NEWSLETTER

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

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EDITORIAL

New guidance for healthy Indoor Air

As people spend a considerable amount of time indoors, either at work or at home, indoor air quality plays a significant role in their general state of health. The most important effects of exposure to indoor air pollutants are the increased prevalence of respiratory symptoms, allergies and asthma, as well as disturbance of the immune system. This is particularly so for children, elderly people and other vulnerable groups.

Mouldy ceiling © Infrogmation / wikipedia

On the one hand, sufficient moisture is available, hundreds of biological species of bacteria and fungi – particularly mould – pollute indoor air quality. For example, related to damp and mould the risk of respiratory disease in children and adults increases by 50%. On the other hand, hazardous substances emitted from buildings, construction materials and indoor equipment or due to human activities such as fuel combustion for cooking or heating, lead to a broad range of health problems and may even be fatal.

Therefore, WHO/Europe has started a series of new guidance documents on healthy indoor air quality, identifying threshold limits for exposure that are based on the latest scientific evidence. The guidelines for dampness and mould were published in 2009, those on selected chemical-specific pollutants in 2010 and WHO expects to issue those on indoor combustion of fuels next.

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The first article of this indoor air-related Newsletter issue gives an overview on the process of the development of WHO indoor air quality guidelines and their respective recommendations.

An insight will be provided by the second article, a particular country view on the approach of harmonizing indoor material emission labelling schemes in the European Union.

Such overviews are amended by a contribution on a practical guidance for Indoor Air Hygiene in School Buildings in Germany, and news about a European project on School Indoor Air Pollution and Health: Observatory Network in Europe (SINPHONIE).

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ABOUT

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DEVELOPMENT OF WHO GUIDELINES ON INDOOR AIR QUALITY

Michal Krzyzanowski

Background

Quality of indoor air is an important determinant of health. Available data indicate that up to 14% of lung cancers are attributable to residential radon exposure. Life-long exposure to benzene concentrations as observed in European houses is associated with up to 10 cases of leukaemia per 100,000 people. Asthma risk is increased by ca. 50% among residents of in houses with dampness and microbiological contamination of indoor air related to it. Indoor combustion is a source of pollution causing severe burden to health, especially for children and women in developing countries. The WHO Comparative Risk Assessment project estimated that ca. 2 million deaths per year are attributed to indoor air pollution from household fuel combustion (Smith et al. 2004). Importance of indoor air is magnified by the substantial fraction of time populations spend within buildings. In residences, day-care centres, elderly people homes and other special environments, indoor air pollution affects population groups that are especially susceptible due to their health status or age.

There are many potentially hazardous compounds released indoors due to combustion, emissions from building materials, household equipment and consumer products. Microbial pollution comes from hundreds of species of bacteria, fungi, and moulds growing indoors. Indoor air quality management is made difficult not only by the large number and variation of indoor spaces but also the complex relations of indoor air quality and the building design, materials, operation and maintenance, ventilation and behaviour of the building users.

Planning of Guidelines development

To bring the vast body of evidence on health hazards of indoor air pollution to the attention of public health professionals and to facilitate a comprehensive action to reduce the risks, the World Health Organization develops a series of WHO Guidelines on Indoor Air Quality. The process started with a planning meeting in Bonn, in October 2006 (WHO 2006). The experts involved in assessment and management of risks due to indoor air quality evaluated relevance of a wide range of indoor air quality parameters for health, assessed availability of the scientific evidence on the relationships between exposures and adverse health effects attributable to these factors, recommend formats of the guidelines, and recommend actions needed to develop the guidelines for the selected agents. The group recommended focusing on the following groups of factors affecting indoor air quality:

a) Selected pollutants, with a group of substances for which scientific evidence was deemed sufficient for guidelines' formulation (Group 1), and a longer group of substances for which further investigation would be needed before it was clear whether there was sufficient evidence to warrant their inclusion in the guidelines (Group 2).

b) Biological agents, to be addressed through guidelines on dampness and mould, allergens (from house dust mites, pets), and ventilation.

c) Household fuel combustion (HFC), addressing stove construction and venting, fuels, and house ventilation.

The implementation of the plan formulated by the expert meeting in 2006 was dependent on the resources raised by WHO for the process. Until now, two parts have been published: on dampness and mould (WHO 2009b) and on selected pollutants (WHO 2010).

The WHO European Centre for Environment and Health, Bonn Office, coordinated the development of these guidelines. Intensive efforts to raise funds for development of the guidelines related to household fuel combustion resulted in accumulation of critical mass of funding in December 2010, enabling initiation of the work on this important part of the series under coordination by WHO Headquarters.

Since 2009, all WHO guidelines are developed according to a standardised approach, assuring high quality of the evidence review and evaluation, transparency of the process as well as an independence of the experts involved in formulation of the guidelines and supervised by a WHO/HQ Guidelines Review Committee (http://www.who.int/rpc/guidelines/review_committee/en/index.html). While the process increases the number of formal reviews and clearances inside WHO, it assures high quality of the produced guidelines and increases their reliability. The guidelines are targeted at public health professionals involved in preventing health risks of environmental exposures as well as specialists and authorities involved in the design and use of buildings, indoor materials and products. The guidelines are based on the accumulated scientific knowledge available at the time of their development. They have the character of recommendations. Nevertheless, countries may wish to use the guidelines as a scientific basis for legally enforceable standards.

WHO Indoor Air Quality Guidelines on dampness and mould

The presence of many biological agents in the indoor environment is due to dampness and inadequate ventilation. Excess moisture on almost all indoor materials leads to growth of microbes, such as moulds, fungi and bacteria, which subsequently emit spores, cells, fragments and volatile organic compounds into indoor air. Moreover, dampness initiates chemical or biological degradation of materials, which also pollutes indoor air. Dampness has therefore been suggested to be a strong, consistent indicator of risk for asthma and respiratory symptoms (e.g. cough and wheeze). The health risks of biological contaminants of indoor air could thus be addressed by considering dampness as the risk indicator.

