

# INDOOR Air Quality and Health

We spend most of our time in enclosed spaces. Even more time is spent indoors by vulnerable people, such as children and ill and elderly people. Therefore, it is important to ensure that the air that we breathe indoors is good quality. A French study estimates that 20,000 deaths per year and 28,000 new cases of diseases are linked to indoor air pollution. The annual socio-economic cost of this is 19 billion euros<sup>1</sup>.

Indoor air quality (IAQ) comes from the construction quality of buildings and materials used, but also from how a building is used. The energy insecurity of some households can lead to the spread of indoor pollutants. There are several different

sources of pollution:

- pollution primarily resulting from **building**, interior furnishing and decoration **materials** (paints, glues, floor coverings, wood panelling, furniture),
- **lifestyle**-related pollution (smoking, aeration, ambience products, kitchen activities, laundry drying, maintenance and DIY, etc.),
- pollution from **equipment** such as a malfunctioning heater or CMV system,
- and lastly, pollution coming from the **outdoor** air or from the ground.

The main air pollutant are **chemical pollutants** such as volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), nitrogen oxide (NOx), carbon monoxide (CO), and polycyclic aromatic hydrocarbons (PAHs); **bio-contaminants** such as mould, pollen, acarid and cockroach allergens, and lastly **particles and fibres** such as asbestos and synthetic mineral fibres. **Damp** in a dwelling is not a

pollutant in itself, but can speed up the development of mould and acarids.



## Stronger if we act together

Indoor air quality is a subject that requires the different sectors within a community to act together. The basic principle is to **firstly take action upstream to reduce sources of pollutants**. In order to act effectively, interdisciplinary and cross-cutting action must mobilise various sectors (construction, health, economic development, transport, urban planning, etc.) and a large number of public and private stakeholders (occupants, landlords, companies, etc.).

Several organisations may support the considerations/actions of a city or intermunicipality. At local level, there are certain Regional Health Agencies, DREALs, ALECs and Air Agencies. At national level, there are the Ministries of Health and Ecology, the OQAI, the CSTB, the INERIS and the ADEME<sup>2</sup> and its "AACT-AIR" call for proposals for local authorities.

<sup>1</sup> Study conducted in 2013 by the National Health Security Agency (ANSES) and the Indoor Air Quality Observatory (OQAI) [www.oqai.fr/userdata/documents/454\\_Bulletin\\_OQAI7\\_Cout\\_economique\\_QAI.pdf](http://www.oqai.fr/userdata/documents/454_Bulletin_OQAI7_Cout_economique_QAI.pdf) or [www.anses.fr/fr/system/files/AUT-Ra-CoutAirInterieurSHS2014.pdf](http://www.anses.fr/fr/system/files/AUT-Ra-CoutAirInterieurSHS2014.pdf)

<sup>2</sup> DREAL = Regional Directorate for Environment, Development and Housing; ALEC = Local Energy and Climate Agency; OQAI = Indoor Air Quality Observatory; CSTB = Scientific and Technical Centre for Building; INERIS = National Institute for Industrial Environment and Risks; ADEME = Agency for the Environment and Energy Management

## Experiences of Healthy Cities

### Measurement campaigns

The City of **Grenoble** decided to anticipate regulatory obligations regarding indoor air quality monitoring in buildings frequented by children under 6 years old. The initial action measured concentrations of formaldehyde and assessed aeration/ventilation systems in 31 crèches and 43 nursery schools. The findings show that 67% of nursery schools and 90% of crèches have an average formaldehyde content below the regulatory guide level (30 µg/m<sup>3</sup>). An IAQ technical file is currently being created for each building and the IAQ is taken into account in the City's procurement contracts.

In **Aix-les-Bains**, a number of analysis campaigns on air quality (benzene, formaldehyde, CO<sub>2</sub> and radon) during the heating and non-heating season in 21 nursery schools, crèches and leisure centres, were combined with an acoustic assessment and a thermal evaluation as part of a comprehensive approach. Any shortcomings detected were rectified by means of construction works. An exhibition on indoor air quality was also developed to go alongside the results and raise awareness among cleaning and maintenance staff. Moreover, in association with the UFC/Que choisir consumer association, the City is conducting radon measurements in accommodation on request, and where necessary, proposing technical solutions.

