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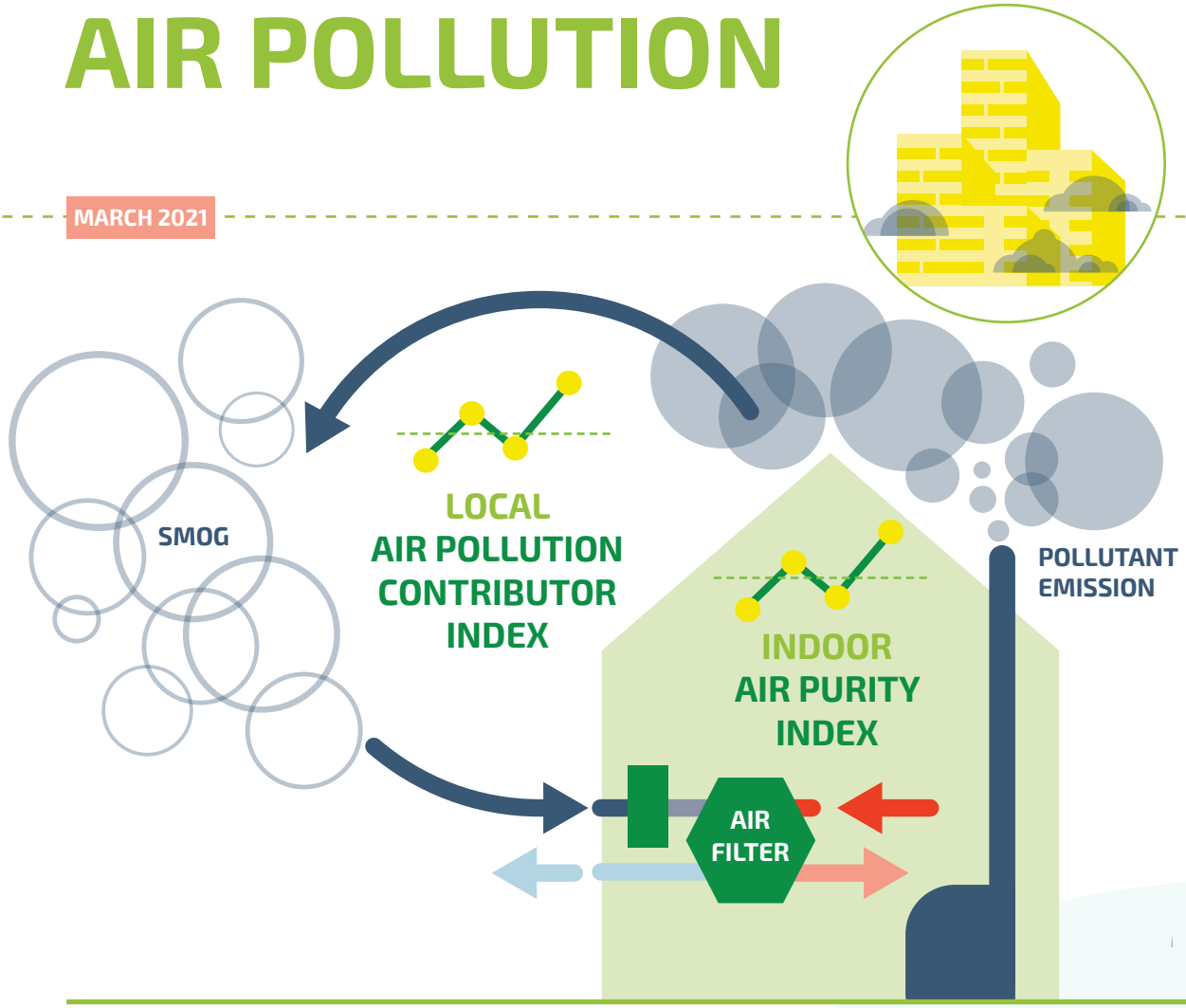
INTRODUCTORY REPORTS

OUTDOOR AIR POLLUTION

MARCH 2021



OUTDOOR AIR POLLUTION IS DEFINED WITH TWO INDICATORS: THE LOCAL AIR POLLUTION CONTRIBUTOR INDEX ASSESSES POTENTIAL BUILDING INFLUENCE ON LOCAL SMOG DEVELOPMENT, AND THE INDOOR AIR PURITY INDEX ASSESSES THE EFFICIENCY OF AIR FILTRATION IN THE VENTILATION SYSTEM OF A BUILDING.