Damp houses are common: between 5% and 37% of population of various European countries face this problem. Exposure to damp housing is distributed unequally in the society, with poorer part of population facing it more often than average in all countries of Europe (WHO 2009a). The main conclusions of the evidence review, presented by the Guidelines (WHO 2009b) are as follows:

- Sufficient epidemiological evidence is available from studies conducted in different countries and under different climatic conditions to show that the occupants of damp or mouldy buildings, both houses and public buildings, are at increased risk for respiratory symptoms, respiratory infections and exacerbation of asthma. Some evidence suggests increased risks for allergic rhinitis and asthma. Although few intervention studies were available, their results show that remediation of dampness can reduce adverse health outcomes.
- There is clinical evidence that exposure to moulds and other dampness-related microbial agents increases the risks for rare conditions, such as hypersensitivity pneumonitis, allergic alveolitis, chronic rhinosinusitis and allergic fungal sinusitis.
- Toxicological evidence obtained in vivo and in vitro supports these findings, showing the occurrence of diverse inflammatory and toxic responses after exposure to microorganisms isolated from damp buildings, including their spores, metabolites and components.
- While groups such as atopic and allergic people are particularly susceptible to biological and chemical agents in damp indoor environments, adverse health effects have also been found in non-atopic populations.

The main actions recommended by the Guidelines address the occupants, building owners, designers and builders:

- Persistent dampness and microbial growth on interior surfaces and in building structures should be avoided or minimized, as they may lead to adverse health effects.
- Indicators of dampness and microbial growth include the presence of condensation on surfaces or in structures, visible mould, perceived mouldy odour and a history of water damage, leakage or penetration. Thorough inspection and, if necessary, appropriate measurements can be used to confirm indoor moisture and microbial growth.
- As the relations between dampness, microbial exposure and health effects cannot be quantified precisely, no quantitative health-based guideline values or thresholds can be recommended for acceptable levels of contamination with microorganisms. Instead, it is recommended that dampness and mould-related problems be prevented. When they occur, they should be remediated because they increase the risk for hazardous exposure to microbes and chemicals.
- Well-designed, well-constructed, well-maintained building envelopes are critical to the prevention and control of excess moisture and microbial growth, as they prevent thermal bridges and the entry of liquid or vapour-phase water. Management of moisture requires proper control of temperatures and ventilation to avoid excess humidity, condensation on surfaces and excess moisture in materials. Ventilation should be distributed effectively throughout spaces, and stagnant air zones should be avoided.
- Building owners are responsible for providing a healthy workplace or living environment free of excess moisture and mould, by ensuring proper building construction and maintenance. The occupants are responsible for managing use of water, heating, ventilation and appliances in a manner that does not lead to dampness and mould growth.
- Local recommendations for different climatic regions should be updated to control dampness-mediated microbial growth in buildings and to ensure desirable indoor air quality.
- Dampness and mould may be particularly prevalent in poorly maintained housing for low-income people. Remediation of the conditions that lead to adverse exposure should be given priority to prevent an additional contribution to poor health in populations who are already living with an increased burden of disease.

To complement the Guidelines, WHO has reviewed and evaluated the evidence on the effectiveness of interventions addressing dampness in buildings and its health effects. This review resulted in an advisory to a wide public (WHO 2009c).

WHO Indoor Air Quality Guidelines on selected pollutants

The evidence review supporting the Guidelines for each of the selected pollutants includes an evaluation of indoor sources, current indoor concentrations and their relationship with outdoor levels, as well as a summary of the evidence on the kinetics and metabolism and health effects (WHO 2010). Based on the accumulated evidence, the experts formulated health risk evaluations and agreed on the Guidelines for each of the pollutants as summarized below. The Guidelines establish targets at which health risks of the pollutants are significantly reduced.

Benzene - Indoor air is a significant source of benzene and inhalation is the main pathway of human exposure. Benzene is a genotoxic carcinogen in humans and no safe level of exposure can be recommended. Life-long exposure to benzene at concentrations commonly observed in houses in European cities are associated with up to 10 excess cases of leukaemia per 100,000 people.

Carbon monoxide - Exposure to high levels of carbon monoxide is a frequent cause of fatal accidents. At lower levels, exposure leads to reduced exercise ability and increased risk of ischaemic heart disease. A series of guidelines is recommended to prevent effects of short peaks of exposure. New guideline value of 7 mg/m^3 is defined for 24-hour mean CO concentration to prevent effects of chronic exposures.

Formaldehyde - Indoor sources are the dominant contributor of exposure to formaldehyde. A 30-minute guideline value of 0.1 mg/m^3 is recommended to prevent sensory irritation in the general population. This guideline, valid for any 30 minutes period, prevents also effects of long term exposures on lung function or on risk of nasopharyngeal cancer and myeloid leukaemia.

Naphthalene - The main health concerns of exposure to naphthalene are respiratory tract lesions, including tumors in the upper respiratory tract. A guideline value of 0.01 mg/m^3 is established as an annual average to prevent these risks.

Nitrogen dioxide - An annual average indoor nitrogen dioxide guideline value of 40 µg/m^3 is recommended. This guideline intends to reduce the risk of a broad range of respiratory symptoms associated with the exposure.

Polycyclic aromatic hydrocarbons (PAHs) - Lung cancer is the most serious health risk from exposure to PAHs in indoor air. Benzo[a]pyrene is one of the most potent carcinogens among the known PAHs. No safe level of exposure can be recommended. Life-long exposure to PAHs at concentrations commonly observed in European or North American cities are associated with excess up to 50 cases of lung cancer per 1,000,000 people. Markedly higher risks have been estimated for houses with smokers or poorly ventilated indoor combustion sources.

