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**MOVING TOWARDS
CLEAN AIR
FOR EUROPE**

25-26.09.2024.

**SECOND
INTERNATIONAL
CONFERENCE
ON AIR POLLUTION**

**SECOND INTERNATIONAL CONFERENCE ON AIR
POLLUTION –
MOVING TOWARDS CLEAN AIR FOR EUROPE**

PROGRAMME
AND
BOOK OF ABSTRACTS

virtual conference
25-26 September 2024

Dear Participants,
Dear Colleagues,

We proudly announced the “Second International Conference on Air Pollution – Moving Towards Clean Air for Europe”. This conference is organized in the framework of the LIFE IP HungAIRy coordinated by HungaroMet Hungarian Meteorological Service. Our goal is to bring together experts, decision makers and other relevant stakeholders from across Europe to discuss key air pollution issues. Air pollution remains the largest environmental health risk in Europe and significantly impacts the global climate. While substantial efforts have been made to reduce concentrations of key pollutants, further reductions in emissions across various sectors are essential to meet the required standards and guidelines. With participants and presenters from countries including Belgium, Bosnia and Herzegovina, Bulgaria, Germany, Greece, Hungary, Italy, Ireland, Poland, Serbia, and Slovakia, the conference will be a truly international event, offering an excellent opportunity to exchange knowledge and explore diverse perspectives.

The topics to be discussed include, but are not limited to:

- air quality modelling,
- new technologies and networks in air quality monitoring,
- emission reduction strategies and practices in different sectors (e.g. residential, traffic, agriculture),
- monitoring the impact of activities,
- communication strategies and good practices,
- policy uptake,
- effects of air pollution on the health, climate and the built environment.

The conference will feature presentations from both ongoing and recently completed projects, particularly those funded under the European Union’s LIFE program, along with contributions from experts involved in international projects funded by other programs, such as Horizon 2020.

We are looking forward to meeting you online on 25-26 September 2024!

The HungAIRy LIFE IP team

PROGRAMME

Day 1 - 25 September 2024

8:30-9:00 **Virtual welcome coffee/tea and connection checks**

9:00-9:15 **Opening**

Anikó Raisz, state secretary, Ministry of Energy, Hungary

Gábor Szanka, chief executive, HungaroMet Hungarian Meteorological Service, Hungary

Guido de Wilt, policy officer, European Commission

Plenary session

9:15-9:45 **Guido de Wilt**, policy officer, European Commission

Air Quality - Revision of EU Rules, review of the NECD

9:45-10:15 **Stijn Janssen**, program manager, VITO

ATMOSYS, modelling toolbox to support the AAQD implementation

Session I.

10:15-10:35 **Tamás Szigeti**, Nóra Koplányi, Ildikó Babcsány, Orsolya Tamás-Józsa, Barbara Bezegh
Improving air quality in Hungary: A comprehensive approach to emission reduction and community engagement in the LIFE IP HungAIRy

10:35-10:55 **Tomasz Pietrusiak**
LIFE Integrated Project “Implementation of Air Quality Plan for Małopolska Region – Małopolska in a healthy atmosphere”

10:55-11:10 **Virtual coffee/tea break**

Session I. (cont.)

11:10-11:30 Helena Jadwiszczok-Molencka
Summary of results from the first phase of the Silesia Blue Sky Restored LIFE IP

11:30-11:50 Giulia Righi, Lucia Ramponi, **Katia Raffaelli**
LIFE IP PREPAIR

11:50-12:10 **Júlia Čaplová**, Zuzana Kopinová, Dana Stopková, Jana Palúchová, Katarína Mičáková, Marta Bejdáková
New measures for tackling emissions in Slovakia

12:10-12:30 Yana Kirilova, **Dochka Velkova**
Towards cleaner air in Bulgaria with LIFE IP CLEAN AIR

12:30-13:00 **Virtual lunch break**

Session II.