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WHY WE DEVELOPED THIS FEATURE

Air pollution is one of the most important environmental risks to human health, and is perceived as the second biggest environmental concern for Europeans, after climate change.[1] Indoor and ambient air pollution are recognised as one of the risk factors for non-communicable diseases. It has been estimated that 90% of the global population are breathing highly polluted air. In 80% of cities in the EU with available data, the recommended World Health Organization (WHO) levels of pollution have been exceeded.[2] In many cases, people are unaware that they are breathing polluted air. They also do not know that their actions can directly influence it. Buildings affect both the quality of the outside air (pollutant emission) and the purity of the indoor air (air filtration). Currently there is no method to estimate the building's influence on local smog development or its air filtration system's effect on indoor air purity. The Local Air Pollution Contributor Index and Indoor Air Purity Index will increase the awareness of building owners and users on the impact of their buildings on smog development as well as the air-filtration efficiency. This will encourage people to take action to eliminate the sources of local emissions of pollutants and to use efficient air filtration systems where necessary.

SCOPE OF APPLICATION

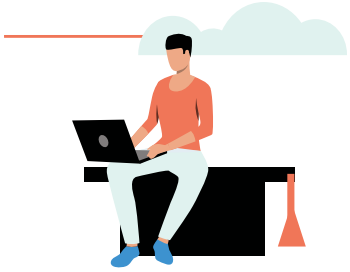
The Local Air Pollution Contributor Index and Indoor Air Purity Index methodology can be applied to both residential and non-residential buildings, as it does not depend on building function but on the type of energy sources (e.g., local gas boiler, district heating substation, electrical grid) and on the air filtration devices in mechanical ventilation systems. The methodology can be used to assess new buildings, existing buildings and buildings under renovation. It is suitable for buildings located in rural areas, where individual energy sources dominate, and in urban sectors where centralised systems (district heating networks) are present. The Indoor Air Purity Index takes into account air filtration, so is applicable only when mechanical ventilation is present in the assessed building. The Local Air Pollution Contributor Index can make building owners or users take action to modernise their buildings, leading to diminished energy needs and/or less polluting energy sources, while the Indoor Air Purity Index can persuade them to invest in mechanical ventilation with effective air filtration.

Building typology	New and existing buildings • Residential (single family, multi-family) • Non-residential (offices, commercial, industrial) • Public (administrative, education, health, heritage)
Tenure	Owner-occupied, co-operative, private rental, public rental
Property status	Renovating, renting, selling, buying

[1] European Commission. 2017. Special Eurobarometer 468: Attitudes of European citizens towards the environment. http://data.europa.eu/euodp/en/data/dataset/S2156_88_1_468_ENG

[2] https://unearthed.greenpeace.org/2018/05/02/air-pollution-cities-worst-global-data-world-health-organisation

LEVEL OF EXPERTISE, SKILLS AND TRAINING



The estimation of both indicators is simple and straightforward. The energy auditor's basic knowledge is sufficient to perform the calculation required to assess this feature. Additional training and courses are not required. The data needed for the calculation is gathered while performing energy performance certificate (EPC) assessment and no additional labour is required.

