of kerosene, creates risks of fire, burns and poisoning (WHO, 2014a).

While cooking over an open fire is not commonplace in countries in the WHO European Region, the health- and climate-damaging effects from burning solid fuels, including wood and other biomass, for domestic heating remain critical issues. Evidence links emissions from wood and coal heating to serious health effects such as respiratory and cardiovascular mortality and morbidity. Wood and coal burning also emit carcinogenic compounds (WHO Regional Office for Europe, 2015).

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Household fuel combustion contributes to outdoor air pollution, which was responsible for over 482 000 premature deaths in the European Region in 2012 (WHO, 2014b). Where use of solid fuel is widespread across a community, emissions may result in outdoor air pollution exceeding values recommended in the WHO air quality guidelines (WHO Regional Office for Europe, 2006).

Measures are available to reduce emissions of solid fuels for residential heating in most places. Such measures include encouraging fuel switching (away from coal and other solid fuels) and the use of more efficient heating technologies (such as certified fireplaces or pellet stoves), which can reduce the emissions from residential wood and coal heating devices. Educational campaigns may also be useful tools to reduce emissions from residential solid

fuel heaters. Furthermore, filters may reduce health effects from indoor air pollution. Regulatory measures do exist, and include ecodesign regulations and labels in the European Union (EU) and technology-based emission limits in the United States of America and Canada. Financial fuel switching and technology change-out incentives – as well as targeted "no burn" days and ecolabelling – are other tools available to policy-makers (WHO Regional Office for Europe, 2015).

It will be difficult to tackle outdoor air pollution problems in many parts of the European Region without addressing fuel combustion at the household level, along with other sources, such as transport and industrial production. Reducing emissions from household fuel combustion in turn can have immediate benefits for health, and reduce some of the pollutants that cause climate change. Nevertheless, the use of solid fuels for heating is expected to persist and probably even expand, especially within the EU, in the coming decades as a result of climate policies that favour wood burning. Better alignment is therefore needed between climate and air pollution policies in many countries. Information campaigns – especially those that increase knowledge about the energy efficiency of heating options – are encouraged (WHO Regional Office for Europe, 2015).

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Marie-Eve Héroux, Technical Officer, Air Quality and Noise, WHO Regional Office for Europe, Bonn, Germany
herouxm@ecehbonn.euro.who.int

Exposure to particulate matter from wood burning for residential heating in the Po Valley

Guido Lanzani, Leader of Air Quality Unit, Lombardia Region Environmental Protection Agency, Italy. E-Mail: g.lanzani@arpalombardia.it

The Po Valley is surrounded by mountains exceeding 2500 m above sea level on three geographic sides and it experiences meteorological conditions that are often adverse to air pollution dispersion. More than 20 million people live in the basin, with a population density of more than 3000 inhabitants/km^2 in Milan, in the centre of the valley. The Po Basin represents an important region also in terms of produced wealth (more than 50% of the Italian GDP).

These features make it particularly difficult to achieve levels of air quality compatible with European limits and therefore with the values suggested by WHO guidelines. Particulate matter represents one of the most difficult challenges. PM10 daily levels exceeding the EU limit are frequent and widespread, with approximately 60 - 80 days every year above 50 µg/m^3, although a decreasing trend is evident (in 2005, 150 days above the limit were observed). Annual mean PM2.5 concentrations measured in the city of Milan in 2013 reached 31 µg/m^3. In the rural areas of the plain, PM levels are not much lower than they are in the urban areas, although local contributions are limited compared to PM of regional origin.

But what are the sources of this particulate? The common sentiment would indicate traffic as the main culprit, perhaps followed by industrial activities. This may have been true in the past, but today the direct dust emissions from tailpipes of vehicles are becoming less and less important, thanks to the introduction of particulate filters.

Today, the reality is, according to emission inventories, a bit different in the Po Valley. Considering primary particulate (which constitutes about half of the particulate matter in the air, while in the Po plain the other half is formed in the atmosphere from gases), the main source of PM10 is wood burning in stoves and fireplaces for residential heating. In Lombardia (the largest Region in the basin, with about 10 million inhabitants) this source is responsible for 46% of the primary PM10 yearly emissions (1. INEMAR 2012), a percentage that increases during the winter.

