NEWSLETTER

WHO COLLABORATING CENTRE FOR AIR QUALITY MANAGEMENT AND AIR POLLUTION CONTROL

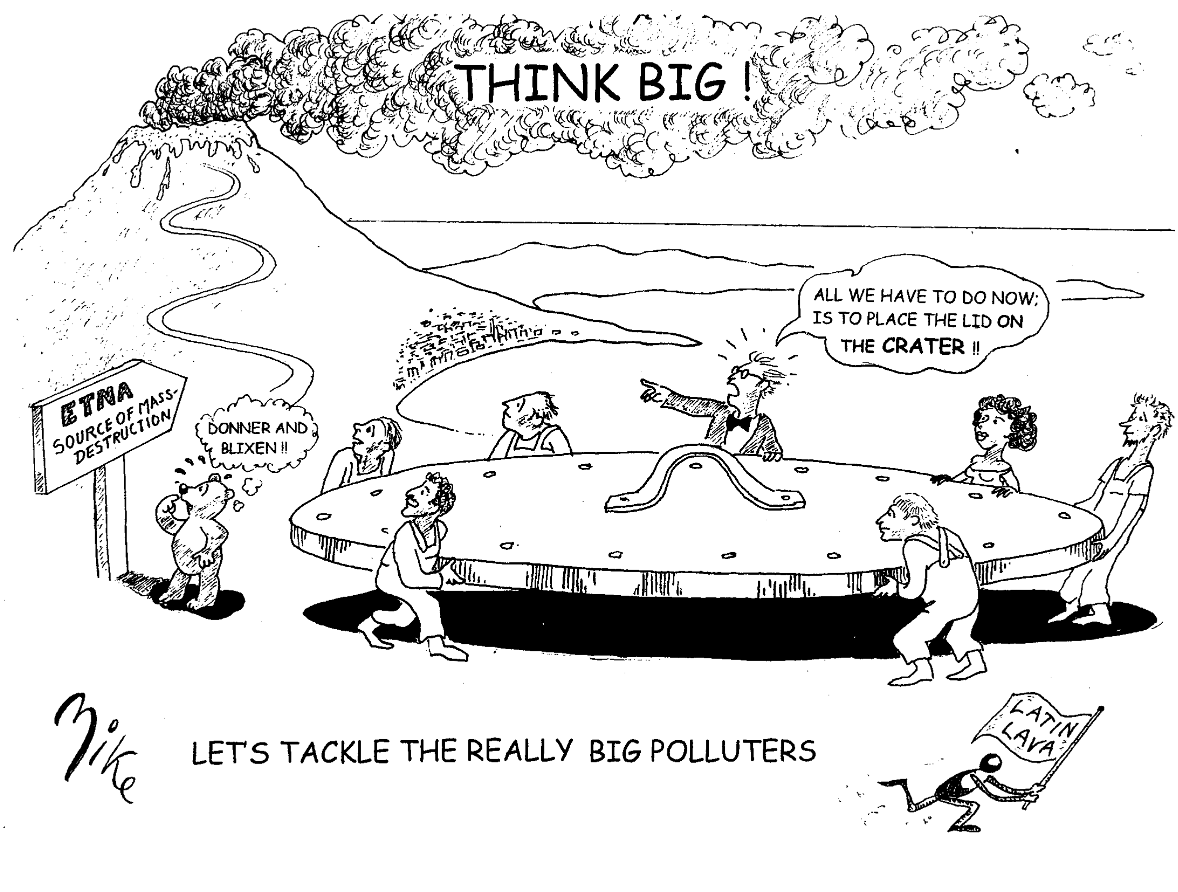
at the

FEDERAL ENVIRONMENTAL AGENCY
GERMANY

No. 31 June 2003

CONTENTS

Air Quality Management in Switzerland	2	Notes and News	12
WHO Revision of the Toxic Equivalency Factors for Dioxins and Furans and its Impact on the Emissions of Waste Incineration Plants in Germany	5	Meetings and Conferences	15
		Publications	18
		Coming Events	19



AIR QUALITY MANAGEMENT IN SWITZERLAND

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Introduction

This article is focused on existing tools how urban air quality managers can effectively and efficiently reduce human exposure to harmful air pollutants both in ambient and indoor air in Switzerland. Therefore, legal instruments and differences in controlling ambient and indoor air pollution are described. Additionally, the relevance of exposure information needed in order to formulate and evaluate policy options is discussed. The article gives an air quality managers and policy makers perspective. The perspective is primarily action-oriented, i.e. towards implementing legal instruments and mitigation measures. Thus it differs from the perspective of researchers, which is more science-oriented.

Legal Instruments in Switzerland

In Switzerland the legal prerequisites for ambient and indoor air pollution control are very different: The legal base for the management of **ambient** air quality is very good. On the national level the Federal Law relating to the Protection of the Environment (Swiss, 1985) is implemented since 1985. First of all this law defines preventive measures to reduce air pollution. Additionally it defines criteria to set ambient air quality standards. For the management of **indoor** air quality the legal basis in Switzerland is poor. The environmental law is not applicable because the interior of buildings is not considered an "environment" in the sense of the law. Moreover Switzerland has no general national law relating to the protection of health, which could be the basis for regulating indoor air quality.

So this chapter will focus on ambient air pollution control according to the Swiss environmental law. The purpose of this law is to protect human beings and the environment against harmful effects or nuisances. The concept is based on a two-stage approach:

1. The primary instrument is the **principle of preventive action**: Irrespective of the existing air pollution, emissions shall be limited as much as technology and operating conditions will allow, provided this is economically acceptable.

2. If it is found or expected that air pollutants will be harmful or a nuisance, even though the preventive emission limit values are respected, **additional or stricter emission limitations** will be ordered.

The first stage - the principle of preventive action - shall keep the air pollution and thus its negative effects as low as possible. The basic idea is very simple: Air pollution, which can be avoided has to be avoided. Air pollution control measures have to be implemented as early as possible, even before damages appear. For Switzerland, this principle of preventive action gave very good results. Excessive air pollution could be avoided in many cases. The second stage - additional or stricter emission limitations - is enacted when legal ambient air quality standards are exceeded or are likely to be exceeded in the near future. This is the case e.g. for nitrogen oxides (NOx), ground-level ozone, and particulate matter (PM_{10}). Both stages - the principle of preventive action and tightened emission control - are important and necessary. But the principle of preventive action is a clear primary tool of Swiss policy. This Swiss air pollution control strategy can also be considered as a two-track approach: It is source-oriented as well as effect-oriented.

The principle of preventive action is **source**-oriented. In order to put this principle into concrete terms the Swiss Government has issued several ordinances. The most important is the Ordinance on Air Pollution Control (OAPC, Swiss, 2000). This ordinance enacts general emission limit values for about 170 air pollutants, specific emission limit values as well as construction and operating prescriptions for approximately 50 categories of stationary sources like industrial and combustion installations, and quality requirements for fuels. Other important ordinances are controlling the emissions of mobile sources such as passenger cars, trucks and motorcycles. There exist also ordinances implementing economic instruments such as a fee on emitted VOC or a fee on oil with a high sulphur content.

On the other hand, the Swiss ambient air quality standards indicate the level of excessive ambient air pollution and thus give the signal to initiate additional measures to reduce air pollution. The Swiss Government has set ambient air quality standards for about 10 major air pollutants. The Swiss ambient air quality standards are **effect**-oriented. According to the environmental law the following criteria (among others) have to be taken into account for setting ambient air quality standards: Air pollution at levels below the air quality standards shall not endanger human beings, animals and plants, their biological communities and habitats. The air quality standards shall also take account of the effects of air pollution on particularly sensitive groups such as children, sick persons, elderly people and pregnant women.