A naturally occurring radioactive gas, radon causes approximately 2,000 deaths per year in France from lung cancer. Following the detection of radon in a school in **Nantes**, annual awareness-raising campaigns on the risk related to the accumulation of this gas in accommodation and more generally on indoor air pollutants have been taking place in the districts involved since 2007. Radon measurements are systematically conducted in municipal schools and crèches. More than 900 measurements have been taken in private accommodation: 28% > than 300 Bq/m<sup>3</sup>, of which 3% > 1,000 Bq/m<sup>3</sup>. A detailed diagnosis is offered by the City Health department and the Centre for Studies and Expertise on Risks, the Environment,

Mobility and Development (CEREMA) for dwellings presenting high levels.

### Changing public procurement procedures

Owing to their ingredients and/or the way in which they are used, cleaning products can contribute to the degradation of indoor air quality and the health of users and people who frequent the space. In 2013, the City of **Rennes** incorporated a "health" criterion into the cleaning products contract. This work was carried out in three main steps: (1) drafting of specifications with specific criteria on product composition, (2) creation of a scoring scale, (3) scoring of 350 products proposed by candidates based on information contained in the safety data sheets (SDSs) and technical data sheets. The "health" scores of each product were incorporated into candidates' overall scores. Subsequently, in 2015 Rennes decided to no longer use any type of deodorising product (aerosol sprays, air fresheners, etc.) in municipal buildings.

Since 2013, the City of **Lyon** has encouraged a cross-cutting approach with indoor air diagnosis campaigns, which has characterised the set of 52 municipal facilities for young children. These diagnoses have led to the approval of very low-emission purchasing policies and cleaning protocols, and have brought to light other practices to be adapted – substantial use of hydro-alcoholic gels and felt-tip pens for whiteboards, and delivery of beds without prior ventilation. The director of the facility, the maintenance officer and the technician in charge of maintaining ventilation equipment participate in refocusing priorities – fixing CMV breakdowns or undersizing, improving openings, and reminding personnel of manual ventilation recommendations.

### Taking action on housing

**Montreuil** has made preventing energy insecurity-related diseases and identifying action levers a priority. This involves flagging up housing affected on the basis of medical and energy reports, and also discussions with households and cross-matching data (construction, health and energy). Each year, 40 to 50 new files are examined.



### Awareness raising and training

**Belfort** is developing a network of professionals, with a view to delivering simple awareness-raising messages regarding indoor air quality as close as possible to residents. Following a 15-hour training course, this awareness-raising initiative can be rolled out either in the context of various health forums organised by the Community Centre for Social Action (CCAS), or with target groups (schoolchildren, "Femmes Relais" associations, senior citizens associations, etc.). An awareness-raising kit is currently being developed (5 constituent tools for the general public & a video).

The vast majority of schools in the City of **La Rochelle** are housed in old buildings without ventilation systems. Supported by the ADEME and following a needs analysis, the City of La Rochelle plans to create a general ventilation recommendations guide, per type of building, according to their emission potential and the activities practised therein. This guide will adapt the recommended ventilation guidelines, which will be tested and cross-referenced with continuous measurements of pollutants (formaldehyde, benzene, etc.) in a test building.

#### The difference between AERATION and VENTILATION

**Aeration:** To aerate is to open a window for at least a few minutes to let fresh air enter, both in summer and in winter. Aeration has a more powerful flow than ventilation, but it is irregular. The recommendation of aerating all accommodation for at least 10 minutes a day continues to apply.

**Ventilation:** Ventilation is the system that allows the air in a building to be continuously refreshed, and requires regular maintenance. Ventilation can be natural (through grating) or electric (controlled manual ventilation - CMV).

Professionals who work in private households (nurses, carers, family workers, etc.) play a special role in terms of providing families with information. This is why **Nancy**, together with its partners, is organising awareness-raising days for these professionals on indoor air issues, which will take place on 8 sites.

**Saint-Quentin-en-Yvelines** has designed an educational kit comprising three board games for all ages, based

on the life and the environment of the "Bon'Air®" family. Through a playful approach, the aim of these games is to raise awareness of the importance of indoor air quality and its impact on health, and to encourage simple everyday actions.