13:00-13:20	Tymoteusz Sawiński , Magdalena Korzystka-Muskala, Joanna Kubicka, Anetta Drzeniecka-Osiadacz, Marek Kowalczyk Air quality forecasts and measurements and how we use them in educational way - experiences of LIFE-MAPPINGAIR/PL Project
13:20-13:40	Anna Lorynowicz Effective implementation of the Air Quality Plan for the Podkarpackie Voivodeship, taking into account the problem of energy poverty: Podkarpackie – Live and Breathe
13:40-14:00	Robert Mazurkiewicz-Biczuk , and the LIFE AQP Opolskie 2019 Project Team Implementation of the air quality management system in the local governments of the Opole Voivodeship
14:00-14:20	David Kelleghan , Dermot Burke, Patrick Malone, Stijn Vranckx, Lisa Blyth, Patrick Kenny Emissions ModEling and FoRecasting of Air in IreLanD – LIFE EMERALD

End of Day 1

Day 2 - 26 September 2024

9:30-10:00 Virtual welcome coffee/tea and connection checks

Session III.

10:00-10:20	Cathy Wing Yi Li , Claire Granier, Thierno Doumbia, Renske Timmermans, Gabriele Pfister, Rajesh Kumar, Mikhail Sofiev, Marc Guevara, Nicolas Huneus, Dan Mo, Olivier Salvi, Bastien Caillard, Guy Brasseur Overview of the AQ-WATCH Toolkit and the lessons learnt from its co-development process
10:20-10:40	Plamenko Tais , Sanela Salihagic Air Quality measurements and Functional Review of Air Quality Management in Canton Sarajevo, Bosnia and Herzegovina
10:40-11:00	Melas Dimitrios , Parliari Daphne, Economou Theo, Kushta Jonilda, Giannaros Christos Quantifying mortality burden from combined environmental stressors: the LIFE SIRIUS approach
11:00-11:20	Jovan Javorac , Miroslav Ilić, Dejan Živanović, Marija Jevtić Impact of nitrogen dioxide exposure on the risk of severe acute exacerbations in chronic obstructive pulmonary disease

11:20-11:40 Virtual coffee/tea break

Session IV.

11:40-12:00	András Hoffer , Ádám Tóth, Beatrix Jancsek-Turóczi, Tibor Ajtai, Szabolcs, Hodovány, András Gelencsér Identification of waste burning based on the physicochemical properties of aerosols emitted from chimneys
12:00-12:20	Claudia Schön , Juho Louhisalmi, Kamil Krpec, Isaline Fraboulet, Benjamin Cea, Hans Hartmann, Jarkko Tissari Novel real-life test protocol for log wood stoves during round robin
12:20-12:40	Claudia Schön , Juho Louhisalmi, Kamil Krpec, Isaline Fraboulet, Benjamin Cea, Hans Hartmann, Jarkko Tissari Novel method for TPM determination – Combination of ENPME and Porous Tube Dilution
12:40-13:00	Kristóf Pázmándy Introduction to the LIFE-IP NORTH-HU-TRANS (<i>tbc</i>)

End of the Conference

Abstracts

Improving air quality in Hungary: A comprehensive approach to emission reduction and community engagement in the LIFE IP HungAIRy

Tamás SZIGETI, Nóra KOPLÁNYI, Ildikó BABCSÁNY, Orsolya TAMÁS-JÓZSA, Barbara BEZEGH

HungaroMet Hungarian Meteorological Service, Budapest, Hungary

Presenting author's name: *Tamás SZIGETI*

Presenting author's e-mail: szigeti.t@met.hu

Keywords: *air quality plan, awareness raising, emission reduction, modelling, pilot actions*

Abstract:

The overall aim of the LIFE IP HungAIRy project is to improve ambient air quality in 10 Hungarian municipalities (Békéscsaba, Budapest, Debrecen, Eger, Kaposvár, Karcag, Miskolc, Pécs, Szolnok, and Tatabánya) across 8 regions of the country. The project officially began on 1 January 2019, and will run until the end of 2026.

As part of the project, an eco-manager network was established in 2020 to enhance capacities in the participating municipalities. Tasks of the network's experts include organizing awareness-raising campaigns and conducting biannual revisions of air quality plans. A decision-support tool, called ATMO-Plan, was developed for Hungary to predict the impact of various measures on air quality, providing assistance during the revision process.