Radon - There is evidence from residential epidemiological studies of the lung cancer risk from radon, with no safe exposure level. Continuing smokers have 20 to 25 times higher risk of lung cancer than non-smoker at radon mean concentrations commonly observed in houses in various regions of the world.

Trichloroethylene - The plausibility of a human cancer risk (including liver, kidney and testicular cancer as well as non-Hodgkin's lymphoma) leads to the recommendation of a non-threshold approach.

Tetrachloroethylene - The recommended guideline value for year-long exposure is 0.25 mg/m^3. At higher exposures, effects can appear in the kidney indicative of early renal disease and impaired neurobehavioural performance.

WHO Indoor Air Quality Guidelines on household fuel combustion

Following the approval of the proposal to develop this part of the Guidelines by the WHO Guidelines Review Committee, WHO convened the scoping meeting of a small group of experts in Geneva, in January 2011. The meeting formulated the principles of the Guidelines formulation, recommending that the guidelines on HFC will emphasize the need to reach existing air quality guidelines for selected pollutants (including those on particulate matter), will focus on technologies / indicators which will enable a move towards the AQGs, will emphasize the importance of monitoring and evaluation of the effectiveness of the guidelines implementation, and will formulate recommendations on specific fuels. The evidence will be reviewed in the following main sections:

- Household fuel and technology use
- Contaminated fuels
- Emissions
- Household air pollution and personal exposure
- Health effects and vulnerable groups
- Interventions
- Case studies
- Policy issues

Preparation of the background material will be completed in 2011, followed by the expert group meeting formulating the Guidelines early in 2012. It is expected that this part of the IAQ Guidelines will be published in mid-2012.

Conclusion

The complete set of the WHO Indoor Air Quality Guidelines will provide the basic set of recommendations to public health authorities, building designers, operators and owners, as well as to the building occupants, on the health hazards associated with the most important risk factors affecting indoor air quality. These recommendations should be turned into actions to prevent, or eliminate, these hazards. Considering that most of the indoor air pollutants increase the risk of non-communicable diseases, being the leading cause of burden of disease in the world, addressing this risk factor will provide and important element of non-communicable disease prevention and improvement of population health.

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A GERMAN VIEW ON THE HARMONISATION OF INDOOR MATERIAL EMISSION LABELLING SCHEMES IN THE EU

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Introduction

Emissions of volatile organic compounds (VOC) from construction products can constitute a significant source of indoor air pollution and also have negative impact on human health. The growing awareness of emission impact on indoor air quality (IAQ) has led to different approaches for the evaluation of construction products in several European countries. Existing labelling schemes, developed over the last 20 years, reflect these slight differences. A critical review of existing labelling schemes in the European Union (EU) is provided by European Collaborative Action Report No. 24 (ECA 2005). One of the main successes of existing emission quality labels is that they have encouraged the development of low emission products in Europe. Significant practical experience has also been gained during recent years. However, differences between the product quality labels still make it difficult for consumers to compare products in the open European market.

A need for harmonisation

In 2007 the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety took the initiative to stimulate a EU-wide discussion process about the different existing approaches and possible ways forward within the EU. The main conclusion of the two-day international conference on 'Construction Products and Indoor Air Quality' held in Berlin in June 2007 was, that a EU-wide harmonised approach for a health-related evaluation of emissions from building products is strongly requested (UBA 2007).

Subsequently a preparatory working group (WG) has been established, including representatives of the German evaluation system (AgBB), the Danish Indoor Climate Label (DICL), the Finnish (M1) labelling scheme, and representatives of emission test laboratories from Finland, Denmark, Germany, the UK (for Building Research Establishment Environmental Assessment Method, BREEAM) and France (for French Agency for Environmental and Occupational Health Safety, AFFSET). The EC Joint Research Centre – Institute of Health and Consumer Production (JRC-IHCP) in Ispra, Italy, has also participated in the WG to help co-ordinate the harmonisation activity and to interface the group's activities with political and administrative services by the European Commission.

Methodical approach

Since the 2007 conference in Berlin eight meetings have been organised and two practical comparison tests have been conducted. The preparatory steps carried out in Phase I of the work (2007-2009) included:

1. interlaboratory comparisons involving testing and evaluating the same construction materials using the different labelling schemes,
2. common evaluation of the advantages and disadvantages of criteria and procedures within the individual schemes and consideration of long time experiences,
3. reaching a consensus on setting common European criteria,
4. updating the wider community on the status of discussions – e.g. at the Healthy Buildings Conference, September 2009 in Syracuse, NY, USA,

5. initiating discussion with EC DG SANCO and EC DG ENTR on the course of action required for political implementation on a harmonised labelling scheme in Europe,
6. presentation of the results in a detailed report within the ECA publication series (ECA Report No. 27).

Phase II of the harmonisation programme (2010-2012) included the following steps:

7. opening the WG to other interested European parties (test laboratories, labelling- or standardisation bodies, industry) to gain a broader consensus ,
8. adoption of the harmonised framework by the EC policy process (DG ENTR and DG SANCO) and
9. creation of an expert group to establish harmonised European criteria for evaluating VOC emissions from products using the LCI concept (Lowest Concentration of Interest).