Differences in Controlling Ambient or Indoor Air Pollution

From a scientific point of view it is obvious that for the assessment of the exposure of human beings to air pollution the **total** exposure has to be taken into account. So why is only outdoor (ambient) air pollution addressed within the frame of the Swiss air pollution control strategy? There are two reasons: The main reason is the **legal situation**. As mentioned before, Switzerland has a very good law relating to the protection of the environment. But this law is only applicable for ambient air pollution. No law relating to indoor air pollution exists. The authorities have to respect the legal basis and the legal mandate. The second point is a more practical one: The legal possibilities to influence indoor air pollution are limited. It is of course possible to create prescriptions for chemical agents or construction materials, but the greatest effect to influence indoor air quality is the **behaviour** of the inhabitants. Effects with great impact are smoking and airing of houses and flats. In public buildings certain behavioural measures can be enacted. But the behaviour of the inhabitants within their own house or flat cannot be controlled by legal prescriptions.

This shows that the possibilities to control ambient and indoor air pollution differ not only regarding the legal situation but also with respect to the sources, the affected persons, the critical activities and places and, last but not least, the possible mitigation measures. Ambient air quality management has achieved some very good results in the last twenty years. There is no need to look for a completely new approach in this field. But of course the strategies should adapted permanently to new situations and new findings. Particularly the principle of preventive actions has proven to be very effective. It is a pragmatic approach and allows early action even if exposure and health data is not yet fully available. This is e.g. illustrated by the fact that the Swiss Ordinance on Air Pollution Control contains effect-based air quality standards for only about 10 air pollutants, but preventive emission limit values for about 170 air pollutants. Outdoor air pollution contributes also to indoor air pollution. So efforts to reduce outdoor pollution are beneficial for indoor air quality too. But additional indoor sources and effects can lead to very different indoor pollution situations. This urges specific legislation and specific measures to cope with indoor air pollution. However, the principle of preventive action (among others) would be a good means also to reduce indoor air pollution.

Exposure Information needed

Although the Swiss air pollution control strategy is in favour of the principle of preventive action, exposure information is important. For air quality management the following requirements are relevant:

- Good population exposure data

It is essential to know which part of the population is exposed in which situations to which kind of air pollutant and how long.

- Good data on exposure-response relationship

Exposure-response relationships are the basis to set effect-oriented air quality standards. Particularly data from epidemiological research have to be taken into account.

- Reliability of data

All data delivered by researchers have to be of good reliability. Scientists should have a certain consensus about the data quality and interpretation. It could, as an example, be scientifically correct to state that the limit of harmful effects of an air pollutant lies in a range between 0.2 and 20 micrograms per m^3 (like e.g. in the EU position paper on benzene). Let's assume that the actual scientific knowledge does not allow a better statement. But with such great uncertainties and discrepancies it is difficult for policy makers to set a scientifically based legally binding ambient air quality standard.

- Health effects

Exposure data must be backed by related health effect data. The primary interest of politicians is not exposure "as such", but the resulting health effects.

- Identification of priority areas for mitigation measures

Exposure and health assessments should be directed to identify priority areas for mitigation measures. Air quality managers cannot transform all details of scientific research results into mitigation measures because of practical and legal limitations. But it is important that science and research show the priority areas to be addressed.

Conclusions

1. Air quality managers and policy makers are primarily **action-oriented**, i.e. towards implementing legal instruments and mitigation measures.
2. Exposure assessments should be complemented by **health effect** assessments. To be useful for policy making the result of these assessments must be suited to be transformed into corresponding mitigation measures.
3. It is not necessary that the data is very sophisticated. But it must show **priority areas** for mitigation actions. And the data must be reliable.
4. It is desirable to aim at **total exposure** data including both outdoor and indoor air pollution. Starting from the total exposure, the identified priority areas have to be dealt with by specific measures which are best suited to mitigate each of these priority areas: Ambient air pollution with the classic instruments of ambient air pollution control, indoor air pollution by specific measures suited for this specific field.
5. Outdoor and indoor air pollution control are two different fields. Although starting from the total exposure one should not aim at one integrated overall-strategy to cope with both kinds of this pollution. It seems more effective and rational to have in each of these two fields a best suited adequate strategy, because the source and thus the measures to be taken are very different. The abatement strategies for ambient air pollution and indoor air pollution **complement** each other.

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WHO REVISION OF THE TOXIC EQUIVALENCY FACTORS FOR DIOXINS AND FURANS AND ITS IMPACT ON THE EMISSIONS OF WASTE INCINERATION PLANTS IN GERMANY

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1. Introduction

The toxicological assessment of dioxins (PCDDs) and furans (PCDFs), a group of substances with 210 individual congeners (75 PCDDs and 135 PCDFs), is commonly carried out by using a limited number of PCDD/PCDF congeners. In the 1980s, various assessment models were developed by several institutions and research groups (e.g. WHO, Nordic countries, US EPA, NATO-CCMS). A feature all these models have in common is that a selected number of congeners is assigned so-called toxic equivalency factors (TEFs) which are to express a toxicity equivalent to that of 2,3,7,8-TCDD (Seveso dioxin). The measured concentrations of these selected congeners are each multiplied by a congener-specific equivalency factor to calculate the toxic equivalent (TEF) concentration. The TEF concentrations of the various congeners are subsequently summed up to give the overall TEF concentration of the medium investigated.

One of the above-mentioned research groups (NATO-CCMS) selected 7 compounds from among the polychlorinated dibenzodioxins and 10 compounds from among the polychlorinated dibenzofurans to represent the 210 individual congeners, and assessed them by means of so-called international toxic equivalency factors (I-TEFs). In 1990, the NATO-CCMS method and the selection of 17 I-TEF-evaluated PCDD/PCDF congeners were adopted for the first time to be included in a German regulation (i.e., in establishing the limit value for dioxins and furans of 0.1 ng I-TEF/m^3 in the Ordinance on Incinerators for Waste and Similar Combustible Material – 17^{th} BImSchV). At the European level, the assessment method developed by NATO-CCMS has meanwhile also been taken into account in the formulation of the EU waste incineration directive.

A recent development is that in 1997, the WHO-ECEH (World Health Organization – European Centre for Environment and Health, Bilthoven Division, The Netherlands) and the IPCS (International Programme on Chemical Safety, WHO, Geneva, Switzerland) jointly published a consensus list containing new or revised TEFs for dioxins, furans and dioxin-like substances including a number of polychlorinated biphenyls (12 PCB congeners). Of the dioxins, 1,2,3,7,8-PeCDD was re-evaluated with a TEF of 1 (NATO-CCMS value: 0.5). In contrast, the TEFs for OCDD and OCDF were reduced by a factor of 10, to 0.0001 (NATO-CCMS value: 0.001). These new WHO-TEFs were defined for three groups of organisms from a health effects perspective: mammals and wild mammalian species, fish and birds. Aspects that played a decisive role in the selection of substances and the definition of the new WHO-TEFs comprise, in particular, the structural similarity of the considered substances to 2,3,7,8-TCDD, binding to the Ah receptor, determination of effects similar to those of TCDD in animal experiments, and persistence in the environment and in organisms.