Two new air quality monitoring stations were constructed in cities previously lacking such facilities, and a PM monitoring network with low-cost sensors has been launched in two partner cities. Various pilot activities have been developed to reduce residential emissions (e.g., regulating garden waste burning, supporting local composting, promoting district heating) and traffic emissions (e.g., developing a smart parking system, implementing mini public bicycle systems). To reduce agricultural emissions, training programs have been launched to promote access to best practices. The biomass supply chain has been assessed, and a national strategy for its improvement is currently under development.

Communication materials targeting both adults and children have been produced, alongside several national awareness campaigns. Numerous networking events have also been organized to share experiences at both the national and international levels.

The environmental, social, and economic impacts of project activities are monitored biannually. Currently, the LIFE IP HungAIRy partners are mainly focused on collecting and sharing good practices from their pilot actions with interested entities.

LIFE Integrated Project “Implementation of Air Quality Plan for Małopolska Region – Małopolska in a healthy atmosphere”

Tomasz PIETRUSIAK

The Marshal's Office of the Małopolska Region, Kraków, Poland

Presenting author's name: *Tomasz PIETRUSIAK*

Presenting author's e-mail: Tomasz.Pietrusiak@umwm.malopolska.pl

Keywords: *LIFE Programme, air quality plan, smog resolutions*

Abstract:

The LIFE IP "Malopolska in a Healthy Atmosphere" project is a key initiative aimed at improving air quality in the Malopolska region. Launched in 2015, the project focuses on implementing the Air Quality Program through the effective utilization of EU and national funds. A central component of the project is the innovative network of Eco-advisors, who assist residents in replacing outdated heating systems and implementing anti-smog measures at the local level.

The project includes extensive educational campaigns, the distribution of air purifiers to educational institutions or e.g. development of a network of sensors to monitor air quality. Through comprehensive actions, including numerous training sessions and workshops for municipal employees, the project has achieved significant reductions in particulate emissions and an increase in environmental awareness among residents.

The project's results are measurable - since 2015, PM₁₀ emissions have decreased by 3.7 thousand tons, and project partners have secured over 1 billion euros for further air quality improvement investments. The LIFE IP "Malopolska in a Healthy Atmosphere" project serves as a model solution, with its outcomes set to be sustained and expanded upon after the program's conclusion.

The presentation will showcase the key activities, achievements, and future plans, offering a unique insight into the successful approach to improving air quality at the regional level.

Summary of results from the first phase of the Silesia Blue Sky Restored LIFE IP

Helena JADWISZCZOK-MOLENCKA

Regional Ecoinformation Centre, Katowice, Poland

Presenting author's name: *Helena JADWISZCZOK-MOLENCKA*

Presenting author's e-mail: helena.jadwiszczok-molencka@slaskie.pl

Keywords: *air quality, air pollution, eco-managers, eco-friendly practices, anti-smog resolution*

Abstract:

The main objective of integrated LIFE project "Silesia. Blue Sky Restored" is consistent with the overarching goal of the Air Protection Program, that is the development and implementation of remedial measures, that will lead to the improvement of air quality, which will consequently reduce the negative impact of air pollution on the health and life of the inhabitants of the Silesian Voivodeship.

The Coordinating Beneficiary of the project is the Silesian Voivodeship, and as many as 80 partners are involved in its implementation.

Thanks to the implementation of the project, the following specific objectives will also be achieved:

- increasing the effectiveness of the implemented legislative solutions (Anti-Smog Resolution) forcing the replacement of outdated, low-efficiency heating devices;
- implementation of effective pollution control mechanisms at the local government level and development of good practices in this area (emission monitoring with the use of drones, furnace controls);
- developing good practices in the field of investment planning at the commune level;
- implementation of methods of optimal improvement of energy efficiency and rational investment in public utility facilities (model target solutions for wide application);
- support for local authorities in activities to improve air quality and adapt to climate change by improving the quality of public space and increasing the share of green space in urban areas.

During the speech, the most important project actions and results of its implementation from the first phase, i.e. 2022-2023, will be presented.