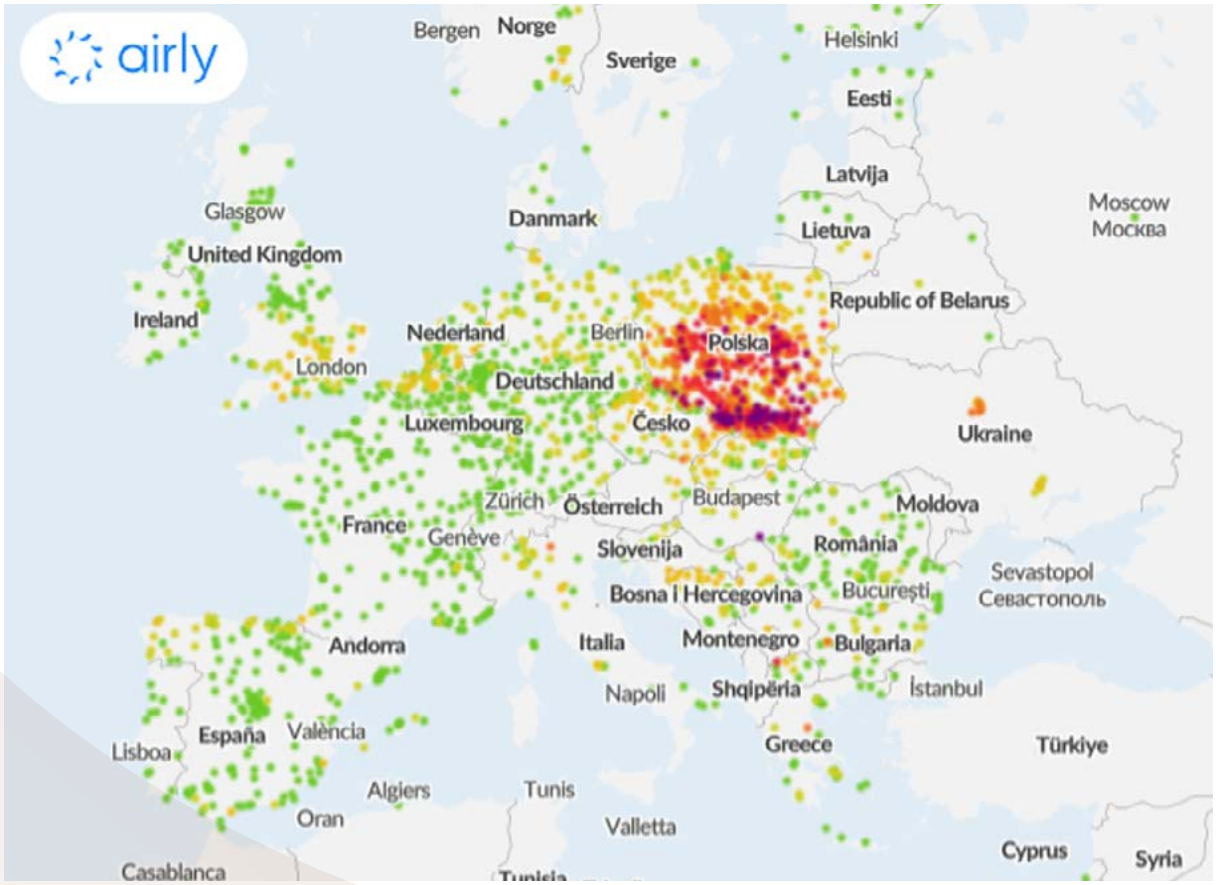
	Fundamental awareness (basic knowledge)	**Novice** (limited experience)	**Intermediate** (practical application)	**Advanced** (applied theory)	**Expert** (recognised authority)
Local air pollution contributor index	✓				
Indoor Air Purity	✓				

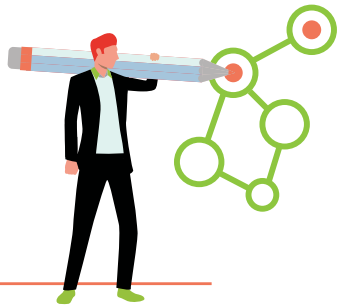
GOOD PRACTICES

Poor outdoor air quality and associated problems caused by the generation of smog have raised interest in this topic. In Poland, the "Clean Air" programme provides financial support for residential building owners to switch to newer and more efficient energy sources, reducing the polluting emissions from their buildings. The Local Air Pollution Contributor Index could be used in such programmes to support the decision process and assess the results of energy source exchange. A national database of pollutant emissions from buildings has been developed in Poland, and the Local Air Pollution Contributor Index could provide useful additional information.

The Airly platform shows the air quality in Europe based on real-time measurements. An ambient Air Quality Index (AQI) can be consulted for over 3,000 stations (see Figure 1 below). The Indoor Air Purity Index would complement such data by assessing the air purity inside buildings.

Figure 1 - Ambient air quality index stations in Europe





METHODS AND ASPECTS INCLUDED

The calculation of CO_2 emissions related to energy needs for heating, domestic hot water, cooling, lighting and auxiliary energy is common in EPCs; however, estimation of the building's contribution to local smog development is not present. The methodology is based on comparison of pollutant emissions from assessed buildings with the values for reference buildings. Weightings are assigned to the main pollutants (PM2.5, PM10, NOx, SOx, CO) in order to calculate the final indicator value. The Local Air Pollution Contributor Index estimation methodology is inspired by the AQI, and applies the same scale and methods for assessing pollutants.