In addition, in May 1998 a revised TDI (tolerable daily intake) value of 1-4 pg TEF/kg body weight/day was established as tolerable daily intake for PCDD/PCDFs and dioxin-like PCBs by the WHO-ECEH in cooperation with IPCS and an international expert group. The new WHO-TEFs established in 1997 were used to calculate the daily intake. For Germany, the re-evaluation by WHO entails the need to clarify whether the value of 1 pg I-TEF/kg body weight/day for PCDD/PCDF intake, which is taken to be a precautionary value, may have to be redefined, as this value must now be considered a limit value (TDI).

This article mainly deals with the impact of the WHO decisions on the I-TEF-evaluated emissions of PCDD/PCDFs from waste incineration plants, and not with health effect aspects, the consequences that may result from the TDI value revised by WHO will not be discussed here any further. This question has to be clarified elsewhere, from a health protection perspective, by toxicologists and other health experts.

2. Impact Estimation of the New WHO-TEFs on I-TEF-evaluated Emissions of PCDD/PCDFs from Waste Incineration Plants

Verification as to whether the dioxin concentrations determined in treated waste gas of waste incineration plants comply with the limit value of 0.1 ng I-TEF/m^3 laid down in the 17^{th} BImSchV is based on the provisions in the Appendix to the 17^{th} BImSchV. The Appendix stipulates: “To obtain the total sum referred to in Art. 5 para. 1 no. 4, the concentrations of the following dioxins and furans determined in the waste gas concerned shall, before adding them, be multiplied by the equivalence factors given.”
An exemplary calculation for a waste incineration plant complying with the requirements of the 17^{th} BImSchV is presented in Table 1.

Table 2 shows an assessment of the concentrations in treated waste gas on the basis of the new WHO-TEFs. When comparing the emission values obtained using the two assessment methods, given as ng TEF/m^3, it can be seen that the value calculated by using the new WHO-TEFs do not differ until the fourth digit behind the decimal point compared to that calculated according to NATO-CCMS. The comparison thus shows that given the low emission levels currently attained for dioxins and furans in the waste gas of waste incineration plants, the re-evaluation by WHO has no significant influence on the PCDD/PCDF emission level value. The stringent dioxin limit value laid down in the 17^{th} BImSchV can safely be complied with, irrespective of what assessment method is used.

Table 1:

Congeners covered by App. to 17^{th} BImSchV (I-TEFs according to NATO-CCMS)	I-TEF	Measured concentration [ng/m^3]	Evaluated emission value [ng I-TEF/m^3]
2,3,7,8 - Tetrachlordibenzodioxin (TCDD)	1	0.001	0.001
1,2,3,7,8 - Pentachlordibenzodioxin (PeCDD)	0.5	0.001	0.0005
1,2,3,4,7,8 - Hexachlordibenzodioxin (HxCDD)	0.1	0.002	0.0002
1,2,3,7,8,9 - Hexachlordibenzodioxin (HxCDD)	0.1	0.004	0.0004
1,2,3,6,7,8 - Hexachlordibenzodioxin (HxCDD)	0.1	0.002	0.0002
1,2,3,4,6,7,8 - Heptachlordibenzodioxin (HpCDD)	0.01	0.022	0.00022
Octachlordibenzodioxin (OCDD)	0.001	0.039	0.000039
2,3,7,8 - Tetrachlordibenzofuran (TCDF)	0.1	0.009	0.0009
2,3,4,7,8 - Pentachlordibenzofuran (PeCDF)	0.5	0.011	0.0055
1,2,3,7,8 - Pentachlordibenzofuran (PeCDF)	0.05	0.012	0.0006
1,2,3,4,7,8 - Hexachlordibenzofuran (HxCDF)	0.1	0.010	0.001
1,2,3,7,8,9 - Hexachlordibenzofuran (HxCDF)	0.1	0.008	0.0008
1,2,3,6,7,8 - Hexachlordibenzofuran (HxCDF)	0.1	0.001	0.0001
2,3,4,6,7,8 - Hexachlordibenzofuran (HxCDF)	0.1	0.006	0.0006
1,2,3,4,6,7,8 - Heptachlordibenzofuran (HpCDF)	0.01	0.016	0.00016
1,2,3,4,7,8,9 - Heptachlordibenzofuran (HpCDF)	0.01	0.002	0.00002
Octachlordibenzofuran (OCDF)	0.001	0.007	0.000007
Total		0.153	0.012246

Table 2:

Congeners evaluated according to WHO (changes versus NATO-CCMS I-TEFs are given in bold letters)	**new WHO-TEF**	Measured concentration [ng/m^3]	Evaluated emission value [ng new WHO-TEF/m^3]
2,3,7,8 - Tetrachlordibenzodioxin (TCDD)	1	0.001	0.001
1,2,3,7,8 - Pentachlordibenzodioxin (PeCDD)	**1**	0.001	0.001
1,2,3,4,7,8 - Hexachlordibenzodioxin (HxCDD)	0.1	0.002	0.0002
1,2,3,7,8,9 - Hexachlordibenzodioxin (HxCDD)	0.1	0.004	0.0004
1,2,3,6,7,8 - Hexachlordibenzodioxin (HxCDD)	0.1	0.002	0.0002
1,2,3,4,6,7,8 - Heptachlordibenzodioxin (HpCDD)	0.01	0.022	0.00022
Octachlordibenzodioxin (OCDD)	**0.0001**	0.039	0.0000039
2,3,7,8 - Tetrachlordibenzofuran (TCDF)	0.1	0.009	0.0009
2,3,4,7,8 - Pentachlordibenzofuran (PeCDF)	0.5	0.011	0.0055
1,2,3,7,8 - Pentachlordibenzofuran (PeCDF)	0.05	0.012	0.0006
1,2,3,4,7,8 - Hexachlordibenzofuran (HxCDF)	0.1	0.010	0.001
1,2,3,7,8,9 - Hexachlordibenzofuran (HxCDF)	0.1	0.008	0.0008
1,2,3,6,7,8 - Hexachlordibenzofuran (HxCDF)	0.1	0.001	0.0001
2,3,4,6,7,8 - Hexachlordibenzofuran (HxCDF)	0.1	0.006	0.0006
1,2,3,4,6,7,8 - Heptachlordibenzofuran (HpCDF)	0.01	0.016	0.00016
1,2,3,4,7,8,9 - Heptachlordibenzofuran (HpCDF)	0.01	0.002	0.00002
Octachlordibenzofuran (OCDF)	**0.0001**	0.007	0.0000007
Total		0.153	0.0127046

3. Impact Estimation of Coplanar PCBs included by the WHO on the Dioxin Emission Value (new WHO-TEF) in Waste Incineration

The impact estimation of the additional evaluation of 12 coplanar (non-ortho substituted, i.e. not 2,2' or 6,6' chlorinated) PCBs by WHO on the dioxin emission value (new WHO-TEF) of waste incineration plants involves the problem that the data base in this area is insufficient. In the past, PCBs have mainly been determined in commercial products and waste oil. Six PCBs out of a total of 209 PCB congeners (nos. 28, 52, 101, 138, 153, 180) as covered by the German Industrial Norm (DIN 51527) were usually used for this purpose. Calibration standards are available for these PCBs, and measurement and analysis methods exist for both waste oil and commercial PCB products as well as for the determination of PCB concentrations in treated waste gas of waste incinerators. These PCB compounds commonly used in Germany are also employed to determine the total sum of PCBs in the waste gas of waste incineration plants. Another possibility of determining the total emission of PCBs consists of the determination of the sums of PCB homologues. Corresponding data can be found in the literature.

