

Workshop on Emerging Pollutants in Non- Industrial Indoor Environments

NORMAN Workshop Report



**Workshop on
Emerging Pollutants
in Non-Industrial
Indoor Environments**



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ABSTRACT This workshop aimed to identify the current state of the art plus knowledge gaps and needs within the research field of CECs, covering both "old" and emerging SVOCs and NVOCs in non-industrial indoor environments. Further, it aimed to promote awareness of emerging pollutants in non-industrial indoor environments and the exchange of knowledge/ information, and to encourage enhanced collaboration by bringing together scientists in the field of CECs in indoor environments with expertise from building and consumer product sectors and stakeholders/regulatory authorities.		
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Preface

Exposure in non-industrial indoor air and dust is an important exposure pathway for emerging pollutants for humans, since we spend a high proportion of our time in indoor environments and the levels of many of the pollutants are often higher indoors than outdoors. Despite this, there is still a lack of knowledge as well as political and public awareness of the occurrence and distribution of emerging pollutants in non-industrial indoor environments and of the relationship between indoor levels and content in building materials/consumer products.

In 2014, a new working group (WG) on the Indoor Environment was established within the Network of reference laboratories, research centers and related organizations for monitoring of emerging environmental substances (NORMAN) (<http://www.norman-network.net>). This WG will act as a key player in the research area of “Chemicals of Emerging Concern” (CECs) in non-industrial indoor environments, and will also be an important link between policy and science. The main focus of the WG will be on compounds that partition between the indoor air and surface films/dusts (i.e. semi- and non-volatile organic compounds (SVOCs and NVOCs)). A kick-off meeting of the WG, held in December 2014, identified important issues and future aims for the WG, as well as a demand for a follow-up, wider scope workshop – including expertise beyond the WG (e.g. different research communities, stakeholders, authorities and building/product sectors).

This workshop aimed to identify the current state of the art plus knowledge gaps and needs within the research field of CECs, covering both “old” and emerging SVOCs and NVOCs in non-industrial indoor environments. Further, it aimed to promote awareness of emerging pollutants in non-industrial indoor environments and the exchange of knowledge/information, and to encourage enhanced collaboration by bringing together scientists in the field of CECs in indoor environments with expertise from building and consumer product sectors and stakeholders/regulatory authorities.

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Emerging Pollutants in Non-industrial Indoor Environments – Workshop summary report NORMAN Workshop Report

1 Introduction

A two-day workshop on “Emerging pollutants in non-industrial indoor environments” was hosted by the Norwegian Institute for Air Research (NILU) in June 2015. The workshop was jointly organized by NILU, NORMAN, and IVL (the Swedish Environmental Research Institute). The location for the workshop was “Kunnskapsbyen” in Kjeller, Norway. In total, 50 participants from eleven countries were present. Participants included scientists from different research fields - environment, human health, building/construction; stakeholders and regulatory authorities; building/construction enterprises; consumer product associations; and non-governmental organizations (NGOs).

The purpose of the workshop was to gather people from the different fields to raise awareness of the importance of emerging pollutants in non-industrial indoor environments. This was achieved by a combination of presentations and discussions with a focus on three interconnected topics:

- i) current knowledge/state-of-the-art;
- ii) building materials and consumer products – regulations and labelling;
- iii) analytical and sampling methodologies.



2 Workshop presentations and discussions

The workshop included four sessions with 18 oral presentations and dedicated discussion sessions. The programme and the individual presentations are available on the NORMAN web site (<http://www.norman-network.net/?q=node/260>).

In addition to the three focus areas, the presentations and discussions were also suggested to address specific topics:

1. How big is the problem with emerging pollutants – what message to give to policy-makers?

2. Occurrence and distribution of emerging pollutants in non-industrial indoor environments – what compounds are found, where are they found and at what concentrations?
3. Emissions and important pathways of emerging pollutants – as a result of consumer products use, applications, and eventual fate (direct emission, emission via abrasion, etc.)?
4. How to include emerging pollutants in regulations/standards/guidelines – are new approaches needed, what information is missing (e.g. emission factors)?
5. Sampling and analytical methodologies – possible to harmonise methods, how to assess emissions of emerging pollutants at an early stage?

3 Main messages

The three focus areas were addressed through presentations and fruitful discussions and the main messages from each area are presented below.

3.1 Current knowledge/state of the art

In line with the NORMAN definition, emerging pollutants are defined as compounds/substances: not included in regular monitoring programmes; newly/recently being observed in the environment (but not necessarily new); with a potential to pose significant risks; showing chronic effects at low doses; and not currently regulated, but identified as candidates for future regulations.