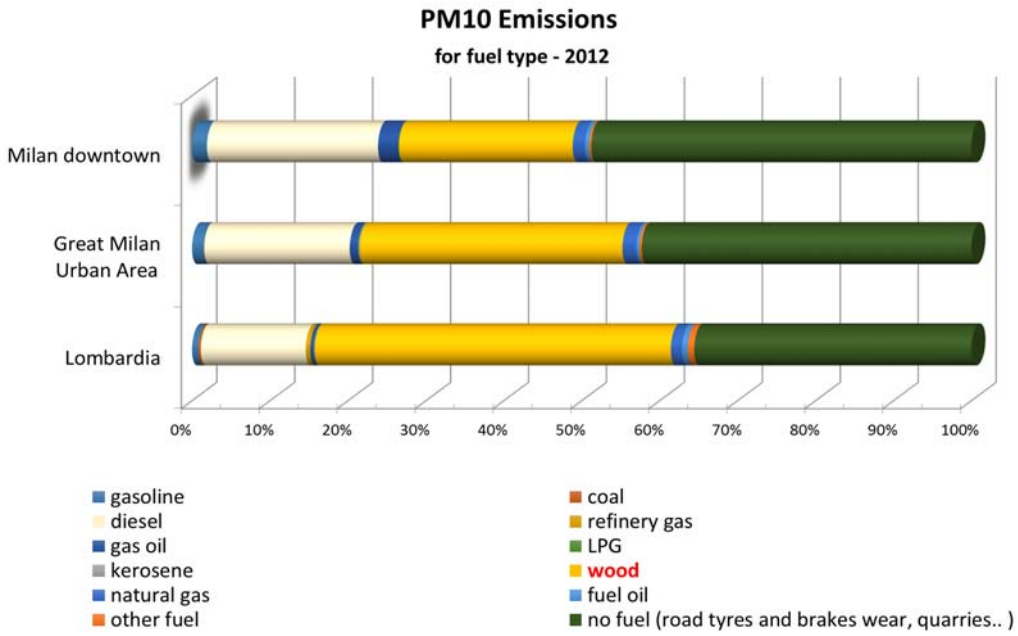

Figure 1: PM10 Emmisions for fuel types – 2012

This is not surprising, despite the fact that in Lombardia, 87% of the energy used for heating is obtained from natural gas, and only 7% from wood. However, the PM emission factor for natural gas is about 0.2 gr/GJ while the PM emission factor for an open fireplace can be as high as 800 gr/GJ, and 50 gr/GJ for a new wood stove. Therefore, even a limited number of appliances can produce significant emissions.

Even in the downtown areas of the largest cities, where the contribution of wood combustion on PM10 total emissions is less important, it still remains one of the main ones (22% in Milan municipality). In addition, the air pollutants present in the urban areas come in part from outside the city centers (in particular in the Po valley where particulate can 'age' – and move – considerably in conditions of meteorological stability).

Source apportionment studies can give information about the different source contributions, based not on emission data but on samples collected in the air and therefore including all particulate matter, both primary and secondary. On the basis of a statistical analysis of the trends of particulate concentrations and of its components (some of which are tracers of different sources, such as levoglucosan for wood burning) it is possible to reconstruct the contributions of the various sources to the total concentrations. These studies show that, in the Po Valley, the contribution of wood burning to PM mass varies during cold season (the worst one for particulate concentrations) between 8% and 24% in the Milan monitoring stations, between 15% and 25% in the rural stations in the plain, and between 25% and 35% in alpine and pre-alpine stations (2. Colombi et al. 2008; 3. Lonati et al. 2010; 4. 5. Pirovano et al. 2015; 6. AIRUSE 2014 Report Action B4 7. AIRUSE 2015 report action B2).