LIFE IP PREPAIR

Giulia RIGHI, Lucia RAMPONI, Katia RAFFAELLI

Emilia-Romagna Region, Bologna, Italy

Presenting author's name: *Katia RAFFAELLI*

Presenting author's e-mail: katia.raffaelli@regione.emilia-romagna.it

Keywords: *emission, sustainability, scenarios, Po Basin Agreement, regional plans*

Abstract:

The PREPAIR project aims to implement the measures envisaged by the regional plans and the Basin Agreement on a larger scale and to strengthen the sustainability and durability of the results: the project covers the Po valley, the regions and cities that most influence air quality in the basin. The project actions also extend to Slovenia with the aim of evaluating and reducing the transport of pollutants even beyond the Adriatic Sea. The project has a duration of 7 years, from 1 February 2017 to 31 January 2024 (extended until 31 December 2024). The total budget is € 16,805,939 with a European co-financing of € 9,974,624. The project is led by the Emilia-Romagna Region and involves 17 partners.

The 4 thematic areas addressed are those that contribute most to atmospheric emissions in the Po basin and consequently affect air quality values.

In the context of technical actions, important tools for the Po basin have been developed:

- Emissions data set;
- Database of the measurements of the AQPs, the Basin Agreements and the project itself;
- Emission and QA scenarios;
- Web platform with QA data and modeling tools used for evaluations.

As far as thematic actions are concerned, several training courses, conferences, and workshops were organized with the participation of stakeholders, professional technicians, students and citizens. Several specific technical reports, guidelines, software for the assessment of emissions from farms (BAT-TOOL), information manuals for the promotion of CAM, an energy Info Point to support local authorities in accessing financing opportunities and also analyses of energy consumption in the main production sectors have also been created.

Other important results have been achieved in the field of sustainable cycling and electric mobility, such as the development of a model for the rationalization of short and medium-haul logistics, the recognition of the intermodal equipment of the main railway stations.

New measures for tackling emissions in Slovakia

Júlia ČAPLOVÁ¹, Zuzana KOPINOVÁ¹, Dana STOPKOVÁ¹, Jana PALÚCHOVÁ², Katarína MIČÁKOVÁ¹, Marta BEJDAKOVÁ³

¹Ministry of Environment, Bratislava, Slovakia; ²Slovak Environment Agency, Banská Bystrica, Slovakia; ³Self-governing region Trnava, Trnava, Slovakia – Project Populair

Presenting author's name: Júlia ČAPLOVÁ

Presenting author's e-mail: julia.caplova@enviro.gov.sk

Keywords: *emissions, industry, residential, traffic*

Abstract:

As Slovakia faces an air quality problem, there is a need to identify and make use of new possibilities to reduce pollutant emissions. The Life IP – Air Quality Improvement project (Populair) has been established, among other reasons, to identify and, wherever possible, contribute to implementation of these measures. So far, there have been a few successes to share, some are still in the implementation phase with high hopes in achieving good results. The main areas of focus are:

- Industry – reducing PM emissions from ground sources within facilities and plants in a cost-effective manner,
- Residential – Pilot scheme “Obnov dom mini” (Renovate you house – mini) for citizens endangered by energy poverty, focused on insulating houses and exchange of outdated heating equipment,
- Traffic – Campaign “Do školy po vlastných” (To school by foot) which explains the benefits of abandoning the typical parent-taxi mode of transport bringing about a positive change in both traffic organization and traffic behaviour.

In the presentation, the abovementioned measures, their effects and funding will be explained in clear detail. Undoubtedly, limited funding provides limited results. Therefore the focus of activities in the foreseeable future shall be acquiring finances to implement these and further measures to reduce emissions, thus improving air quality.

Towards cleaner air in Bulgaria with LIFE IP CLEAN AIR

Yana KIRILOVA, Dochka VELKOVA

Club "Economika 2000", Sofia, Bulgaria

Presenting author's name: *Dochka VELKOVA*

Presenting author's e-mail: docha@club2000.org

Keywords: *air pollution, domestic heating, replacement of heating devices*

Abstract:

Bulgarian Municipalities Working Together to Improve Air Quality - LIFE IP CLEAN AIR at a glance – budget, duration, coordinating and associated beneficiaries, main objectives. The core of the IP is reduction of the PM₁₀ and PM_{2,5} pollution from household heating through replacement of old wood and coal burning devices of 10500 households in the 6 cities with environmentally-friendly alternatives (500 households in the pilot phase and 10000 in the main phase) within a developed Scheme for transition towards alternative forms of heating.