Results and Discussion

Phase I – Elaboration of the basic recommendations and expert consultation

Main characteristics of the labelling schemes

Table 1: Characteristics of labelling schemes involved in Phase I (preparatory phase)

Requirements/Parameter	M1 Finland	DICL Denmark	AgBB Germany	AFSSET France
Pre-assessment of product composition	no	voluntary	mandatory within approval requirements of DIBt[1]	no
Measurement method chamber	ISO 16000 Series	ISO 16000 Series	ISO 16000 Series	ISO 16000 Series
Time of measurement (days)	28	3, 10 and 28	3 and 28	3 and 28
Formaldehyde measured	yes	yes	no (yes)[1]	yes
TVOC measured	yes	no	yes	yes
SVOC measured	no	no	yes	no
Single VOCs evaluated	no	yes	yes	yes
Carcinogens evaluated according to	IARC class 1	IARC class 1	EU classes[2] 1 and 2	EU classes[2] 1 and 2
Irritants evaluated	formaldehyde and ammonia	formaldehyde and VOCs	all VOCs according to LCI-values	all VOCs according to LCI-values
Assessment of other VOCs	no	no	yes	yes
Sensory evaluation	yes	yes	under development	no (voluntary)

TVOC = total volatile organic compounds; SVOC = semi-volatile organic compounds;
LCI = lowest concentration of interest; IARC = International Agency for Research on Cancer;
[1] within approval requirements of DIBt (Deutsches Institut für Bautechnik) in Germany
[2] Directive 67/548/EEC

Table 1 summarises the main characteristics of each of the labelling schemes evaluated in the preparatory phase (Phase I). The concentration of organic chemicals (VOC) in the air of a test chamber is measured under fixed conditions of temperature, humidity, air change rate, time, etc. and used to calculate a rate of emission from the construction product. This test procedure and the analytical (measurement) methods used in the schemes are based on those described in international standards (ISO 16000 series).

Sensory evaluation

Both Denmark and Finland have traditionally included sensory tests as an important part of product evaluation, though using different procedures which make results difficult to compare. The French AFSSET (now ANSES) protocol for emission testing does not included sensory testing and in Germany, the practicality of a sensory test is currently under examination for a possible future inclusion in the AgBB scheme.

Round robin testing and evaluation according to the labelling schemes

In the first round robin, three of the major labelling schemes; M1, DICL and AgBB, were used to evaluate a rubber flooring material. The results were both encouraging and challenging. The material was unanimously rejected by these three different labelling schemes. However, the rejection was for different reasons. Both M1 and DICL rejected the flooring material because it did not pass the sensory evaluation. The flooring material was rejected by the AgBB scheme due to the detection of a class 2 carcinogen (EU): 1,3-Dichloro-2-propanol among the emitted VOC. The Danish test had identified the substance as well, but in DICL only IARC class 1 carcinogens into consideration.

A sealant material was used in the second round robin test. Here, the differences in evaluation were less pronounced. With regard to VOC emissions the material had quite similar results in all participating laboratories. According to the sensory evaluation the material has barely passed after 28 days in the M1 label and barely failed in the DICL labelling scheme. The sensory evaluation according to the drafted sensory test under development in Germany qualified the odour as 'low intensity' but no limits were defined at that time.

Table 2: Consensus of the WG on harmonisation of labelling schemes

Requirements/Parameter	Consensus
Measuring method/chamber	harmonised CEN standard (based on ISO 16000 series)
Measuring points (days)	3 and 28
Core criteria	
single VOC evaluation ($R=\Sigma C_i/LCI_i<1$)	harmonised list of LCI R<1
Carcinogens (EU carcinogens class 1 and 2)	harmonised list
TVOC measured	200-1000 µg/m^3
Formaldehyde measured	value still under discussion
Optional criteria	
Compounds without LCI assessment	sum<100 µg/m^3
TSVOC measured	await validation TC 351
Sensory evaluation	await ISO 16000-28

Elaboration of common criteria for a European framework

These practical experiences laid the grounds for the next step: i.e. for the elaboration of a common set of criteria for a EU-wide framework of labelling schemes. The WG agreed that common, 'core' test criteria should be accepted by consensus and optional additional criteria could be applied locally for those factors for which consensus had not yet been reached. Table 2 summarises the current status of the harmonised framework - The WG consensus on core measurement method requirements and additional optional criteria.

One of the most important outcomes of phase I in the harmonisation process was that the consensus that evaluation of individual VOCs (by LCI-concept as per ECA Report No. 18 (ECA 1997)) is required for assessing building materials with respect to potential health effects. The group agreed upon the establishment of a European expert group to review the toxicological basis for establishing and periodically updating common European LCI (lowest concentration of interest) values.

Presentation to experts and consultation of stakeholders

This approach was presented in September 2009 at the Healthy Buildings Conference in Syracuse (Kephalopoulos et al. 2009). This international conference takes place every 3 years with the aim of presenting the latest scientific results and reporting on practical progress made in the field of indoor air quality and associated health effects. A one-day workshop on evaluating VOC emissions from building products from a health perspective was organised during this conference and brought together many of the major US and European Stakeholders. The harmonisation initiative for a European labelling system for building products was one of the major focal points of the workshop. It received a very positive response, including from US and Canadian representatives willing to join the European harmonisation initiative as observers. Another important milestone was the presentation of the harmonisation proposal at a DG SANCO Indoor Air Experts Group meeting in October 2009 in Luxembourg.