It should be noted that the impact on air quality of burning wood in small heating appliances is not limited to the total mass of particulate. In the Po Valley the most worrisome aspect is the contribution of this source to the toxicologically relevant components of particulate matter. In particular, according to the data of the emission inventory of Lombardia, the combustion of wood in stoves and fireplaces is responsible for 70% of the total annual emissions of benzo(a)pyrene (BaP) (1. INEMAR 2012).

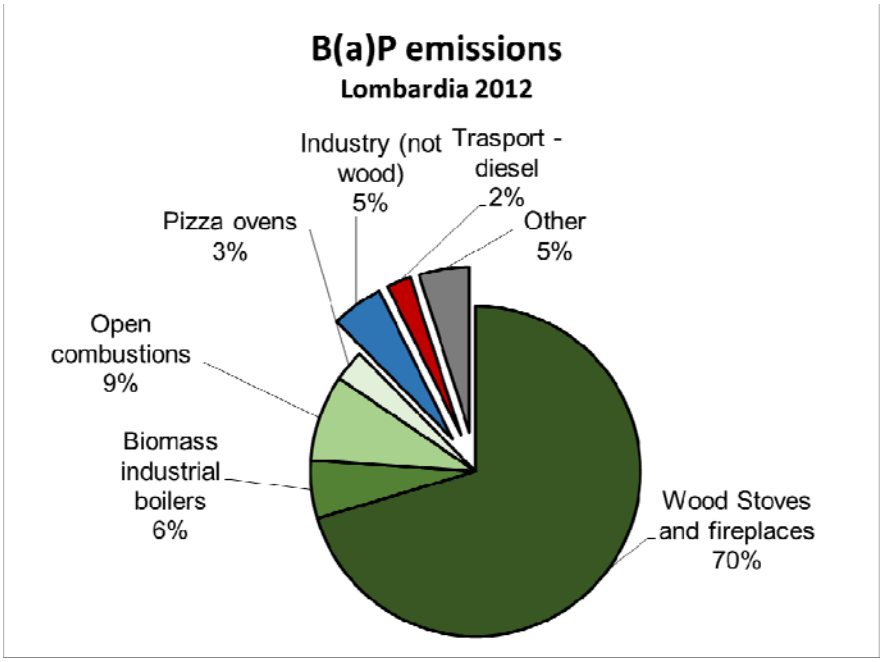

Figure 2: B(a)P emissions – Lombardia 2012

Measures of BaP in the air confirm this: in the city centres, BaP concentrations are well below the EU limit of 1 ng/m^3 as an annual average (in Milano the annual average varies between 0.2 and 0.4 ng/m^3) while in the suburbs and in the stations in the plain it increases (with peaks above 1 ng/m^3 as annual average) and it reaches the maximum values in the Alpine valley bottoms, where wood burning is undoubtedly the primary source, with annual averages also above 4 ng/m^3 (1.8 ng/m^3 in Sondrio, a town of 22.000 inhabitants at the bottom of Valtellina; 2.3 ng/m^3 in Laces at the bottom of Val Venosta - Vinschgau, in Alto Adige – Südtirol; 4,3 ng/m^3 in Storo, at the bottom of Valle del Chiese; 4.5 ng/m^3 at the bottom of Valle del Primiero) with daily averages even higher than 30 ng/m^3 (8. Belis et al, 2011; 9. Appa Trento – 2015).

The population exposure to wood combustion products in the Po Valley seems therefore to be significant, especially considering that emissions in this sector are expected to increase, in relation to policies on climate change. Therefore, technological development of wood burning appliances must

continue, while it is also necessary to increase people's awareness of the problem, also in consideration of the fact that the misuse of the appliances, such as by burning waste or damp wood, can lead to very significant increases in emissions.

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Workshop 'More heat with less wood' in Geneva

Florian Steierer, United Nations Economic Commission for Europe (UNECE) and Frank Helbig, independent consultant. E-Mail: florian.steierer@unece.org

Wood is one of the most important fuels for heating and cooking worldwide, including in some developed economies. It therefore remains an important source of energy with a significant increase in use, in particular in the past decade. There are different reasons why people continue to use or revert back to the use of wood for heating and cooking. The reasons differ according to the socio-economic conditions of the countries. In developed economies, energy and environmental policies often are the main drivers for switching back to wood, while economic conditions and technical constraints are the most critical factors in economies in transition or developing countries.