Presentation of the achievements of the IP project: air quality monitoring stations; replacement of heating devices – pilot and main project phase (implementation process – application process, ranking, contracting households, tendering and procurement of new heating devices, assessment of the results); information dissemination and awareness raising; complementary actions. Lessons learnt from the project implementation.

Air quality forecasts and measurements and how we use them in educational way - experiences of LIFE-MAPPINGAIR/PL Project

Tymoteusz SAWIŃSKI, Magdalena KORZYSTKA-MUSKAŁA, Joanna KUBICKA, Anetta DRZENIECKA-OSLADACZ, Marek KOWALCZYK

University of Wrocław, Institute of Geography and Regional Development, Department of Climatology and Atmosphere Protection, Koszuby 8 St, 51-621 Wrocław, Poland; LIFE-MAPPINGAIR/PL Project

Presenting author's name: *Tymoteusz SAWIŃSKI*

Presenting author's e-mail: tymoteusz.sawinski@uwr.edu.pl

Keywords: *air quality, forecasts, measurements, environmental education*

Abstract:

One of the key issues related to activities to improve air quality is the appropriate level of public awareness regarding this problem. Its recognition and understanding, both at the institutional and individual level, are a prerequisite for undertaking repair actions. Of course, classic educational and information activities, targeted at children, adolescents and adults, activities serve to increase awareness, but the experiences of the LIFE-MAPPINGAIR/PL and LIFE-APIS/PL projects (implemented by authors from 2013), shows that they can be strengthened by access to reliable as well as interesting environmental data referring directly to the place of residence, work or study target groups.

For this purpose, as part of the LIFE-MAPPINGAIR/PL Project, a number of activities and tools have been designed to provide access to the provisory and detailed information about air quality in the project area (Poland, Wrocław and Bydgoszcz agglomerations). They include:

A measurement network based on 40 low cost devices, providing continuous, public information on PM_{2.5} concentrations and selected meteorological parameters (T, RH) in the project area

Portal with air quality forecasts, including high resolution forecasts for the project area;

The results of patrol measures of PM concentrations conducted in the project area.

The obtained data are used in actions informing about current aerosanitary conditions, such as daily resume of the AQ forecasts, thematic articles commenting on current aerosanitary conditions, retrospective articles (e.g. seasonal summaries). In addition, the obtained data and information are also used in direct education, indicating the actual problems that the inhabitants may identify with. An example here can be workshops on air quality measurements, including joint patrol measurements, and then the development and interpretation of results, based on GIS techniques. Our experience has shown that data self-acquiring and then their processing and interpretation is a spectacular "eye opener" for participants of such classes.

In addition, the results obtained are often an important argument in discussions on activities to improve air quality, providing reliable information about the actual scale of the problem in local terms, referring to individual districts in "neighborhood scale" with which residents identify the most.

Effective implementation of the Air Quality Plan for the Podkarpackie Voivodeship, taking into account the problem of energy poverty: Podkarpackie – Live and Breathe

Anna LORYNOWICZ

Department of Environmental Protection - Marshal's Office of the Podkarpackie Voivodeship, Rzeszów, Poland

Presenting author's name: *Anna LORYNOWICZ*

Presenting author's e-mail: a.lorynowicz@podkarpackie.pl

Keywords: *air quality, energy poverty, Air Quality Program, EU funds, renewable energy sources*

Abstract:

The Podkarpackie Voivodeship is the coordinating beneficiary of the project: “Effective implementation of air quality plan for Podkarpackie Voivodeship, taking into account the problem of Energy poverty. Podkarpackie: live and breathe!”, in which the main objective is the Implementation of the Air Quality Program for Podkarpackie Voivodeship and the effective use of available EU and national funds for improving air quality. Implementation period is from 01.01.2024 to 31.12.2033. Project budget: €23,400,000. European Commission funding is 60%. 61 municipalities of the Podkarpackie Voivodeship, 2 Non-Government Organizations, 1 Research Institute, 1 entity and 1 foreign Innovation Institution from Slovakia are partners in the project.

The Integrated Project includes four basic pillars:

1. Reducing the effects of energy poverty of the inhabitants of the Podkarpackie Voivodeship.
2. Creation and implementation of a local system of rational energy management
3. Raising the level of awareness of the inhabitants of the Podkarpackie voivodeship about the quality of air in terms of ecology and the importance of energy efficiency.
4. More effective use of planning tools to improve urban air quality.

