

Interreg
CENTRAL EUROPE



InAirQ

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Development Fund

TRANSNATIONAL ADAPTION ACTIONS FOR INTEGRATED INDOOR AIR QUALITY MANAGEMENT

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THE ROAD TO THE JOINT TRANSNATIONAL STRATEGY FOR BETTER INDOOR AIR QUALITY: THE MONITORING CAMPAIGN

InAirQ project has just entered its third and final year.

This newsletter is a report of the project advancements and the meetings that took place, as well as the activities planned in the final year.

The InAirQ monitoring campaigns in the countries participating to the project have now ended, and the results of the monitoring campaign are being elaborated. During the third year of the project, action plans will be developed and testes as well as training materials will be elaborated.

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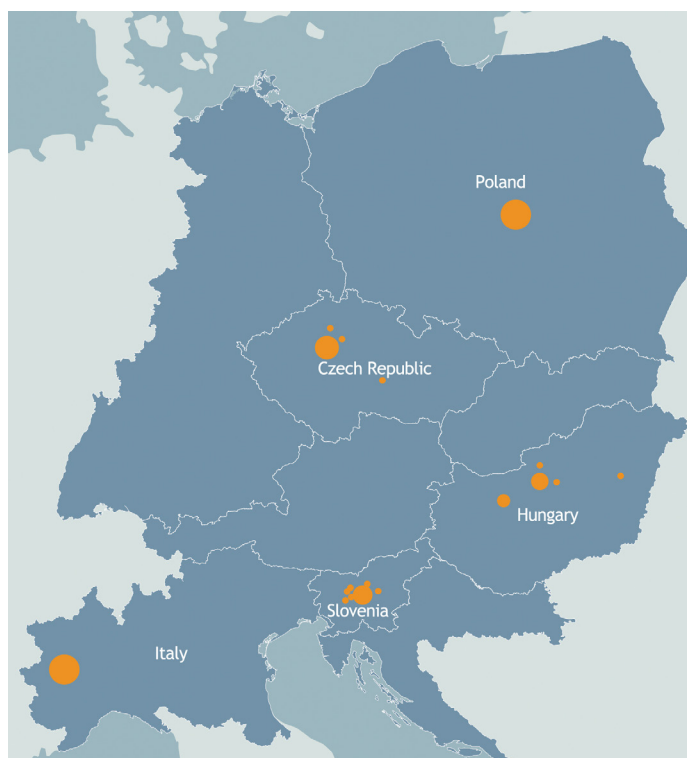
INDOOR AIR QUALITY MONITORING CAMPAIGN

The quality of the school environment, especially indoor air quality (IAQ), plays a key role in the children health development as well as in the well-being and performance of the pupils at school.

In Central Europe, children aged 6-14 spend approximately 6-9 hours per weekday in school buildings, therefore there is an increasing concern on IAQ in these microenvironments. Thus, the aim of the InAirQ project is to assess the health risk of indoor air pollutants on pupils in school buildings in Central Europe (Czech Republic, Hungary, Italy, Poland and Slovenia).

The air quality was investigated in 64 primary school buildings: 12 in Czech Republic, 16 in Hungary, 12 in Italy, 12 in Poland and 12 in Slovenia, during the heating period of school year 2017-2018 (October-February).

In each school, air quality was monitored in one classroom and at an outdoor location from Monday morning to Friday afternoon; the sampling took place only when the classroom was occupied in order to provide a better estimate of what children actually breathe while in classrooms.



The results of the InAirQ monitoring campaigns are now being elaborated.





INDOOR AIR QUALITY MONITORING CAMPAIGN

PRELIMINARY RESULTS

The concentration of ten volatile organic compounds (benzene, toluene, xylenes, ethylbenzene, trichloroethylene, tetrachloroethylene, α -pinene, limonene, 2-ethylhexanol, styrene), five aldehydes (formaldehyde, acetaldehyde, propionaldehyde, benzaldehyde, hexanal), $PM_{2.5}$ mass, carbon dioxide, radon as well as temperature, relative humidity and air exchange rate were investigated.