Other articles in this newsletter have stated that using wood for heating and cooking may have negative impacts on the indoor and outdoor air quality and may even cause emissions of methane and black carbon (soot), both with significant global warming potential. Nevertheless, wood should not be considered as a bad fuel, as most of the described negative impacts can be minimized or even entirely avoided if the wood fuel is prepared, stored and used correctly.

At least 40% of the wood removed from forests in the ECE (Economic Commission for Europe) region is being directly used for energy purposes and thus have a significant impact on managing forests sustainably. The United Nations Economic Commission for Europe (UNECE) and the Food and Agriculture Organization (FAO) jointly collaborate in the area of wood energy as part of their integrated programme of work on sustainable forest management. The work comprises mainly collecting data on the supply and use of wood used for energy, assessing wood energy market developments, as well as modelling the future use of wood in the member States of the ECE region and their potential impacts on sustainable management of the forest resources.

The WHO guidelines for indoor air quality on household fuel combustion aim to help understand best approaches to the reduction of household air pollution. UNECE and FAO, with the financial support from the Permanent Mission of the Federal Republic of Germany to the United Nations Office in Geneva, will use the WHO guidelines to launch a discussion on how to achieve proposed indoor air qualities in households depending on wood fuels for heating and cooking in Southern and Eastern Europe, the Caucasus and Central Asia. The discussion also will consider how these measures best can be combined with energy efficiency measures in buildings. Combining energy efficiency measures wisely in a cost-effective way will have a significant impact on the amount of wood required and thus provide additional benefits for reaching optimum indoor air quality and continuing to manage forests sustainably.

The workshop entitled *"More heat with less wood"* will be held at the Palais des Nations in Geneva and targets experts and decision makers in the field of wood energy and energy efficiency in Southern and Eastern Europe, the Caucasus and Central Asia. The outcome of the discussion will be compiled in two documents:

- A roadmap document providing suggestions for policy and decision makers on how to achieve better indoor air quality and lower emissions of climate relevant gases and particles.
- A compilation of best practice examples, which showcase successful past, current and future projects, technologies, decisions and policies, with positive impacts on indoor air quality by using wood as fuel.

The organization of the event is coordinated by the UNECE and FAO, displaying close cooperation between several sectors within the UNECE (UNECE Convention on Long Range Transboundary Air Pollution, Housing and Sustainable Energy), the WHO and several national organizations and expert groups. In addition to the workshop, an infographic on wood energy use in households will be released and a small exhibition about wood energy and energy efficiency will be organized in the Palais des Nations, Geneva, Switzerland.

The date of the workshop will be announced soon on the following website: www.unece.org/forests/meetings.html. Comments and suggestions about the topic are welcome. In this regard, please contact Mr Florian Steierer (florian.steierer@unece.org).

Publications and Resources

Noise in Europe 2014

Noise pollution is a growing environmental concern. It is caused by a varied number of sources and is widely present not only in the busiest urban environments, it is also pervading once natural environments. The adverse effects can be found in the well-being of exposed human populations, in the health and distribution of wildlife on the land and in the sea, in the abilities of our children to learn properly at school and in the high economic price society must pay because of noise pollution. The European soundscape is under threat and this report sets out to quantify the scale of the problem, assess what actions are being taken and to scope those that may need to be considered in the future, in order to redress the problem. For further information please see:
Noise in Europe 2014 — European Environment Agency (EEA)

Green walls show promise as sound barriers for buildings

Green walls and green roofs can provide ecosystem services in urban areas. Their benefits include: lower energy use in buildings, support for biodiversity and storm-water control. Studies have also shown that they reduce noise levels. However, most studies have focused on green roofs' ability to insulate buildings from external sound, and very little research has looked specifically at green walls..
For further information please see:
http://ec.europa.eu/environment/integration/research/newsalert/pdf/Green_walls_show_promise_as_sound_barriers_for_buildings_403na3_en.pdf