It is known from PCB measurements in waste incineration plants complying with the requirements of 17th BImSchV that the total emission of PCBs as determined using the concentration values of six PCBs is in the range of 1-10 ng/m^3. At plants complying with the 17th BImSchV dioxin limit value of 0.1 ng I-TEF/m^3, the total PCB emission is more likely in the range of 1-2 ng/m^3. However, there is a publication reporting results from earlier measurements at a waste incineration plant (Wilken et al., 1994), which puts total PCB emissions at a range of 50 to 110 ng/m^3. This range was obtained by multiplying the sum of the six congeners measured according to DIN 51527 (8.4 - 22.1 ng/m^3) by a factor of 5. For the comparison with the above-cited measuring results from other plants, it must be taken into account that the sum of the six PCBs thus only accounts for about a fifth of these total PCB emissions.

Tables 3 and 4 show the 12 PCB congeners that have been additionally included by WHO, and the associated new WHO-TEFs. From the evaluation it can be seen that WHO did not include any of the six (DIN) PCB congeners commonly measured in Germany.

For the exemplary calculations presented in Tables 3 and 4, use was made of data from a study (Behnisch, 1997) in which waste gas measurements were performed in waste incineration plants to determine emissions of PCDD/PCDFs and which included 11 of the WHO's 12 PCB congeners. These investigations were carried out at a time when the waste incineration plants concerned did not yet, or were not yet required to, comply with the dioxin limit value of 0.1 ng I-TEF/m^3. Nevertheless, the measuring results from this study can be used to obtain an estimate, in terms of order of magnitude, of the impact which the inclusion of the 12 PCB congeners would have on the compliance with the dioxin emission limit value (new WHO-TEF) in waste incineration. In the two examples shown in Tables 3 and 4, two series of measurement carried out at a waste incinerator are compared. The data available from these measurements comprise the total PCB emission of the six DIN-PCBs and of 11 of the 12 WHO-PCBs as well as the PCDD/PCDF (new WHO-TEF) value.

Table 3:

Evaluation by WHO for 12 PCBs	**new WHO-TEF**	Measured concentration [ng/m^3]	Evaluated emission value [ng new WHO-TEF/m^3]
3,4,4',5 - TCB (81)	**0.0001**	n.d.	-
3,3',4,4' - TCB (77)	**0.0001**	0.46	0.000046
3,3',4,4',5 - PeCB (126)	**0.1**	0.34	0.034
3,3',4,4',5,5' - HxCB (169)	**0.01**	0.18	0.0018
2,3,3',4,4' - PeCB (105)	**0.0001**	<0,4	0.00004
2,3,4,4',5 - PeCB (114)	**0.0005**	<0,4	0.0002
2,3',4,4',5 - PeCB (118)	**0.0001**	0.44	0.000044
2',3,4,4',5 - PeCB (123)	**0.0001**	0.44	0.000044
2,3,3',4,4',5 - HxCB (156)	**0.0005**	0.36	0.00018
2,3,3',4,4',5' - HxCB (157)	**0.0005**	<0,3	0.00015
2,3',4,4',5,5' - HxCB (167)	**0.00001**	0.13	0.0000013
2,3,3',4,4',5,5' - HpCB (189)	**0.0001**	0.10	0.00001
Total		3.55	0.036
Sum of the 6 DIN-PCBs	[ng/m^3]	6.89	
PCDD/PCDF NATO-CCMS	[ng I-TEF/m^3]	1.26	

n.d.: not determined

Table 4:

Evaluation by WHO for 12 PCBs	**new WHO-TEF**	Measured concentration [ng/m^3]	Evaluated emission value [ng new WHO-TEF/m^3]
3,4,4',5 - TCB (81)	**0.0001**	n.d.	-
3,3',4,4' - TCB (77)	**0.0001**	4.58	0.000458
3,3',4,4',5 - PeCB (126)	**0.1**	2.90	0.29
3,3',4,4',5,5' - HxCB (169)	**0.01**	0.84	0.0084
2,3,3',4,4' - PeCB (105)	**0.0001**	1.42	0.000142
2,3,4,4',5 - PeCB (114)	**0.0005**	0.68	0.00034
2,3',4,4',5 - PeCB (118)	**0.0001**	2.38	0.000238
2',3,4,4',5 - PeCB (123)	**0.0001**	2.38	0.000238
2,3,3',4,4',5 - HxCB (156)	**0.0005**	1.64	0.00082
2,3,3',4,4',5' - HxCB (157)	**0.0005**	0.60	0.0003
2,3',4,4',5,5' - HxCB (167)	**0.00001**	0.94	0.0000094
2,3,3',4,4',5,5' - HpCB (189)	**0.0001**	0.98	0.000098
Total		19.34	0.301
Sum of the 6 DIN-PCBs	[ng/m^3]	14.0	
PCDD/PCDF NATO-CCMS	[ng I-TEF/m^3]	4.53	

The comparison of the two exemplary calculations presented above shows that the evaluated total emission of the WHO-PCBs decreases with the dioxin (new WHO-TEF) emission value. In the study referred to above (Behnisch, 1997), a figure of ~3.1% is given as the average contribution of the WHO-PCBs to the dioxin I-TEF values determined in all measurements carried out at a plant. The dominant PCB I-TEF value is that of PCB 126. From this it was concluded that when waste gas measurements are performed at waste incinerators, it would be sufficient to merely include PCB 126, as the only congener among the dioxin-like coplanar PCBs, in the calculation of the total dioxin I-TEF value.

The calculation presented in the following serves to get an idea of the order of magnitude of the possible additional potential for WHO-PCB emissions from a waste incineration plant which complies with or has emission levels significantly lower than the dioxin limit value.
In reference (Tejima et al., 1998), the contribution of coplanar PCBs to a total I-TEF value (PCDD/PCDFs and PCBs) is given as 1.5% - 3.5%. Assuming that the total dioxin emission value of 0.0127 ng I-TEF/m^3 calculated in Chapter 2 on the basis of the new WHO-TEFs is a 96.5% value, the contribution of the 12 coplanar WHO-PCBs to the 100% total I-TEF value of 0.0131606 ng I-TEF/m^3 would be in the order of 0.00046 ng I-TEF/m^3. This means that given the current low level of dioxin emissions from waste incinerators, the additional coplanar PCBs would not contribute to emissions reaching excess levels of the limit value of 0.1 ng I-TEF/m^3. A close relationship exists between concentrations in waste gas that were determined for coplanar PBCs and those for dioxins/furans, with the emissions of the coplanar PCBs decreasing with the emissions of dioxins/furans. They ascribe this effect to the simultaneous action of measures to reduce the emissions of dioxins/furans.

4. Current Measurement Results from two Waste Incineration Plants in Germany

4.1 MSW Incinerator in Bielefeld-Herford

Thanks to the cooperation of the operators of the MSW incinerator in Bielefeld-Herford, the concentrations of the new WHO-PCBs were determined in addition to those of PCDD/PCDFs on three days in December 1999. This means that current measurement results are now available from a plant which safely complies with the PCDD/PCDF emission limit value of 0.1 ng I-TEF/m^3. At this grate-firing waste incinerator, an annual volume of about 316,000 tons of residual municipal waste is subjected to thermal treatment. Waste gas treatment at this plant consists of the following: electrostatic precipitation, spray drying, two-stage scrubbing in conjunction with aerosol removal, DENOx-SCR catalyst with oxidation catalyst, and entrained-flow reactor. The results of the three measuring series are presented in the following (Tables 5 to 7). The sums of the 12 WHO-PCBs range from 0.00113 ng TEF/m^3 to 0.00235 ng TEF/m^3. The conclusion that low PCDD/PCDF emission values coincide with low PCB emission values is confirmed by these measurements.