Similar results were obtained for **volatile organic compounds** (except for benzene) and aldehydes for all countries both indoors and outdoors.

The concentration of **benzene** was higher than $5 \mu\text{g m}^{-3}$ (annual limit value set for the ambient air by the European Commission), in 10 out of the 12 school buildings investigated in Italy.

It must be noted that the concentration of benzene indoors was similar to that obtained for outdoors in all cases, which indicates the lack of indoor sources. The main source of benzene is vehicular emission.

Except from benzene, the other **BTEX compounds** (i.e., toluene, ethylbenzene and xylenes) were present in higher concentrations indoors than outdoors which indicate the presence of indoor sources. Wooden based products and fragranced consumer products (e.g., air fresheners) emit α -pinene. The concentration of this compound was usually higher indoors than outdoors.

The highest indoor/outdoor concentration ratios were obtained for **limonene** which is emitted from floor cleaning materials during the cleaning of the classrooms.

Formaldehyde can be formed during ozone-initiated reactions with reactive volatile organic compounds; moreover, formaldehyde can be directly emitted from building materials and consumer products.

The concentration of formaldehyde was always higher indoors than outdoors with a median indoor/outdoor concentration ratio of 4.1.

However, the concentration of formaldehyde never reached the World Health Organization guideline threshold ($100 \mu\text{g m}^{-3}$).

In general, the **$PM_{2.5}$ mass concentration** was higher indoors than outdoors and showed spatial pattern. It is well-known that the ambient $PM_{2.5}$ mass concentration is usually higher than the annual limit value ($25 \mu\text{g m}^{-3}$) set by the European Commission during winter.

Moreover, re-suspension of settled dust might contribute to the high PM concentration indoors.

The **carbon-dioxide** concentration was high in the majority of the classrooms, indicating an inappropriate ventilation.

In contrast, the **relative humidity** was below the healthy range (i.e. 40-60%) in many cases. The low relative humidity can cause dry eye and dry skin symptoms.

The **radon** level was around or below 100Bq m^{-3} , except for some locations in Hungary, Poland and Slovenia where the radon level exceeded 200Bq m^{-3} in some cases.



VIRTUAL HEALTH REPOSITORY

The **Virtual Health Repository (VHR)** has been developed in the frame of the InAirQ project to provide health relevant information about Indoor Air Quality to decision makers.

The VHR is an online platform consisting of:

- the methodology of Indoor Health Index developed in the InAirQ project;
- the categorization of the comfort parameters;
- a brief description of the main features of the school buildings investigated in the project;
- the Indoor Health Index and comfort categories calculated based on the indoor air quality (IAQ) data for each school building.

The aim of the tool is to act as a repository for IAQ related health relevant information. The school managers are encouraged to regularly collect and process IAQ data. Accordingly, any improvements in IAQ can be monitored or new IAQ related problems can be identified.

The VHR is an appropriate online tool to highlight the IAQ related problems in different regions in Central Europe and to provide evidence to stakeholders.

The Virtual Health Repository (VHR) is available at:

>> <https://www.oki.hu/vhr/>

It is operated and updated by the National Public Health Institute, Budapest, Hungary.

THE INDOOR HEALTH INDEX

Air pollution is one of the major determinants of public health in Central Europe. Indoor air quality (IAQ) can be characterized by physical parameters (e.g., temperature, relative humidity, air exchange

rate), chemical air pollutants (e.g., carbon dioxide, nitrogen dioxide, particulate matter, ozone, benzene, etc.) and biological agents (e.g., pollen, fungi).

Due to the complexity of this issue, a simple tool was needed to provide health relevant information on IAQ to stakeholders, school managers, etc. to be able to elaborate actions to improve the indoor environment. The Indoor Health Index developed in the InAirQ project provides very clear information on the presence of IAQ related problems, since is based on the results of the monitoring campaign carried out in the 64 primary school buildings in the project partner countries during the heating period in 2017/2018.

The Indoor Health Index categories (healthy, moderate, unhealthy, very unhealthy and dangerous) for all investigated school buildings as well as the methodology are available on the VHR. The database consisting of all weekly mean values measured during the monitoring campaign is available for stakeholders upon request.