WHO highlights serious threat posed by exposure to recreational noise

Some 1.1 billion teenagers and young adults are at risk of hearing loss due to the unsafe use of personal audio devices, including smartphones, and exposure to damaging levels of sound at noisy entertainment venues such as nightclubs, bars and sporting events, according to WHO. Hearing loss has potentially devastating consequences for physical and mental health, education and employment.
For further information please see: http://www.who.int/mediacentre/news/releases/2015/ear-care/en/

Umwelt und Gesundheit in Stadtentwicklung und Planung
Environment and Health in Urban Planning

The latest Newsletter of the German Environmental Agency (UBA) on Environment and Health provides a series of articles that tackle urban planning and health effects from different ankles. The articles are written in German, however, the abstract is also in English.
For further Information please see:
http://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/umid_02_2014_internet_endv_aktu.pdf

Bauprodukte: Neue Prüfmethode zur Schadstoffauslaugung
Building materials – new method for testing the leaching of pollutants

Building materials which are in contact with rain, ground water or moist soil, such as tiles or basement waterproofing, may release heavy metals and other pollutants. Using standardized procedures, a new test method for such products for the European market will be tested as of now. For further information please see:
http://www.umweltbundesamt.de/sites/default/files/medien/461/publikationen/4153.pdf

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.

Table of Topics

Allergies and Respiratory Diseases

Immunotherapy for house dust mite sensitivity: where are the knowledge gaps?
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Indoor Air

Developmental neurotoxicity of persistent organic pollutants: an update on childhood outcome.
Berghuis SA, Bos AF, Sauer PJ, Roze E.
Arch Toxicol. 2015 Jan 25. [Epub ahead of print]

Levels of non-polybrominated diphenyl ether brominated flame retardants in residential house dust samples and fire station dust samples in California.
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Event Announcements

Fachkonferenz "Gesunder Lebensraum Schule"
April 28, 2015
Cologne, Germany
Further Information: Gesunder Lebensraum Schule

International Noise Awareness Day
April 29, 2015
Worldwide
Further Information: Noise awareness day 2015

22. WaBoLu Innenraumtage
May 12-13, 2015
Berlin, Germany
Further Information: WaBoLu Innenraumtage

Kongress 'Grün in der Stadt'
'Green City' Conference
June 11-15, 2015
Berlin, Germany
Further Information: Grün in der Stadt

ASHARE 2015 Annual Conference
June 27- July 1, 2015
Atlanta, USA
Further Information: Indoor Environment Connections

13th Word Allergy Congress 2015
October 14-17, 2015
Seoul, Korea
Further Information: World Allergy Congress

9th National Housing Conference
October 28-30, 2015
Perth, Australia
Further Information: NHC - National Housing Conference

4. Schulkongress "Zukunftsraum Schule"
4th Congress on School Settings
November 17-18, 2015
Stuttgart, Germany
Further Information: Zukunftsraum Schule :: Information

2015 Greenbuild International Conference and Expo
November 18-22, 2015
Washington D.C., USA
Further Information: 2015 Greenbuild International Conference and Expo

Nanotechnology based sensors and detection methods - workshop
December 1-2, 2015
Ispra, Italy
Further Information: Nanotechnology based sensors and detection methods - workshop - JRC Science Hub - European Commission

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, built and urban environments

The European Environment and Health Process (EHP) Mid-Term Review (MTR) will be held in Haifa, Israel from 28–30 April 2015

The Mid-Term Review (MTR), hosted by Israel in Haifa from 28–30 April 2015, is the chance to evaluate progress and establish next steps to meet the goals of the Parma Declaration on Environment and Health. This commitment to act was ratified by Member States at the 5th Ministerial Conference of 2010 in Parma, Italy, and includes the EHP's first-ever, time-bound goals on environment and health challenges.

The Parma Declaration's time-bound targets include providing safe water and sanitation, healthy settings for physical activity, environments free of tobacco smoke and toxic chemicals, and national programmes for eliminating asbestos-related diseases. Member States and EHP stakeholder organizations will also share progress and plans in environment and health areas such as indoor and outdoor air quality; climate change mitigation and adaptation; and noise guidelines.