The strategies for identification of emerging pollutants include effect-based tools, non-target screening, suspect screening, and prioritisation. Prioritisation schemes allow the selection of priority compounds for further actions (e.g. monitoring campaigns, hazardous assessment, regulatory measures). The emerging pollutants can be found indoors in building materials, consumer products, air (gas and particle phase) and dust. Dust is an important exposure pathway to semi- and non-volatile compounds (SVOCs and NVOCs) and therefore an important matrix to sample. Indoor surfaces may also act as significant sinks and consequently as possible secondary sources for emission. Indoor chemical space plot diagrams with air and vertical and horizontal surfaces shows that vertical surfaces may also be recipients for emerging SVOCs and NVOCs.

A list of emerging indoor pollutants for which work/research is ongoing (within the indoor research field) includes flame retardants, plasticisers, bisphenols, perfluorinated compounds, biocides, personal care products, antioxidants, siloxanes etc. More research is needed for most of the pollutants on the list as well as for those not currently on the list.

Mapping the occurrence and distribution of emerging pollutants in indoor environments is important in order to increase knowledge and awareness in this field. In addition to measurements, modelling of the indoor fate and transport is a crucial tool. To improve modelling more knowledge of emission factors from materials/products, partitioning mechanisms/coefficients to other materials, and indoor-outdoor-indoor flows are needed. Both the research community and the building and consumer product sectors can contribute with more information here.

Early warning systems

As many of the new and emerging pollutants mainly have indoor sources, they can be identified and monitored in indoor environments at an earlier stage than in outdoor matrices. The indoor environment can thereby act as an early warning system for outdoor environmental matrices (e.g. ambient air, water, soil, biota). This is an important message to give to authorities and environmental researchers focusing on outdoor matrices.

3.2 Building materials and consumer products – regulations and labelling

Regulations (e.g. REACH, CLP etc) and labelling systems (BREEAM etc) oblige producers to report and register the content of their products. There are also voluntary systems like BASTA which address the inherent properties of the substances, rather than the specific (listed) substances. In addition, some voluntary systems have set limit values or requirements for some chemicals contained in building materials and consumer products, and to some extent what is emitted from the materials and products. The available regulations and labels are set only for chemicals that easily emit from materials (i.e. volatile chemicals) while less volatile chemicals are currently ignored. There has been so far a great focus on products that are problematic for allergies and greenhouse gases but there is generally less awareness about other health effects. As a result there is a gap in knowledge as well as in the focus of labelling systems with regards to the relevant occurrence and exposure pathways for both the “old” and the emerging SVOCs and NVOCs in indoor environments.

The building and consumer product sector have an interest in marketing healthy buildings and healthy products but there is no clear guidance on how to include SVOCs and NVOCs that are not emitted from products but instead are released via abrasion, etc.

In general, it is important to develop labelling systems that are easy for the end-users to understand.

Moreover, the science/research community should take initiatives towards stakeholders/policy-makers to promote entry into force of regulations and limit values for SVOCs and NVOCs in the indoor environment. In order to suggest such regulations or limit values, the authorities/policy makers need more information on the occurrence, levels, and transport and exposure pathways of chemicals of emerging concern. It was clear that more research is needed to raise awareness and provide new information to authorities/policy makers and building and consumer product sectors. In addition, the building/product sectors have emission data for some chemicals (mainly volatile organic compounds (VOCs)) and materials/products but these data are not easily available for researchers. As the lack of emission data is a limiting factor for emission modelling there is a need to challenge the industry to declare the content and emission data in their products.

It was also clear from the discussions that there is a big difference between countries/regions in how consumers are informed about risks connected with chemicals/products as well as in how well research is linked to other fields. There is a need for closer cooperation between science and industry, with better access to producers. One way to improve the link is to raise awareness among authorities of NORMAN’s work on its priority list of chemicals.

3.3 Analytical and sampling methodologies

Emerging pollutants in indoor environments are detected and measured in air and/or dust using a range of sampling methodologies such as active air sampling, passive air sampling, wipe sampling, vacuum cleaning sampling etc. Among the various methodologies there are few or no standardised approaches; instead research groups, etc. often develop/use their own approaches, especially for dust and wipe sampling. The heterogeneity in sampling methodologies causes large variations, inconsistent patterns (profiles) etc., and hampers the comparability of data among available studies.