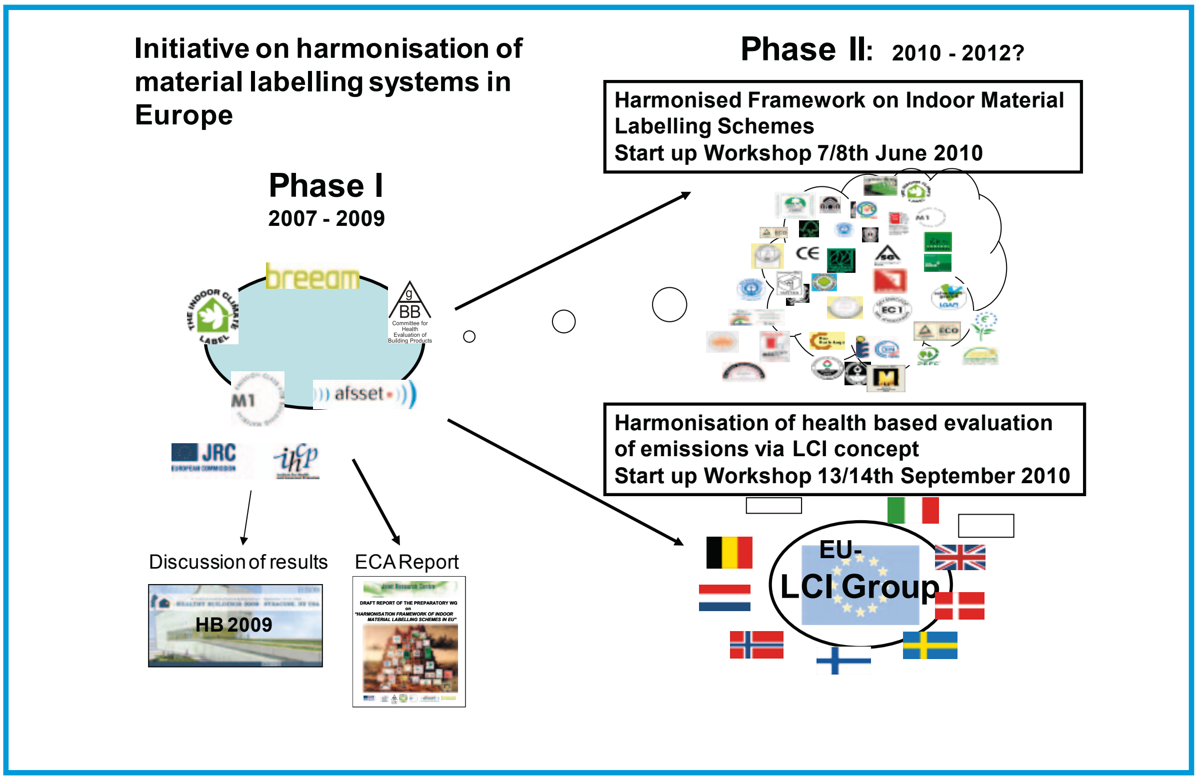

Figure 1: The progress in the initiative towards a harmonised framework of labelling schemes

The DG SANCO group recognised and valued the outcomes of Phase I of the harmonisation process and assured the WG of their further support for Phase II. The results of the common harmonisation approach of Phase I are summarised and compiled in the new ECA Report No. 27 (ECA 2011).

Phase II – Seeking consensus with stakeholders

Phase II started with the international workshop 'Harmonised framework on indoor material labelling schemes: challenge with a global perspective' organised by EC JRC-IHCP in Somma Lombardo, Italy, June 2010. Among the 100 participants of this workshop were:

- representatives from emission related labelling schemes in the EU,
- testing labs in the EU,
- European Commission services related to indoor air quality and sustainable construction,
- industry partners from various construction sectors and their European federations,
- governmental organisations, standardisation bodies and NGOs with a direct involvement and/or interest in labelling of building materials and consumer products and
- representatives from labelling schemes overseas in the US, Canada, China and Korea.

The aim of this workshop was to discuss the recommendations made by the WG at the end of Phase I and to agree upon the next steps in reaching a broad consensus for future harmonised standards and uniform product labelling in the European market. There was positive feedback from the different stakeholders agreeing both on the need for a common framework for indoor labelling schemes and on the consensus elaborated so far by the preparatory working group. It was agreed that the work should continue and a wider expert forum on indoor labelling schemes should be established to enable the efficient implementation of a harmonised framework for health based evaluation and labelling of products for their indoor air emission properties.

First steps towards a European LCI-list

The second Phase II workshop was organised in September 2010 by EC JRC-IHCP in Ispra (Italy) and dealt with the concept of lowest concentration of interest (LCI) in evaluation of product emissions. Toxicologists and other experts agreed on a first technical approach for addressing the challenges of future European LCI development. Since then the preparatory group has held its first meeting to begin defining standard operational procedures (SOPs) for derivation of LCI values for a list of more than hundred VOC commonly detected in emission tests of building materials and other products used indoors. This activity is supported by DG SANCO and DG Enterprise of the EC and shall enable a future CE mark to use harmonised evaluation protocols and LCI values for its intended emission classes. They will also provide a sound basis for other voluntary and mandatory emission-based product quality labels.

In Germany, since 2001 a subgroup of AgBB has met regularly to establish, refine and update the German LCI list for mandatory evaluation of regulated building products. This experiences is valuable for the European preparatory LCI group and helps ensure a sound harmonised concept for SOPs and deriving LCIs. It will also facilitate acceptance of European solutions for national committees like AgBB in the future.

Conclusions

Emissions of organic chemicals from construction products may have a negative effect on indoor air quality and human health. Low emitting materials are of increasing importance since building regulations request a tighter envelope for energy conservation.

Emission labelling schemes encourage the development of low emitting products and provide consumers, building designers and material specifiers with the information they need to select products with appropriate characteristics. Harmonisation of labelling schemes will provide clearer guidance to users and further promote low emitting materials, as well as reduce the administrative and testing burden for producers that wish to market Europe wide.

The preparatory working group has laid the grounds for a harmonised framework for future European labelling schemes, supported by the European Commission. The proposal is based on the sound experience of existing schemes and on generation of new comparative test data. By establishing a concept for harmonised European LCI values a new European LCI list will be developed and the work can be shared. This will enable voluntary and mandatory labelling schemes to evaluate emissions of products in the same way and even the future emission classes for CE marking can benefit from the harmonised European LCI list in progress.