4.2 MSW Incinerator in Hamburg

Thanks to the cooperation of the plant operators, measurements were also carried out at the MSW incinerator in Hamburg on two days in May 2000 to determine the concentrations of the WHO-PCBs in addition to those of PCDD/PCDFs. This means that current measurement results are available from a second plant that safely complies with the PCDF/PCDF emission limit value of 0.1 ng I-TEF/m^3. This grate-firing waste incineration plant is designed to thermally treat an annual volume of about 320,000 tons of residual municipal waste. Waste gas treatment at this plant consists of SNCR, a fabric filter with

Table 5:

Evaluation by WHO for 12 PCBs (first measurement)	**new WHO-TEF**	Measured concentration [ng/m^3]	Evaluated emission value [ng new WHO-TEF/m^3]
3,4,4‘,5 - TCB (81)	**0.0001**	< 0.01	0.000001
3,3‘,4,4‘ - TCB (77)	**0.0001**	< 0.02	0.000002
3,3‘,4,4‘,5 - PeCB (126)	**0.1**	< 0.02	0.002
3,3‘,4,4‘,5,5‘ - HxCB (169)	**0.01**	< 0.03	0.0003
2,3,3‘,4,4‘ - PeCB (105)	**0.0001**	< 0.03	0.000003
2,3,4,4‘,5 - PeCB (114)	**0.0005**	< 0.02	0.00001
2,3‘,4,4‘,5 - PeCB (118)	**0.0001**	< 0.08	0.000008
2‘,3,4,4‘,5 - PeCB (123/106)	**0.0001**	< 0.02	0.000002
2,3,3‘,4,4‘,5 - HxCB (156)	**0.0005**	< 0.03	0.000015
2,3,3‘,4,4‘,5‘ - HxCB (157)	**0.0005**	< 0.02	0.00001
2,3‘,4,4‘,5,5‘ - HxCB (167)	**0.00001**	< 0.02	0.0000002
2,3,3‘,4,4‘,5,5‘ - HpCB (189)	**0.0001**	< 0.02	0.000002
Sum of the 12 PCBs according to WHO		< 0.32	0.00235
PCDD/PCDFs NATO-CCMS [ng I-TEF/m^3]		0.0006	
PCDD/PCDFs NATO-CCMS [ng I-TEF/m^3] incl. detection limit		0.0009	
Total C [mg/m^3]		0.09	
CO [mg/m^3]		7.3	

Table 6:

Evaluation by WHO for 12 PCBs (second measurement)	Measured concentration [ng/m^3]	Evaluated emission value [ng new WHO-TEF/m^3]
Sum of the 12 PCBs according to WHO	< 0.28	0.00215
PCDD/PCDFs NATO-CCMS [ng I-TEF/m^3]	0.0007	
PCDD/PCDFs NATO-CCMS [ng I-TEF/m^3] incl. detection limit	0.0009	
Total C [mg/m^3]	0.2	
CO [mg/m^3]	10.4	

Table 7:

Evaluation by WHO for 12 PCBs (third measurement)	Measured concentration [ng/m^3]	Evaluated emission value [ng new WHO-TEF/m^3]
Sum of the 12 PCBs according to WHO	< 0.19	0.00113
PCDD/PCDFs NATO-CCMS [ng I-TEF/m^3]	0.0005	
PCDD/PCDFs NATO-CCMS [ng I-TEF/m^3] incl. detection limit	0.0008	
Total C [mg/m^3]	0.16	
CO [mg/m^3]	6.0	

addition of hearth oven coke, a HCl scrubber, a SO_2 scrubber, and an entrained-flow reactor. The results from the two measurement series are shown in Tables 8 and 9. The sums of the 12 WHO-PCBs in the two measurements range from 0.0007 to 0.00075 ng TEF/m^3. The conclusion that low PCDD/PCDF emission values coincide with low PCB emission values was confirmed by these measurements as well.

Table 8:

Evaluation by WHO for 12 PCBs (first measurement)	**new WHO-TEF**	Measured concentration [ng/m^3]	Evaluated emission value [ng new WHO-TEF/m^3]
3,4,4‘,5 - TCB (81)	**0.0001**	< 0.01	0.000001
3,3‘,4,4‘ - TCB (77)	**0.0001**	< 0.2	0.00002
3,3‘,4,4‘,5 - PeCB (126)	**0.1**	< 0.005	0.0005
3,3‘,4,4‘,5,5‘ - HxCB (169)	**0.01**	< 0.005	0.00005
2,3,3‘,4,4‘ - PeCB (105)	**0.0001**	< 0.3	0.00003
2,3,4,4‘,5 - PeCB (114)	**0.0005**	< 0.03	0.000015
2,3‘,4,4‘,5 - PeCB (118)	**0.0001**	<0.9	0.00009
2‘,3,4,4‘,5 - PeCB (123/106)	**0.0001**	< 0.09	0.000009
2,3,3‘,4,4‘,5 - HxCB (156)	**0.0005**	< 0.05	0.000025
2,3,3‘,4,4‘,5‘ - HxCB (157)	**0.0005**	< 0.01	0.000005
2,3‘,4,4‘,5,5‘ - HxCB (167)	**0.00001**	< 0.03	0.0000003
2,3,3‘,4,4‘,5,5‘ - HpCB (189)	**0.0001**	< 0.01	0.000001
Sum of the 12 PCBs according to WHO		< 1.64	0.0007463
PCDD/PCDF NATO-CCMS [ng I-TEF/m^3]		0.00101	
Total C [mg/m^3]		0.07	
CO [mg/m^3]		4.998	

Table 9:

Evaluation by WHO for 12 PCBs (second measurement)	Measured concentration [ng/m^3]	Evaluated emission value [ng new WHO-TEF/m^3]
Sum of the 12 PCBs according to WHO	< 1.6	0.0007
PCDD/PCDF NATO-CCMS [ng I-TEF/m^3]	0.00052	
Total C [mg/m^3]	0.34	
CO [mg/m^3]	7.95	

5. Summary

While for PCDD/PCDFs available data are sufficient to permit conclusions to be drawn as to the impact of the revision of the new WHO-TEFs on compliance with the dioxin emission value for waste incineration plants, the limited availability of measurement data made it impossible in the past to fully examine this question and give more than an estimate for the WHO's coplanar PCBs. Due to current measurement data from the MSW incinerators in Bielefeld-Herford and Hamburg it has become possible to establish a direct relation between low PCDD/PCDF values and results obtained for the 12 WHO-PCBs.

The results of these investigations confirm the statement, made in Chapter 3, that in view of the very low PCDD/PCDF emission level normally achieved by waste incineration plants, the additional inclusion of the 12 WHO-PCBs and the application of the WHO-TEFs do not contribute significantly to higher values being obtained in the evaluation/calculation of actual emission levels and consequently do not result in the dioxin (I-TEF) limit value laid down in 17^{th} BImSchV being exceeded. Among the TEF values of the new WHO-PCBs, PCB 126 plays a dominant role. Therefore, when waste gas measurements are performed in waste incineration plants, it might be sufficient to merely include PCB 126, as the only congener among the dioxin-like coplanar PCBs, in the calculation of the I-TEF value for dioxins.