Planned results:

1. At least 48% increase in primary renewable energy production by 2033.
2. Annual reduction of CO₂ by 5852.7 tonnes eq CO₂/year
3. Annual reduction of PM₁₀ by 804.09 Mg/year.
4. Annual reduction of PM_{2.5} by 631.53 Mg/year.
5. Annual reduction of B(a)P by 0.2795 Mg/year.
6. Reduction of the area particularly vulnerable to climate change by at least 260.7 ha by 2033.

In order to achieve the adopted goals, it is necessary to focus on: replacement of inefficient heat sources; thermal modernization of single-family houses and public buildings, installation of renewable energy sources, increasing the share of greenery in cities, financial support of municipal governments by providing them with their own contribution to energy efficiency investments, rational energy management in municipalities.

Implementation of the air quality management system in the local governments of the Opole Voivodeship

Robert MAZURKIEWICZ-BICZUK and the LIFE AQP OPOLSKIE 2019 Project Team

Department of Environmental Protection, Marshal's Office of the Opole Voivodeship

Presenting author's name: *Robert MAZURKIEWICZ-BICZUK*

Presenting author's e-mail: a.rychlicka@opolskie.pl, r.mazurkiewicz-biczuk@opolskie.pl

Keywords: *air quality management system*

Abstract:

We represent the Opolskie Voivodeship. We are gathering 71 municipalities in 11 counties. In 2020, we signed an agreement with the European Commission and the National Fund for Environmental Protection and Water Management to co-finance the Project: "Implementation of Air Quality Management System in Local Governments of Opolskie Voivodeship", LIFE19 GIE/PL/000398 - LIFE_AQP_Opolskie_2019. PL

The activities we carry out are mainly focused on improving air quality through:

- Increasing the competence of the administration –conducting postgraduate studies.
- Appointment of Municipal Air Protection Coordinators
- Appointment of certified energy advisors.
- Elimination and replacement of inefficient and non-ecological heat sources.
- Cooperation in obtaining subsidies for residents for thermo-modernization and replacement of heat sources.
- Implementation of the anti-smog resolution – an act of local law.
- Education for all age groups.
- Establishment of a partnership with the Moravian-Silesian and Olomouc Region in the Czech Republic.
- A series of specialized lectures on air protection.
- Participation in dedicated events, conferences, congresses, forums and meetings.
- Monitoring module with 71 sensors for measuring air quality
- Establishing of a network of cooperation with LIFE projects.

More about Life_AQP_Opolskie on www.powietrze.opolskie.pl or Facebook LIFE – System zarządzania jakością powietrza w województwie opolskim

Emissions Modelling and Forecasting of Air in Ireland – LIFE EMERALD

David KELLEGHAN¹, Dermot BURKE¹, Patrick MALONE¹, Stijn VRANCKX², Lisa BLYTH², Patrick KENNY¹

¹Environmental Protection Agency (EPA), Ireland; ²Vlaamse Instelling voor Technologisch Onderzoek (VITO), Belgium

Presenting author's name: *David “Dáithí” KELLEGHAN*

Presenting author's e-mail: d.kelleghan@epa.ie

Keywords: *LIFE, air quality, forecast, near-real time, annual high resolution*

Abstract:

The LIFE Emerald project represents a significant advance in air quality management and modelling in Ireland. Co-funded by the Government of Ireland and EU LIFE Programme (LIFE19 GIE/IE/001101), the LIFE Emerald Project developed an ambient air modelling infrastructure based on the ATMOSYS (Air quality MODelling SYStem) suite of forecasting and modelling tools used in Belgium. Ireland's ATMOSYS infrastructure will be maintained by the EPA to produce 1) a 3-day national air quality forecast, 2) near real-time hourly updated air quality maps, and 3) high-resolution annual average air quality maps.