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Guidelines for Indoor Air Hygiene in School Buildings in Germany

In the last years in Germany many schools have been renovated because of suspected asbestos, PCB or other indoor air pollutants. However, there are still many schools which need to go through renovation on account of inadequate building maintenance. To meet the Energy Conservation Regulation in Germany introduced in 2002 and amended in 2007 new challenges came into play. As a consequence of the new regulations the buildings became almost airtight and therefore ventilation became a bigger issue to maintain the indoor air quality. In 2000 the German Federal Environment Agency (UBA) published the first version of the 'Guidelines for Indoor Air Hygiene in School Buildings' to draw the attention of teachers, school staff, parents and pupils to the air hygiene problems and the importance of cleaning in schools. This version was updated in 2008 to adjust the guidelines to new challenges such as the problems due to fine and ultra-fine particles, carbon dioxide or the necessity of renovating the buildings to meet the new energy efficiency standards.

The guidelines refer primarily to classrooms and recreation rooms in schools in which children regularly have classes as well as child care facilities, such as kindergarten and day nurseries. Many recommendations contained in these guidelines are also valid for indoor spaces in other public buildings. For special technical areas in school buildings (e.g. teaching kitchen, craft workshops, laboratories, etc) there are other specific regulations like the Ordinance on Hazardous Substances not included in these guidelines.

Additionally to teachers, pupils and parents the guidelines are also directed to all interested parties, from school authorities to regulatory agencies. Furthermore, they offer information for all working groups involved in the plan, establishment, renovation or reconstruction of school buildings. The guidelines are structured in several parts comprising different topics, which are roughly described below:

- Part A examines the hygienic demands in daily school routine. Besides the general needs for maintenance and operation, very important issues like cleaning procedures, ventilation and minor building works are discussed.
- Part B gives an overview of important chemical and biological pollutants in schools.
- Part C addresses the demands on structural and room climatic conditions, including its acoustic requirements.
- Part D shows how to practically deal with several building problems and gives a list of examples with 'typical' procedures.
- Part E outlines briefly the existing renovation/reconstruction guidelines.

To make the guidelines available to a broader share of the population in Germany and to facilitate the experience exchange in the field with other countries, an English version of the guidelines is available now. It can be ordered directly and free of costs either from the German Federal Environment Agency or downloaded as a pdf-file: http://www.umweltdaten.de/publikationen/fpdf-l/4113.pdf.

For more information, please contact Heinz-Jörn Moriske (heinz-joern.moriske[at]uba.de) or Marcia Giacomini (marcia.giacomini[at]uba.de).

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SINPHONIE

The SINPHONIE project (Schools Indoor Pollution and Health: Observatory Network in Europe) is a complex research project covering the areas of health, environment, transport and climate change and aimed at improving air quality in schools and kindergartens. The project is implemented under a European Commission service contract of the DG Sanco. Thirty-six environment and health institutions from 25 countries are participating in the SINPHONIE research project in order to implement Regional Priority Goal III (RPG3) of the Children's Environment and Health Action Plan for Europe (CEHAPE), which is to prevent and reduce respiratory disease due to outdoor and indoor air pollution.

SINPHONIE is an example of the practical implementation of the EU Environment and Health Action Plan 2004-2010; and is an example of subregional cooperation in order to implement the revised CEHAPE RPG3 (2004, 2010). With its special focus on schools and childcare facilities, the SINPHONIE project aims to define policy recommendations on remedial measures in the school environment.

In order to achieve this overall objective, SINPHONIE builds on knowledge acquired in the course of earlier projects: EnVIE (http://www.envie-iaq.eu) and SEARCH (www.rec.org/SEARCH/). It aims to expand the spectrum of available information by carrying out complex research into children's exposure to indoor air pollutants and health risks in schools. A common European database will be created using the same protocol on indoor air quality (IAQ) and other environmental parameters in schools and related health impacts throughout Europe in order to provide evidence for use in compiling guidelines to improve air quality in schools.

On average, people spend over 90 percent of their time in indoor environments, which means that indoor air quality (IAQ) has an enormous influence on their health and quality of life. Exposure to air contaminants that can lead to respiratory and other health-related effects is determined by indoor conditions. This refers not only to exposure time but also to the nature and concentration of pollutants (e.g. construction materials, furnishings, cleaning products etc.). Children spend a third of their day in school and have no say over the school environment. At the same time, children are far more vulnerable than adults to the effects of air pollution.

The newsletter of the SINPHONIE project presents the most important milestones of the project implementation. Four newsletters (2 times/year) will be prepared during the project and are foreseen to be published in April 2011, October 2011, March 2012 and September 2012.

The major planned topics of the newsletters are as follows:

- Training program of the project,
- Process of the field studies in the schools (environmental measurements and health survey),
- Actual events and achievements,
- Important results of the research.

For more information, please visit the website of the project:

http://www.sinphonie.eu/

NOTES AND NEWS — NOTES AND NEWS — NOTES AND NEWS — NOTES AND NEWS

Updated Air Hygiene Report No.16, second edition: Inventory of Air Quality and Health Authorities and Institutions in the WHO European Region

Exchange of information is an essential part of cooperation, especially at the international level. Since it's first release within the series 'Air Hygiene Report' in October 2006, the 'Inventory of Air Quality and Health Authorities and Institutions in the WHO European Region' assists with a current compilation of addresses, phone contacts and websites of national authorities and institutions working in the field of air quality - indoor and ambient air - and health. The compilation provides information of all 53 Member States of the WHO European Region - if available - in English language.