The development of Virtual Health Repository (VHR) was a joint work of all project partners, underlining that a transnational cooperation is needed to develop joint methodologies, implement them and to analyze the results in the field of indoor air pollution.

ACTION PLANS

On the knowledge basis provided by the Virtual Health Repository, **National Action Plans** are currently being elaborated, striving to raise standards of human health through improvements in the indoor environment.

They will be tested and implemented in a selected school for each state partner during the next school season (2018-2019).



BENCHMARK VISIT

DAY 1

On 21st and 22nd of May, 2018 a second benchmark visit has been organized. Project partners visited the town of Espoo and Sipoo, in Finland.

The benchmark visit was aimed at gathering good practices of school management, including indoor environment and air quality.

The visit of Saunalahti school in Espoo focused on ventilation systems and indoor air quality.

The new school curriculum was explained, which has

a big influence on the design of the school buildings. It is considered “a School of future”, since it is the first integrated multipurpose building in Espoo: it comprises full-day daycare center, school, public library, youth center and many activities to involve pupils after schooldays.

The design of this house has emphasized safety and flexibility, fitted on the site and is aesthetically pleasant.



School as extension of indoor learning space, and as part of the neighbourhood and wider urban plan



Mechanical ventilation in classroom



Main multifunctional hall (dining room, library, etc.)



BENCHMARK VISIT

DAY 2

On the second day of visit project partners visited the Sipoo Municipality, whose representatives presented how they are dealing with the topic indoor air quality in schools, what are specifics about the planning

process and their new curriculum. The visit continued in the schools in Sipoo, two schools in Nikkilan, and Soderkulla School in Opintie.



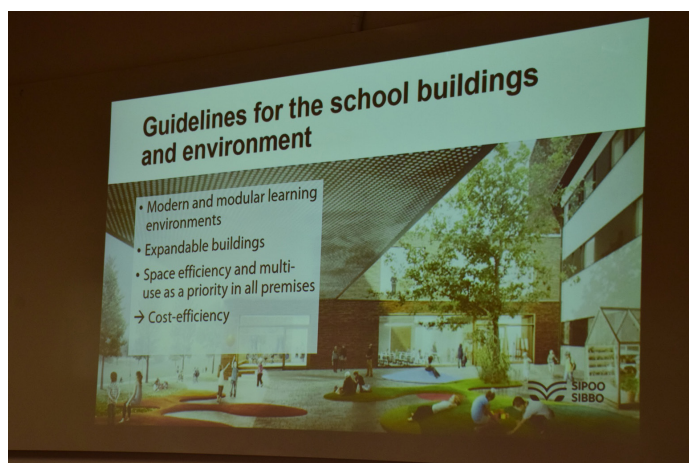
School exterior and playground



Dining hall as the center of school in Sipoo



MEP room



Presentation about the guidelines for school building



EVENTS

FOURTH WORK GROUP MEETING

24-25|04|18

ŁÓDŹ
POLAND

The fourth Work Group Meeting took place in Łódź, Poland, by on the 24th and 25th of April, 2018, and was be hosted by the Nofer Institute of Occupational Medicine.

Project partners invited community representatives and panelists from health and educational sector and other policy bodies for a roundtable talk, in order to discuss the project themes.



UPCOMING EVENTS

26-27|09|18

PRAGUE
CZECH REPUBLIC

The 5th Work Group Meeting will be organized by the National Institute of Public Health (NIPH) in Prague, Czech Republic, on the 26th and 27th September 2018.





THE INAIRQ PARTNERS

WHO WE ARE

Partners from five Central European Programme countries join their forces to improve indoor air quality in primary and secondary schools.

5
COUNTRIES

2 HU **2** IT

2 PL

1 CZ

2 SI

9
PROJECT PARTNERS

7 PUBLIC
2 PRIVATE

6
PUBLIC AUTHORITIES

1
SCHOOL

1
HIGHER EDUCATION & RESEARCH CENTRE

1
NETWORK GDO



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