This 3.5 year project was led by the EPA with support from the Asthma Society of Ireland (ASI), the Department of Environment, Climate and Communications (DECC), the Health Service Executive (HSE), University College Cork (UCC) and VITO. Due for completion in September 2024, it also delivered 1) an expert air quality management dashboard for the EPA, 2) a spatial representativeness study of the national network, 3) an approach to improve local spatial emission inventories of Irish towns, 4) a report on the impact of national strategies, principally emission reduction goals on future air quality, 5) recommendations for the health service, including review of current health impacts based on high-resolution mapping, 6) a review on behaviour change, based on two surveys of the general public, 7) extensive awareness raising and public engagement.

The forecast, hourly updated and annual high-resolution maps are available for the public on www.airquality.ie. The AFTER-LIFE plan outlines continued checking and verification of modelling systems, alongside carrying out required updates, and capacity building within the EPA. Use of these models strengthens air quality management in Ireland, providing more accurate information on exposure to health risks and up-to-date data for air quality policy development and research. It is essential that this modelling infrastructure is maintained and utilised, with EPA's National Ambient Air Quality Unit providing support to local authorities and other Member States where possible.

Overview of the AQ-WATCH Toolkit and the lessons learnt from its co-development process

Cathy Wing Yi LI¹, Claire GRANIER^{2,3}, Thierno DOUMBLA², Renske TIMMERMANS⁴, Gabriele PFISTER⁵, Rajesh KUMAR⁵, Mikhail SOFIEV⁶, Marc GUEVARA⁷, Nicolas HUNEEUS⁸, Dan MO⁹, Olivier SALVI¹⁰, Bastien CAILLARD¹⁰, and Guy BRASSEUR^{1,5}

¹ Max Planck Institute for Meteorology, Hamburg, Germany; ² Laboratoire d'Aérodynamique, CNRS-Université de Toulouse, Toulouse, France; ³ NOAA Chemical Sciences Laboratory/CIRES, University of Colorado, Boulder, CO, USA; ⁴ The Netherlands Organisation for applied scientific research (TNO), Climate, Air and sustainability department, Princetonlaan 6,3584 CB Utrecht, the Netherlands; ⁵ National Center for Atmospheric Research, Boulder, 80307 Colorado, USA; ⁶ Finnish Meteorological Institute, Helsinki, Finland; ⁷ Barcelona Supercomputing Centre, Barcelona, Spain; ⁸ Department of Geophysics, Universidad de Chile, Santiago, Chile; ⁹ Institute of Urban Safety and Environmental Science, Beijing Academy of Science and Technology, China; ¹⁰ INERIS DEVELOPPEMENT SAS, France

Presenting author's name: *Cathy Wing Yi LI*

Presenting author's e-mail: cathy.li@mpimet.mpg.de

Keywords: *air quality, forecasting system, co-development, stakeholder engagement*

Abstract:

AQ-WATCH (Air Quality: Worldwide Analysis and Forecasting of Atmospheric Composition for Health) is an EU Horizon 2020 project (2020-2023) aiming to co-develop and co-produce tailored products and services derived from space and in-situ observational data for improving air quality forecasts and attribution. For this purpose, AQ-WATCH developed a supply chain leading to innovative downstream products and services for providing air quality information tailored to the identified needs of international users. The products were co-developed with the prime users through the “spiral process”, in which the proposed products/services were discussed so that the needs of the users were more clearly identified and incorporated into the products. With the joint efforts of the project partners and prime users across research, public and private sectors, the AQ-WATCH Toolkit has been developed with several AQ-WATCH products organized into 5 modules: (1) Air quality atlas, (2) Air quality attribution & mitigation, (3) Dust and fire forecast, (4) Fracking analysis, and (5) Air quality forecast. This toolkit provides a prototype of a co-produced integrated system that could be applied to the development of integrated environmental systems to support adaptation and mitigation policies against air pollution in regions around the world. This presentation will give an overview of the AQ-WATCH Toolkit and share some lessons learnt from its co-development process.

Air Quality measurements and Functional Review of Air Quality Management in Canton Sarajevo, Bosnia and Herzegovina

Plamenko TAIŠ¹, Sanela SALIHAGIĆ²

¹ E3, Sarajevo, Bosnia and Herzegovina; ²Institute for Public Health of Canton Sarajevo, Bosnia and Herzegovina

Presenting author's name: *Plamenko TAIŠ*

Presenting author's e-mail: ptais@e3-global.com

Keywords: *AQM, AQ Functional Review, human health, policies, PM*

Abstract:

People in many parts of Bosnia and Herzegovina (BiH) are exposed to more toxic particulate matter (PM) air pollution than their neighbours in Western Europe.