Protocols have been established and are used for passive and active air sampling of VOCs and high concentrations of SVOCs. For low concentrations of SVOCs and NVOCs, there is a lack of sampling protocols for active and passive air sampling as well as for dust sampling. This is an obstacle for indoor measurements of SVOCs and NVOCs as well as for a possible NORMAN European monitoring campaign (which, was mentioned as an efficient way to raise awareness of emerging pollutants in indoor environments). Although sampling methodologies cannot be fully harmonised, as they need to be tailored to fit the purpose of the study, harmonised protocols are necessary in order to ensure comparability of data on emerging SVOCs and NVOCs, and in particular:

- harmonised sampling methodologies and protocols for both, air and dust sampling;
- protocols for matrix characterisation, in particular for dust.

Targeted analytical methodologies are important for quantitative measurements of emerging contaminants in air and dust. For detection of new unidentified emerging pollutants, the suspect or non-target screening analytical methodologies are important tools. To enhance the outcomes of suspect and non-target methodologies there was a request for enhanced exchange of analytical standards for emerging pollutants among non-target groups. Quality assurance and standardisation of analytical methods – for target, suspect and non-target analysis – will be ensured via collaborative trials/inter-lab comparisons.

In addition to characterising the occurrence and pathways for emerging pollutants in indoor environments there is also a need to link/combine indoor monitoring research to human health research – biomonitoring, pathways and exposure studies - as human health (exposure and toxicity) is the ultimate endpoint for studies on emerging pollutants in indoor environments.

One way to raise awareness and improve the knowledge of indoor pollutants is to gather and store available data in joint databases. In that way spatial and temporal patterns can be more easily observed. There is a need for agreements on how and where to store indoor data, both concentrations in indoor air and dust as well as product content. There is also a need to store raw data/spectra in order to perform retrospective analyses.

3.4 How can NORMAN WG 6 “Indoor environment” contribute – what is the way forward?

The workshop identified needs related to emerging pollutants in non-industrial indoor environments. NORMAN’s Working Group 6: “Indoor environment” can contribute by addressing these needs in future activities. For example:

To address the needs identified within the focus area “Building materials and consumer products – regulations and labelling” NORMAN can contribute by:

- Raising awareness of emerging pollutants in indoor environments;
- Establishing a link/relationship between the content of emerging SVOCs and NVOCs in building materials/consumer products and their indoor emissions, concentration levels and exposure pathways;
- Providing good scientific input for new/emerging SVOCs and NVOCs e.g. to be used in labelling schemes and European policies;
- Challenging industry to declare products content;
- Improving the communication/information sharing from science to policy-makers and further to consumers and vice versa;
- Establishing an early warning system based on early detection of new compounds in indoor environments;
- Organising large-scale sampling campaign(s) at European level to raise awareness among European policy-makers on pollutants/chemicals of emerging concern in indoor environments.

To address the needs identified within the focus area “Analytical and sampling methodologies” NORMAN can contribute by:

- Providing guidelines/protocols on sampling methodologies for emerging SVOCs and NVOCs – both air and dust;
- Comparing all available dust sampling methodologies;
- Developing guidelines to characterise indoor dust;
- Collecting indoor data from air, dust and consumer products in the NORMAN database;
- Storing indoor raw data in order to allow retrospective analysis in the future;
- Linking research in the field of indoor environments to ongoing research activities in the field of human health – biomonitoring, exposure
- Enabling exchange of analytical standards for emerging pollutants;
- Performing collaborative trials on both target, suspect and non-target analysis.

4 Main outcomes

The presentations and discussions during the workshop confirmed that the five focus points identified for the NORMAN Working Group 6 on “Indoor environment” are valid and highly relevant. However, several researchers and representatives from authorities pointed out that REACH and other regulations have severe limitations in the control of chemical substances imported into Europe as ingredients of articles/products. Measurements of chemicals of emerging concern and new compounds in the indoor environment can be used as an early

warning tool for the occurrence and dispersion of new emerging pollutants, not only for the indoor, BUT also for the ambient environment.

The following points are therefore suggested as primary focus for WG-6:

- Identifying which emerging chemicals and chemical groups are currently analysed in indoor air and dust and which are of concern for the indoor environment
- Improving harmonisation of measurement methods for the indoor environment (via the development of guidelines and organisation of interlaboratory studies)
- Characterising indoor emissions of emerging substances e.g. from products and articles using both measurements and modelling techniques
- Identifying important pathways of chemical exposure for humans indoors and pathways to the outdoor environment using both measurements and modelling techniques
- Improving links between policy and science in the field of the indoor environment
- *Applying and advertising indoor measurements of emerging compounds as an early warning tool for the general environments and for future inclusion in regulations.*

5 Participants

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NILU – Norwegian Institute for Air Research

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NILU's vision: Research for a clean atmosphere

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