As part of Sustainable Development Week 2015, **Cannes** organised a workshop for the "adult" general public on indoor air quality of housing and its impact on health. As part of its annual Health and Environment Days 2015, **Orléans** chose to focus on air. An "air village" was set up in the city centre with specific workshops on considering air in everyday life – fine particles, pollutants in housing, breathing physical therapy, etc. On the request of a social centre, the City of **Roubaix** organised a workshop on "Housing Maintenance". Participants obtained a better understanding of the impact on their health of certain cleaning products and the pictograms associated with these products. They also played a board game called "Justin peu d'air®" where they had to spot dangerous or inappropriate situations in each room of the house.

## Key levers of Local Authorities

### Changing public procurement procedures

Taking air quality into account at the public procurement stage seems to be an effective lever for authorities. Contracts that allow for air quality to be taken into account are often split into several categories – school supplies, furniture, cleaning products, building materials, etc. and represent many of the opportunities for reducing emissions at source. The authority must also monitor the specifications once the contract has been awarded.

In principle, since 2012, all building and decorative materials have had a simple label<sup>3</sup> that states their volatile pollutant emission level, going from A+ (very low emissions) up to C (high emissions).

Safety data sheets (SDSs) enable the composition of a product to be checked. It should be noted, however, that only substances whose concentration in a product exceeds a certain threshold are mentioned on these sheets. For schools, 6 substances are classified "high priority": formaldehyde, benzene, acetaldehyde, PM 10 and PM 2.5, and chromium<sup>4</sup>. Moreover, a number of certification labels have been developed. The ADEME has created a summary document that explains these different certification labels<sup>5</sup>.

### Measurement campaigns

Although indoor air measurements in schools and early childhood places are currently optional, there is a lot to gain from carrying out an inventory in the potentially most "high risk" buildings. Measurement campaigns can also be an opportunity for building managers to control the choices made in terms of furniture or cleaning products and also to raise awareness among their users.

### Raising awareness among staff and the public

Authorities will be able to raise awareness among their staff and the public on the main simple actions to take in order to improve indoor air quality of premises (regular maintenance of ventilation systems, aeration required during construction works, use of cleaning products with the lowest impact on the environment, etc.). Cleaning staff, the people who maintain ventilation systems, and

users of municipal facilities are all key stakeholders in the fight to improve air quality.

### In conclusion

All of these levers can be included in a **Municipal Plan for Indoor Air Quality**. As outdoor air also circulates in premises, this plan should also take into consideration municipal decisions that have an impact on outdoor air. The possible local levers in this regard can be found in another leaflet in this series produced by the Healthy Cities Network.

### We would like to thank...

The Working Group of the French Network of WHO Healthy Cities (RFVS-OMS)

Chair: City of **Grenoble**

Vice-Chair: City of **La Rochelle**

Other members: The Cities of **Aix-les-Bains, Bourgoin-Jallieu, Lille, Lyon, Nantes, Rennes, Valence**, and the intermunicipality of **Saint-Quentin-en-Yvelines**.

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#### Photo credits

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### For further information...

French network of WHO Healthy Cities: [www.villes-sante.com/qualite-air](http://www.villes-sante.com/qualite-air)

INPES: [www.prevention-maison.fr](http://www.prevention-maison.fr)

OQAI: [www.air-interieur.org](http://www.air-interieur.org)

DGS: [www.sante.gouv.fr/qualite-de-l-air-interieur-sommaire.html](http://www.sante.gouv.fr/qualite-de-l-air-interieur-sommaire.html)

DGPR: Guide pratique pour une meilleure qualité de l'air dans les lieux accueillant des enfants, Dec 2015  
[www.developpement-durable.gouv.fr/-Air-interieur-.html](http://www.developpement-durable.gouv.fr/-Air-interieur-.html)

ADEME: General public leaflets & its AACT-AIR call for proposals [www.ademe.fr](http://www.ademe.fr)

<sup>3</sup> [www.developpement-durable.gouv.fr/Chapitre-I-Mode-d-emploi-de-l.html](http://www.developpement-durable.gouv.fr/Chapitre-I-Mode-d-emploi-de-l.html)

<sup>4</sup> Indoor Air Quality Observatory Report no. ESE/Santé 2010-095, Sept 2010

<sup>5</sup> [www.ademe.fr/sites/default/files/assets/documents/14-10\\_7706\\_logos\\_environnementaux.pdf](http://www.ademe.fr/sites/default/files/assets/documents/14-10_7706_logos_environnementaux.pdf)



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