6. References

Wilken, M., Böske, J., Jager, J., Zeschmar-Lahl, L., 1994: "PCDD/PCDF, PCB, Chlorobenzene, and Chlorophenol emissions of a municipal solid waste incineration plant (MSWI), Chemosphere 29, pp. 2039-2050.

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Tejima, H., Shibakawa, S., Osumi, K., Kawashima, M., 1998: Dioxin Emission Behavior in MSW Incinerator Designed after Japanese Guidelines for Controlling Dioxin, Chemosphere, Vol. 37, Nos 9-12, pp. 2309-2314, Elsevier Science Ltd., UK.

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NOTES AND NEWS

Air Pollution Abatement Planning in Europe

This international workshop has served as a forum for exchanging experiences on the national implementation of the EU air quality directives with emphasis on air pollution abatement measures. Therefore experts from the competent authorities of Member States, accession countries as well as Switzerland and Norway and representatives of NGO's and industries were invited to participate and present their experiences in lectures and discussions in an international workshop, beginning of April 2003 in Berlin, Germany.

The workshop of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Ministerium für Umwelt, Naturschutz und Reaktorsicherheit – BMU) within the framework of the Clean Air for Europe (CAFE) Programme of the European Commission was organized by the German Federal Environmental Agency (Umweltbundesamt – UBA) with technical support from Ecologic – Institute for International and European Environmental Policy supported by the Berlin Senate.
On the basis of the EC Air Quality Framework Directive (Council Directive on ambient air quality assessment and management – 96/62/EC) the Directives

- 1999/30/EC (Council Directive relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air – so-called First Daughter Directive) and

- 2000/69/EC (Directive of the European Parliament and the Council relating to limit values for benzene and carbon monoxide in ambient air - so-called Second Daughter Directive)

set new ambitious limit values for the protection of human health, ecosystems and vegetation, which have to be complied with by the EU Member States with effect from 2005 or 2010, respectively. Mainly with respect to particulate matter (PM_{10}) and NO_2, European states envisage problems to meet the limit values. The necessary measures to meet these targets have to be worked out and prepared in the individual Member States. The accession countries also have to take these necessities into account.

The main goals of the workshop were continuing and intensifying the process of an international exchange of experiences with the on-going activities which was started by a workshop in September 2001 in Bruges.
It focused on the exchange of information regarding experiences in the field of air pollution abatement measures – both their planning (drawing up action plans according to art. 7 (3) and preparation of plans or programmes according to art. 8 (3) of the Framework Directive) and their implementation. Furthermore, it is expected to get essential input for the preparation of the review process for the EC Directives 1999/30/EC and 2000/69/EC that is scheduled for 2003/2004.

Presentations and discussion during the workshop included among others the following aspects:

- Examples of preliminary plans/programmes/approaches to solving air pollution problems (from local to national level).
- Methods to identify measures that are appropriate, expedient, efficient and practicable, in order to make sure that the limit values are met within the envisaged periods of time.
- Which authorities have an active role in and with the plans/programmes?
- Use of different enforcement tools (e. g. legislative, administrative and/or economic/fiscal instruments).
- Problems/obstacles occurring during the implementation of abatement measures.
- Acceptance of measures by the parties of concern and the public.
- Application of dispersion models for cause analysis and prognosis.
- Scenario calculations for the effectiveness of local, national and EU-wide measures, in particular national impacts of EC Directives on emission limitations in force. Benefits from the Seville process?
- Is there a need for additional EC-wide or even global measures?

Abstracts and other papers are available on: http://www.ecologic.de/airpollution2003/docs/about.htm

Transport, Health and Environment - Pan-European Programme (THE PEP)

The first meeting of the Steering Committee (THE PEP), held at the beginning of April 2003 in Geneva, Switzerland, discussed and endorsed the programme of work for the implementation of THE PEP for the period January 2003 to December 2005. Proposals submitted to the attention of the Steering Committee included the following:

- Establishment of a clearing house on transport, environment and health;
- Elaboration and Implementation of urban plans for transport sustainable for health and the environment;
- Transport-related health impacts and their costs (collaborative project of Austria, France, Malta, The Netherlands, Sweden, Switzerland);
- Establishment of a set of indicators to monitor the integration of environmental and health aspects into transport policies and the impact of these policies on health and the environment.

The Steering Committee also established a network of national focal points, consisting of representatives from member states and organizations participating in the sessions of the Steering Committee, that will be responsible for the follow-up of THE PEP within their respective countries and organizations, for the dissemination of information to all the relevant stakeholders, and for coordinating the positions of their respective countries and organizations in the Steering Committee.

An international workshop on “Transport Related Health Impacts – Review of Exposures and Epidemiological Status” took place mid of April 2003 in Vienna, Austria. This workshop was the first one out of a workshop series in the frame of the transnational project on “Transport Related Health Impacts – Costs and Benefits with a Particular Focus on Children” launched jointly by Austria, France, Malta, The Netherlands, Sweden and Switzerland in cooperation with UNECE and WHO. The workshop as well as the project are contributions to the UNECE – WHO Pan-European-Programme for Transport, Health and the Environment – THE PEP. This initiative should also provide inputs to next year’s WHO Environment and Health Conference in Budapest with its planned Children’s Environment and Health Action Plan – CEHAP.

The Vienna Workshop focused on transport related health impacts: state of the art reviews were presented and discussed covering the topics air pollution, noise, physical activity, psycho-social effects, road safety and climate change. The workshop brought together governmental representatives in particular the relevant ministries of UNECE and WHO Euro Member States, the European Commission, international institutions, experts and stakeholders on transport, health and environment as well as economy and children affairs, scientists, the private sector and NGOs with a special interest and experience in children related transport, health and environment issues.

Task Force on Health Aspects of Long Range Transboundary Air Pollution

The Executive Body of the UNECE Convention on long-range transboundary air pollution established the Task Force in 1998, to assess the health effects of long-range transboundary air pollution (LRTAP) and provide supporting documentation. Assessments aim to quantify the contribution of transboundary air pollution to human health risks and help define priorities for guiding future monitoring and abatement strategies.

The Task Force works in the framework of the Working Group on Effects. It brings together experts delegated by countries that are Parties to the Convention, and its work is based on estimates of air pollution concentrations, in particular those derived by the Cooperative Programme for Monitoring and Evaluation of Long-range Transmission of Air Pollutants in Europe (EMEP), and on the results of hazard assessment performed by the WHO (e.g. in the scope of the revision of the WHO Air Quality Guidelines). Besides assessing the health significance of the pollution as an important input to designing pollution abatement strategies, the Task Force identifies the information required for improving assessments by providing advice to monitoring and modelling activities under the Convention.

Task Force Reports:

- Health risk of particulate matter from LRTAP – preliminary assessment (WHO/ECEH document 1999, electronic version available on request)
- Health risks of heavy metals from LRTAP
- Health risks of persistent organic pollutants from LRTAP

Subject of **The Sixth Task Force Meeting**, to be held from 22-23 May 2003 in Bonn, Germany, will be modelling and assessment of health impacts of particulate matter and ozone from LRTAP. Parties of the Convention and experts involved in health impact assessment of ozone and particulate matter will identify the present status of models, discuss the appropriateness of current methodologies to assess health effects and the availability in support of the Convention of LRTAP.