For further information on the European Environment and Health Process, click here.

Residential heating with wood and coal: health impacts and policy options in Europe and North America

Residential heating with wood and coal is an important source of ambient (outdoor) air pollution; it can also cause substantial indoor air pollution through either direct exposure or infiltration from outside. Evidence links emissions from wood and coal heating to serious health effects such as illness and death from respiratory and cardiovascular diseases. Burning wood and coal also emits carcinogenic compounds.

The report describes the health effects of and policy options for dealing with residential heating with wood and coal in Europe and the United States. The results presented indicate that it will be difficult to tackle problems with outdoor air pollution in many parts of the world without addressing this source sector. National, regional and local administrations, politicians and the public at large need a better understanding of the role of wood biomass heating as a major source of harmful outdoor air pollutants (especially fine particles). This report is intended to help increase such an understanding.

The report can be accessed here.

Residential buildings and energy efficiency in the spotlight

Increasing attention is devoted by researchers and policy-makers to the benefits as well as potential health effects of energy efficiency interventions. Major publications by international agencies have also addressed this topic, such as below:

WHO (2011): Health co-benefits of climate change mitigation – Housing sector.

UNECE (2013): Good practices for energy-efficient housing in the UNECE Region.

IEA (2014): Multiple benefits of energy efficiency.

WHO contributes to or serves on the advisory board of various European projects working in this area. One of these projects is INSULAtE, which aims to assess the impacts of measures to improve energy efficiency on indoor environmental quality and health. Based on field surveys in residential buildings awaiting thermal insulation, the project has published a paper on assessment of indoor environmental quality, discussing the need for indoor environment quality indicators to complement energy audits and energy performance certificates (accessible here).

A workshop on energy efficiency, indoor environmental quality and health will take place at the forthcoming Healthy Buildings conference in Eindhoven (18—20 May 2015). This workshop will be co-moderated by WHO and discuss the input by four presentations on (1) the recast of the Energy Performance of Buildings Directive, (2) source control and ventilation strategies for better indoor environmental quality, (3) first findings of the INSULAtE project and similar research projects, and (4) WHO work on climate change, housing and health.

WHO launches 'Health in all policies' manual

Enhanced global efforts are needed to improve health in some of the world's poorest and most vulnerable communities by tackling the root causes of disease and health inequalities. To help raise awareness of these challenges, and facilitate implementation of a 'Health in all policies' (HiAP) approach, WHO has launched the Health in All Policies training manual. The manual aims to increase understanding of the HiAP approach and build capacity to promote, implement and evaluate HiAP which covers housing as one of the relevant sectors. In addition, it encourages engagement and collaboration across sectors; facilitates the exchange of experiences and lessons learned; promotes regional and global collaboration on HiAP; and promotes dissemination of skills to develop training courses for trainers.

Click here to access the manual.

Water safety plan: a field guide to improving drinking-water safety in small communities

Sufficient, acceptable and safe drinking-water is a key prerequisite for good health, economic development and sustainable family livelihoods in rural communities. The water safety plan (WSP) approach is the most effective way of ensuring the provision of safe drinking-water in small-scale water supply systems.

This field guide provides a step-by-step introduction to the WSP approach and a range of ready-to-use templates to assist those locally involved in rural water supply to develop and implement their own WSPs. The field guide particularly addresses the rural community members responsible for the operation and management of their water supplies, as well as the staff of the local health and water supply offices responsible for safeguarding drinking-water quality and nongovernmental organizations that support drinking-water safety in rural communities.

To access the field guide, click here.

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WHO Collaborating Centre for Housing and Health
Head: N.N.
Nordbahnhofstrasse 135
70191 Stuttgart

phone +49 (0)711· 904 35000
fax +49 (0)711· 904 35105
who.cc@rps.bwl.de
www.whocc-housing-and-health.de

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Editors:

Dr. Snezana Jovanovic, Dr. Annette Rebmann

Dr. Guido Fischer, Stefan Kluge, Dr. Bernhard Link