Assessment of the air filtration system is part of environmental certification methods like BREEAM, LEED or WELL, but none of these gives an indoor air quality index. The proposed methodology takes into consideration the actual quality of external air, in terms of measured PM2.5 and PM10 concentrations, as well as the efficiency of the air filtration system. It provides an assessment of the supplied air quality using the Air Purity Index together with quantitative information on the PM2.5 and PM10 concentrations.

HOW WE WILL IMPLEMENT IT

The implementation of the methodology consists of several actions:

1. The first draft of the methodology is presented and discussed with national experts.
2. The methodology is presented to EU partners in order to verify the possibility of implementation in every EU member country.
3. The calculation formulas and proposed index scale are presented and discussed with implementing partners.
4. The calculation tool with formulas is prepared, presented and discussed with EU partners.
5. The first draft of guidelines and instructions is prepared and discussed.
6. The tool is used for internal testing, taking into account buildings with different types of energy sources, locations and ventilation systems.
7. The outcomes from testing are used to validate the methodology and functionality of the tool.

OVERALL EVALUATION

LESSONS LEARNT

- The issue of smog development needs estimation of more than one pollutant.
- Indoor air purity is dependent on pollutant emissions from buildings.
- Centralised energy sources (district heating network, electricity grid) do not contribute to local smog development.

PREREQUISITES

- AQI data at a given location.
- Reference values of energy needs and type of energy sources.
- Calculated energy needs of assessed building (according to EPC methodology).

REPLICATION

- The methodology is based on EPC data, so it can be implemented in all EU countries.
- In the methodology, default values are given for reference.
- The possibility of implementation of national values has been foreseen.

PROS

- Increased awareness of building owners and occupants.
- Simple to use and apply.
- Does not need expert knowledge.

CONS

- AQI information is needed.
- The result is a function of reference data that can differ from year to year.
- Maintenance of the energy source and filtration system is not considered.

RISKS

- Not enough data in each EU country (i.e. AQI).
- Uncertainty associated with emission rates used in calculation.
- Data on emissions cannot be verified through measurement.

RECOMMENDATIONS

- Verify input data availability in implementing countries.
- Develop and expand the outdoor air quality monitoring system.
- Develop national databases of pollutant emission factors from energy sources.

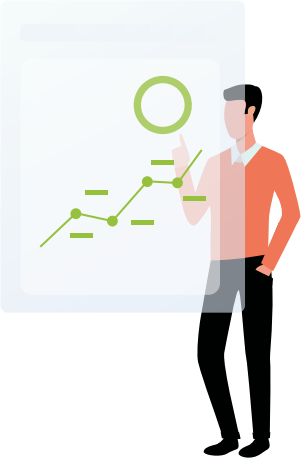
NEXT STEPS

- Testing and validation with different input data.
- Improve functionality and user-friendliness of assessment by energy assessors.
- The use of indexes in building assessment for financial support programmes.

COMPLEXITY

- Integration with total energy needs specified in EPC.
- Can be used for all types of buildings, locations and energy sources.
- The methodology takes into account more than one pollutant (five in Local Air Pollution Contributor Index and two in Indoor Air Purity Index)

COMPLIANCE WITH CROSS-CUTTING CRITERIA



QUALITY AND RELIABILITY OF EPCS

The main input data required for the assessment of the Local Air Pollution Contributor Index and Indoor Air Purity Index are part of the EPC data. The developed methodology is independent of the building type. The data required for this feature is standard or easily obtainable from public sources and no measurements are foreseen. The methodology is transparent and has a direct approach, reducing any ambiguity.

USER-FRIENDLINESS

The terminology used for the feature and its methodology is not strictly technical and engineering related. The indicator, data needs and calculation methods can be explained using common terminology, easily understandable for end-users or public authorities. The result of the feature is presented using a scale (values: very low, low, moderate, bad, very bad, hazardous) and colours from green (very good) to maroon (very bad), increasing users' understanding of the feature. Guidance is given to explain the application of the feature.

CONSISTENCY WITH STANDARDS

The assessment of the filter class in the calculation methodology is according to standards ASHRAE 62.1-2010 or EN 779-2002. For the emission rates, the standard values are used. Since the reference building energy use changes by time or by country, country-specific data should be used instead of the proposed default data.

ECONOMIC AND POLITICAL FEASIBILITY

The extra data needed in this feature requires little additional workload and is economically feasible to use or calculate through existing EPC approaches. The implementation of this feature in targeted Member States does not require financial costs. It is rather a political decision if such feature is needed in the national EPC system.

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