An updated version is expected to be published **online only** in July 2011 at the WHO CC's website (Air Hygiene Report 16, second edition):

http://www.umweltbundesamt.de/whocc/archiv/AHR16end.pdf.

MEEETINGS AND CONFERENCES — MEETINGS AND CONFERENCES

Answers to Key Questions on the Impact of Air Pollution on Health in Europe - Final Aphekom Meeting, 2 March 2011 in Saint-Maurice, France

Aphekom

Improving Knowledge and Communication for Decision Making on Air Pollution and Health in Europe

Much has been done in recent years to reduce air pollution and its harmful effects on the health of Europeans. Yet gaps remain in stakeholders' knowledge and understanding of this continuing threat that hamper the planning and implementation of measures to protect public health more effectively. Sixty Aphekom scientists have therefore worked for nearly 3 years in 12 countries across Europe to provide new information and tools that enable decision makers to set more effective European, national and local policies; health professionals to better advise vulnerable individuals; and all individuals to better protect their health. Ultimately, through this work the Aphekom project hopes to contribute to reducing both air pollution and its impact on health and well being across Europe. To these different ends, the project has focused on answering the following key questions.

<u>What are the latest findings on the health impacts and monetary costs of air pollution in European cities?</u>

Aphekom used traditional HIA (health impact assessment) methods to conduct an in-depth update of the impact of air pollution on health in 25 European cities totalling nearly 39 million inhabitants. This work shows that a decrease to 10 µg/m^3 of long-term exposure to $PM_{2.5}$ fine particles (WHO's annual air-quality guideline) could add up to 22 months of life expectancy for persons 30 years of age and older, depending on the city and its average level of $PM_{2.5}$. Hence, exceeding the WHO air-quality guideline on $PM_{2.5}$ leads to a burden on mortality of nearly 19,000 deaths per annum, more than 15,000 of which are caused by cardiovascular diseases.

Aphekom also determined that the monetary health benefits from complying with the WHO guideline would total some € 31.5 billion annually, including savings on health expenditures, absenteeism and intangible costs such as well being, life expectancy and quality of life. These findings show that air pollution continues to have damaging effects on public health in Europe, and that further steps to reduce PM (particulate matter) would result in significant health and monetary gains.

The findings are particularly relevant now when various European Union member states have exceeded mandated limit values on particles since 2005, especially in large urban areas. When the European Commission has recently put a number of member states on notice for this reason. And when EU and national agendas are being prepared for implementing existing regulations on air pollution and for revising current EU legislation in 2013.

<u>How can we make HIAs more meaningful and actionable for developing Policies and recommendations on air pollution for urban populations?</u>

Pollutants such as ultrafine particles occur in high concentrations along streets and roads carrying heavy traffic. And evidence is growing that living near such streets and roads may have serious health effects, particularly on the development of chronic diseases. Until now, however, HIAs have not explicitly incorporated this factor. For this purpose, Aphekom has applied innovative HIA methods to take into account the additional long-term impact on the development of chronic diseases from living near busy roads.

We also evaluated the monetary costs associated with this impact. We first determined that, on average, over 50 percent of the population in the 10 European cities studied lives within 150 metres of roads travelled by 10,000 or more vehicles per day and could thus be exposed to substantial levels of toxic pollutants.

In the cities studied, our HIA showed that living near these roads could be responsible for some 15-30 percent of all new cases of asthma in children; and of COPD (chronic obstructive pulmonary disease) and CHD (coronary heart disease) in adults 65 years of age and older. Aphekom further estimated that, on average for all 10 cities studied, 15-30 percent of exacerbations of asthma in children, acute worsening of COPD and acute CHD problems in adults are attributable to air pollution.

This burden is substantially larger than previous estimates of exacerbations of chronic diseases, since it has been ignored so far that air pollution may cause the underlying chronic disease as well. In addition, for the population studied Aphekom estimated an economic burden of more than € 300 million every year attributable to chronic diseases caused by living near heavy traffic. This burden is to be added to some € 10 million attributable to exacerbations of these diseases.

Our work thus suggests that the total benefits of reducing traffic exposure for urban populations may have been largely underestimated until now. Together these important findings strengthen earlier arguments that there is an urgent need for policy makers and urban planners to reduce the exposure to air pollution of urban populations living along congested roads. In addition, health professionals and individuals can draw on this information to advise on and adopt behaviours for better health.

Do policies designed to reduce air pollution and its health impacts and Monetary costs really work?

Beyond reviewing the documented benefits to health of the historic Dublin coal ban in 1990 and the recent implementation of congestion charges in London and Stockholm, Aphekom investigated the effects of EU legislation to reduce the sulphur content of fuels (mainly diesel oil used by diesel vehicles, shipping and home heating). Our analysis in 20 cities showed not only a marked, sustained reduction in ambient SO_2 levels but also the resulting prevention of some 2,200 premature deaths valued at € 192 million. These findings underscore the health and monetary benefits from drafting and implementing effective EU policies on air pollution and ensuring compliance with them over time.

How can we improve communication both among and between scientists and stakeholders concerned with the impact of air pollution on health?

Uncertainties perceived by scientists, policy makers and other stakeholders can undermine their confidence in the findings of HIAs. For this reason, Aphekom has developed a method that helps them discuss and share their views on both the uncertainties in HIA calculations and their impact on the decision-making process. In addition, to help decision makers draft policies on air quality and related environmental-health issues, Aphekom has developed a process, based on a deliberation-support tool, that helps frame and structure exchanges between stakeholders working together. Using this process enables them to propose and discuss multiple criteria for evaluating, prioritising and aligning their various needs, and for choosing actions that match their objectives and preferences.

How can our many stakeholders access the Aphekom project's deliverables?