MEETINGS AND CONFERENCES

The Big Smoke: Fifty Years after the 1952 London Smog
9 to 10 December 2002 in London, UK

This major international conference has brought together many leading names in public health and research from government, academia, international organisations and others with an interest in the history and future of air pollution and public health. The conference reviewed the historical background to the 1952 smog and its health impacts. Furthermore the current state of London's air quality, along with that of other major cities, as well as new agendas for air pollution control after the 1950s were reflected. The conference has been organized by and held at the London School of Hygiene and Tropical Medicine and it was attended by more than two hundred participants.

Episodes of fog together with air pollution have been a feature of the London environment for several centuries. The weather conditions at the 1952 episode were typical of those to rise poor air quality in London. Between 5 and 8 December 1952, a dense fog covered greater London and the temperatures remained at or slightly below freezing. An anticyclone was centred over southern England with temperature inversion in the Thames valley. There was an almost complete absence of wind that provided the stagnant condition in which combustion products could not disperse.

The combustion cause was a mixture of industrial and domestic coal burning; back then virtually no-one had central heating. The coal used for domestic fires was of poor quality with a very high content of sulphur. During the smog, both smoke and sulphur dioxide concentrations reached exceptional levels (black smoke: 4.5 mg/m³, SO_2: 4 mg/m³). On 9 December, a southwesterly wind finally cleared the smog from all areas.

Official reports and publications estimated an excess of up to 4000 deaths in the two weeks from the onset of the episode. The increase of mortality was paralleled by increases in applications to hospital, hospital admissions and primary care consultations. The relative increase was similar across all aged groups, but the elderly were most affected. The main manifestations were problems with the respiratory (irritation of the upper and lower airways; elderly people with existing bronchitis were especially affected) and cardiovascular system. The relative increase in cardiovascular deaths and hospital admissions (predominantly ischaemic heart disease) was almost as great as for respiratory diseases.

But the adverse health effects of this episode were not unexpected. Indeed increases in mortality associated with smog situation had been documented in London and other UK cities for over a century. Incidents affecting the Meuse valley, Belgium, in 1930 and Donora, Pennsylvania, in 1948, both of which were small industrial towns in narrow valleys had been intensively investigated and reported. In response to the smog episode, the British government passed legislation to phase out coal fires, which meant initially many people transferred to paraffin heaters, until central heating became more widespread.

More information about the struggle for air quality in London since the great smog of December 1952 can be obtained from: http://www.london.gov.uk/approot/mayor/air_quality/docs/50_years_on.pdf .

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Healthy Housing Conference: Promoting Good Health
19 to 21 March 2003 at the University of Warwick, Coventry, UK

This conference, organized by the Warwick Law School and cosponsored / supported by the World Health Organization, the Chartered Institute of Environmental Health and the Royal Society for the Promotion of Health, was the fourth of a series of conferences arranged by the University of Warwick.

The motto of this conference was "Healthy Housing: promoting good health", following the former conference series on "Unhealthy Housing" with the mottos of "A diagnosis" (1986); "Prevention & Remedies" (1987); and "The public health response" (1991). Retrospectively, the motto was well-chosen, as most presentations stepped beyond the provision of mere research results, and directly addressed issues of application such as urban planning, housing construction and policy-making. As it was also discussed at the conference review of the last day, the conference brought to light a new direction of housing and health research, which is less targeted at the identification of problems, but the derivation of potential solutions. This narrowing-down on useful information for decision-makers was reflected by the frequent use of research approaches focusing on "evidence for planning"; the increasing number of intervention studies and longitudinal designs in order to identify the impact of housing conditions and improvements, and the integration of legislative frameworks.

Several examples were discussed which showed the start of joined-up and interdisciplinary thinking, as it was called for by the first presentation held by Roderick Lawrence from the University of Geneva. In this field, the recent adoption of the Housing and Health Safety Rating System (HHSRS) in the UK or the establishment of an Indoor Air Quality Surveillance System in France were seen as steps forward in the process of putting housing and health issues on the political agenda, as well as in the creation of multidisciplinary networks including urban planners, architects and Public Health professionals. This general trend to integrated approaches was e.g. represented by contributions from the Bonn Office of the WHO European Centre for Environment and Health (ECEH), advocating a broad definition of "housing" which includes both physical, mental and social aspects and covers the building as well as its surrounding. Health effects were seen in a holistic way, putting together various parameters such as noise, air quality, space, infestations or sanitation equipment in order to come to a general assessment of the impact of housing on well-being. Further presentations that focused on the understanding of "housing" in a more general way were for example a randomised trial study on housing improvements undertaken by the Universities of Plymouth and Exeter, the work of Peter Ambrose (University of Brighton) on the housing standards and the connected costs to the British National Health Service (NHS), or the literature review done by the Medical Research Council of Glasgow in order to maximise the health improvement potential of housing improvements. As a major trend, it was concluded that a large amount of studies showed that housing improvements were capable to produce health gains. However, due to questions of sample sizes, project designs and sometimes also conflicting results, the contributors also stated that solid evidence is still rare.

Next to this emerging trend of a broader view on housing and health issues, a second priority that became visible was the increased focus on the residents and the application of qualitative measures. Several contributions dealt for example with the experience of the residents (such as Peter Molyneux from the Housing and Health Network, or the use of heating systems during winter and the social implications for the household by Meryl Basham from the Peninsula Medical School). Also one presentation by the WHO ECEH Bonn Office was based on the perception and subjective assessment of housing conditions and their potential health impacts. Other examples included the risk group approach, which became visible in the contribution of Frances Heywood (University of Bristol) on the impact of housing adaptations for the residential life and well-being of handicapped people, or the work of the Reading University on the specific housing needs of children with visual impairments. The amount of such presentations showed that increasingly, research is focused on the experience and the perception of the residents, trying to identify the way occupants cope with the given situations and housing standards.

Still, a large amount of the presentations focused on selected elements of the housing-health relationship, such fuel poverty and excess winter mortality, home accidents, radon, or indoor air quality. Addressing one of the major Public Health campaigns in the UK today, a series of presentations elucidated the current status of research and "Warmer Homes"-strategies. A second focus were presentations on air quality issues, dealing with exposure to environmental tobacco smoke, dust mite allergens or current trends in indoor environment research. Providing research results from Scotland, the relationship between fuel poverty, air exchange and increasing building tightness were discussed as a causal factor in the rise of asthma. Further points were addressed with contributions covering the issues of home accidents in England, tuberculosis, UK policies on radon exposure, and urban rodent infestations. Making a specific focus on the home accident risk in the UK, Richard Moore identified home accidents such as falls or burns as the biggest health risks in UK homes, next to the issue of cold in winter. However, the presentation also highlighted the methodological challenge of collecting valid data on the number of home accidents happening in a population.

Many participants and contributors expressed their appreciation of the large amount of inputs from different sides and backgrounds, and it was felt that only a further integration of the individual parameters and exposures could pave a way towards a general and comprehensive understanding of "housing" as a health determinant. It was clear that the establishment of a "Global Burden of Disease"-like figure, which would attempt to quantify the amount of ill-health due to inadequate housing standards, was still not possible and that more multidisciplinary approaches would be required for this.

All in all, maybe the greatest achievement of the conference was this common understanding of the further tasks to tackle and the willingness for increased cross-cutting cooperation between the various disciplines. Agreeing on the need to focus the research work on applicable and outcome-oriented projects in order to produce sound evidence and inform policies, it was felt that such cooperation was not only needed between the different researchers working on housing and health, but also to integrate disciplines such as architecture or urban planning, economy or public health in this work. The current lack of these disciplines in housing and health approaches was also experienced at the conference, which mainly was visited by researchers and some housing stock managers from local authorities. Further challenges therefore were seen in an increased inclusion of health experts in this work, and an improved cooperation with the disciplines designing houses and neighbourhoods.
Still, for a real achievement of the "promotion of good health" through housing, as suggested by the motto of this conference, it will also be necessary to devote more work to the supportive and preventive aspects of the housing-health relationship: the positive impacts of good housing conditions still wait to be identified.

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PUBLICATIONS

WHO

The Health Effects of Indoor Air Pollution exposure in developing countries

N. Bruce et al., WHO Publications, Geneva 2002, 40 pages, available both in pdf and in html formats: http://www.who.int/peh/air/Indoor/oeh0205toc.htm

This review examines the evidence that indoor air pollution increases the risk of a range of health problems. It does not attempt to describe current work seeking to quantify the global burden of disease arising from this exposure.

Guidelines for Concentration and Exposure-Response Measurement of Fine and Ultra Fine Particulate Matter for Use in Epidemiological Studies

D. Schwela et al., published on behalf of the European Commission, WHO Publications, Geneva 2002, available both in pdf and in html formats: http://www.who.int/peh/air/PM/pmtoc.htm

There is increasing scientific and medical evidence that exposure to fine and ultra fine particulate matter could have relatively more significant health implications than exposure to larger particles or to other airborne pollutants. At present there is, however, not enough information available on the exposure-response relationship for fine and ultra fine particulate matter to consider appropriate guidelines, which would protect the whole population or at least the most susceptible groups. To facilitate this WHO undertook the task of developing Guidelines for Concentration and Exposure-Response Measurement of Fine and Ultra Fine Particulate Matter for Use in Epidemiological Studies to be used by national and international organizations undertaking studies in this area.

Addressing the Links between Indoor Air Pollution, Household Energy and Human Health - A Meeting Report

WHO Publications, Geneva 2002, available both in pdf and in html formats: http://www.who.int/mediacentre/events/HSD_Plaq_10.pdf

This report is based on a WHO/USAID global consultation on the health impact of indoor air pollution and household energy in developing countries (Washington DC, 3-4 May 2000).

OTHERS

The Chimney of the World

S. Mosley, The White Horse Press, Cambridge 2001, ISBN 1-874267-49-9, 288 pages, £ 35.00.

This book explains how and why air quality became an important and keenly contested issue in the world's first industrial city, Manchester, UK. It opens by looking at the devastating human and environmental costs of Manchester's steam-driven economic miracle, including acid rain, loss of biological diversity, and the adverse health impacts of air pollution.

A Citizen's Guide to Air Pollution (Second Edition)

D. Bates, R. Caton, The David Suzuki Foundation, Toronto 2002, ISBN 0-9689731-2-4, 392 pages. $ 25.00.

An authoritative collection of essays on air quality and air pollution, compiled by two leading experts in the field. A Citizen's Guide to Air Pollution is written primarily for policy makers and educators, but will also appeal to concerned citizens who want to have a greater understanding of air issues.

When Smoke Ran Like Water

D. Davis, Perseus Books, New York 2002, ISBN 0-456-01521-2, 336 pages, US $ 26.00. Information: www.whensmokeranlikewater.com

In When Smoke Ran Like Water, the world renowned epidemiologist Devra Davis confronts the public triumphs and private failures of her lifelong battle against environmental pollution. By turns impassioned and analytic, she documents the shocking toll of a public health disaster - 300,000 deaths a year in the U.S. and Europe from the effects of pollution - and asks why we remain silent. She shows how environmental toxins contribute to a broad spectrum of human diseases, including breast cancer, cardiovascular disease, asthma, and emphysema - all major killers-and in addition how these toxins affect the health and development of the heart and lungs, and even alter human reproductive capacity.

COMING EVENTS

2003

June 2003

XXII Congress of the European Academy of Allergology and Clinical Immunology (EAACI): Allergy as a Global Problem
7-11 June, Paris, France. For information, see :
http://www.congrex.com/eaaci2003/welcome.asp

14th International Congress of the International Society for Aerosols in Medicine
14-18 June, Baltimore, Maryland, USA.
Contact: cmenet@jhmi.edu

Symposium on Transport and Air Pollution
16-18 June, Avignon, France.
Symposium on Environment and Transport
19-29 June, Avignon, France. For information, see :
http://www.inrets.fr/services/services.e.html

July 2003

Healthy Buildings 2003: Official Conference of International Society of Indoor Air Quality and Climate (ISIAQ)
13-17 July, Singapore.
For information, see: http://www.HB2003.org

Int. Symposium on Indoor Air Quality Problems and Engineering Solutions
21-22 July, Research Triangle Park, North Carolina, USA. For information, see: http://www.awma.org/

August 2003

European Aerosol Conference 2003
31 August – 5 September, Madrid, Spain.
For information, see: http://apphys.uned.es/EAC2003

September 2003

Central and Eastern European Chapter of ISEE: The Future for Our Children
4-6 September, Balatonföldvár, Hungary.
Contact: paldy.oki@antsz.gov.hu

Air Pollution 2003 - 11th International Conference on Modelling, Monitoring and Management of Air Pollution
17-19 September, Catania, Italy. For information, see:
http://www.wessex.ac.uk/conferences/2003/air03/index.html

Environmental Health Risk 2003 – Second International Conference on the Impact of Environmental Factors on Health
17-19 September, Catania, Italy.
For information, see:
http://www.wessex.ac.uk/conferences/2003/healthrisk03/index.html

ISEA 2003, 13th Annual Conference: Exposure Analysis in Service of the Community
21-25 September, Stresa, Italy. For information, see: http://www.ISEAweb.org

October 2003

14th Regional IUAPPA Conference on Air Quality of Urban, Regional and Global Scales
6-10 October, Dubrovnik, Croatia.
Contact: vadic@imi.hr

2004

February 2004

Dubai International Conference on Atmospheric Pollution : Air Quality for Better Life in the Third Millennium
21-25 February, Dubai, United Arab Emirates.
For information, see: www.zayedprize.org

June 2004

XXIII Congress of the European Academy of Allergology and Clinical Immunology
12-16 June, Amsterdam, The Netherlands. For information, see: http://www.congrex.com/eaaci2004

97th Annual Conference / Exhibition of the Air and Waste Management Association
20-24 June, Indianapolis, Indiana, USA.
For information, see: www.awma.org

October 2004

13th World Clean Air Congress and Exhibition
24-29 October, Jerusalem, Israel. For information, see:
www.kenes.com/cleanair/

EDITORS' NOTE

We appreciate submissions to NOTES AND NEWS regarding programmes and projects within the field. Notes (100-500 words) should be sent directly to the WHO Collaborating Centre for Air Quality Management and Air Pollution Control.

The NEWSLETTER is published twice a year, circulated in 1700 issues, and distributed to readers in more than 50 countries. The NEWSLETTER does not constitute formal publication; it should not be reviewed, abstracted or quoted without prior permission. Authors alone are responsible for their articles.

Cover cartoon by Prof Michael Wagner, Berlin

Published by

WHO COLLABORATING CENTRE FOR AIR QUALITY
MANAGEMENT AND AIR POLLUTION CONTROL

at the

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