Aphekom makes its findings and tools available to all interested parties through a range of local, national and European media, organisations and events. Aphekom's full reports, presentations and videos can be found on our Web site (www.aphekom.org). And members of the Aphekom network provide in their native languages city reports that highlight local issues and challenges on air pollution and health. General and vulnerable populations and other groups can also have access to Aphekom's findings through health professionals, patient's organisations and NGOs at the EU, national and local level.

Funding and support

The Aphekom project has been co-funded by the European Commission's Programme on Community Action in the field of public health (2003 to 2008) under Grant Agreement No. 2007105, and by the many national and local institutions that have dedicated resources to the fulfilment of this project.

Additional information about Aphekom can be obtained from the project coordinator:

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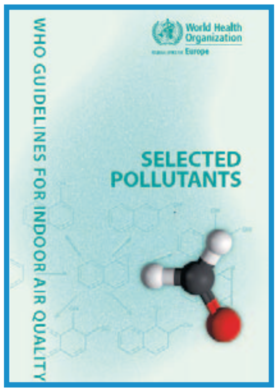
WHO Guidelines for Indoor Air Quality: Selected Pollutants

WHO Regional Office for Europe, European Centre for Environment and Health, Bonn, Germany 2010, 484 pages, ISBN 978 92 890 0213 4, available online: http://www.euro.who.int/__data/assets/pdf_file/0009/128169/e94535.pdf.



This book presents WHO guidelines for the protection of public health from a number of chemicals commonly present in indoor air. You can find a more detailed overview about the content of the book on this issue's page three.

Reporting on Ambient Air Quality Assessment in the EU Member States, 2008 – ETC/ACC Technical Paper 2010/11

B. Jimmink, F. de Leeuw et al., European Topic Centre on Air and Climate Change, Bilthoven, The Netherlands 2010, 63 pages, available online:
http://air-climate.eionet.europa.eu/reports/docs/ETCACC_TP_2010_11_AQQ2008.pdf.

The EU air quality legislation requires the Member States to report on zones designated under the framework directive (96/62/EC) on ambient air quality and to report annually on the levels in comparison to air quality objectives. This report gives an overview and analysis of the submitted information concerning data quality and zone exceedances in the Member States in 2008.

Air pollution - Promoting Regional Cooperation

L. Nordberg, ScandEnvironment Advisory Service, Stockholm, Sweden, first published by the United Nations Environment Programme in 2010, 176 pages, ISBN 978 92 807 3093 7, available online: www.rrcap.unep.org/pub/fileupload/Air_pollution_book.pdf.

The primary aim of this book on Air Pollution Promoting Regional Cooperation is to facilitate the training of governmental decision-makers to further develop cooperation aimed at regional intergovernmental agreements or legal instruments. The book may also find readers among other policy-makers and scientists, as well as university students involved in environmental matters. Practiced negotiators may also benefit from reading selected sections. The book lays down the foundations that will enable potential negotiators to understand the principles of air pollution in its various forms and its effects, how agreements have been and can be developed, before presenting some practical suggestions on how to explore the negotiation process.

Neunter Umweltkontrollbericht - Umweltsituation in Österreich

Environment Agency Austria, Vienna, Austria 2010, 236 pages, ISBN 978 3 99004 087 4, available in German language only and online: http://www.umweltbundesamt.at/fileadmin/site/publikationen/REP0286.pdf.

Der neunte Umweltkontrollbericht beschreibt den Umweltzustand in Österreich vom 1.1.2007 bis 31.12.2009. Mit dem Umweltkontrollbericht 2010 präsentiert das Umweltbundesamt zum neunten Mal das Standardwerk zur Umweltsituation in Österreich. Zielgruppe sind EntscheidungsträgerInnen, insbesondere auf Bundes- und Landesebene sowie InteressenvertreterInnen. Der Bericht bietet aktuelle Grundlagen für die tägliche Arbeit. Dazu fokussiert er auf die wichtigsten Herausforderungen der Umweltthemen und berücksichtigt vor allem jene Aspekte, in denen in den nächsten Jahren wichtige Entscheidungen zu treffen sind.

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2011

International Medical Geography Symposium
10-15 July, Durham, United Kingdom, http://www.dur.ac.uk/geography/conferences/imgs/.

10th International Conference on Mercury as a Global Pollutant
24-29 July, Halifax, Nova Scotia, Canada, http://www.mercury2011.org/.

Environmental Health Risk 2011 –
Sixth International Conference on the Impacts of Environmental Factors on Health
25-27 July, Riga, Latvia, http://www.wessex.ac.uk/ehr2011rem1.html.

ISEE 2011 –
23rd Conference of the International Society for Environmental Epidemiology
13-16 September, Barcelona, Spain, http://www.isee2011.org.

Air Pollution 2011 –
19th Conference on Modelling, Monitoring and Management of Air Pollution
19-21 September, Malta, http://www.wessex.ac.uk/11-conferences/airpollution-2011.html.

Air Quality Eight
24-27 October, Arlington, Virginia, USA, http://www.undeerc.org/AQ8/.

2012

Eighth International Conference on Air Quality –
Science and Application (formerly Urban Air Quality Conference)
19-23 March, Athens, Greece, http://www.airqualityconference.org/.

Forest Fires 2012 – Third International Conference on Modelling, Monitoring and Management of Forest Fires
22-24 May, New Forest, United Kingdom, http://www.wessex.ac.uk/fires2012rem1.html.

Environmental Impact 2012 – First International Conference on Environmental and Economic Impact on Sustainable Development
2-4 July, New Forest, United Kingdom, http://www.wessex.ac.uk/impact2012cfp.html.

Healthy Buildings 2012 –
10th International Conference on Indoor Air Quality and Climate
8-12 July, Brisbane, Queensland, Australia, http://www.hb2012.org.