A recent study on the effects of air pollution in BiH estimated that about 3,600 people die every year from causes associated with AAP (World Bank 2022). The annual cost of mortality caused by AAP in BiH is estimated at around US\$2.4 billion, equivalent to 15.7 percent of gross domestic product (GDP) in 2019 (World Bank 2022).

As part of the improvement of AQM, Functional Review of AQM was prepared by the Environment, Natural Resources, and Blue Economy Global Practice of the Europe and Central Asia Region of the World Bank and was funded by the World Bank.

B&H needed to make functional review (FR) to provide insights and develop recommendations for strengthening regulatory and institutional frameworks and capacity for AQM, enabling the country, entity, and cantonal governments to deliver better air quality for its citizens.

A FR is an analytical approach to strengthen public sector performance and government effectiveness in relation to a specific policy objective. FR is established as six interdependent functions or steps. Each of the six AQM functions, as a cycle, was reviewed against eight criteria for a comprehensive assessment of the formal prerequisites and practical implementation conditions that enable or hinder functional AQM performance.

According to outcomes of the reviewed AQM there are sets adjusting of law regulations, from the entity to the Canton level, which will need to be prepared and adopt in near future. Capacity of the main sectors in AQM should be strengthen as well as Air quality analysis and information dissemination to the public. It is necessary to do estimate the health impacts of air pollution and to develop of short and long term measures to improve AQ.

Quantifying mortality burden from combined environmental stressors: the LIFE SIRIUS approach

Dimitrios MELAS¹, Daphne PARLLARI¹, Theo ECONOMOU², Jonilda KUSHTA², Christos GLANNAROS³

¹Laboratory of Atmospheric Physics, School of Physics, Aristotle University of Thessaloniki, 54124 Thessaloniki, Greece;

²Climate and Atmosphere Research Centre - CARE-C, Cyprus Institute, Konstantinou Kavafi str, Nicosia, 2121,

Aglantzia, Cyprus; ³National and Kapodistrian University of Athens, Department of Physics, 15784 Athens, Greece

Presenting author's name: *Daphne PARLLARI*

Presenting author's e-mail: dparllar@physics.auth.gr

Abstract:

Despite extensive policy efforts, Europe still grapples with significant challenges regarding air quality, particularly in urban areas where the combined effects of urban heat islands (UHI) and urban pollution islands (UPI) contribute to premature mortality. Especially in the Mediterranean, tackling the intertwined issues of climate change and air quality demands a cohesive analysis and coordinated response across these regions. LIFE SIRIUS (System for Integrated EnviRonmental Information in Urban areaS) underscores the necessity for urban air quality management to evolve beyond conventional approaches to address the intertwined impacts of UPIs, UHIs, and heat waves. Our study introduces an integrated modeling system implemented across Thessaloniki, Greece; Nicosia, Cyprus; and Rome, Italy, aiming at enhancing urban air quality planning and management by equipping responsible public authorities with the most up-to-date knowledge and skills in urban air quality governance.

In the present we apply an innovative statistical framework to explore the collective impact of thermal stress (represented by maximum apparent temperature, $T_{app_{max}}$) and air quality (PM_{10} , NO_2 , and O_3 concentrations) on daily mortality within one of the project's focal areas, Thessaloniki. To interpret the combined estimated risk in terms of observed mortality we compute the Attributable Fraction—defined as the proportion of death counts that are attributed to the exposures at non-optimum $T_{app_{max}}$ ranges and levels of pollution. The findings validate the intuition that exposure to extreme heat and cold, alongside poor air quality, substantially heightens mortality burden. We show that extremely high and low temperatures ($> 35^\circ C$ and $< 2.5^\circ C$) are responsible for the majority of deaths at most levels of PM_{10} , NO_2 , and O_3 . The most harmful combination for Thessaloniki's citizens is heatwave-like temperatures and high concentrations of pollution.

Impact of nitrogen dioxide exposure on the risk of severe acute exacerbations in chronic obstructive pulmonary disease

Jovan JAVORAC^{1,2}, Miroslav ILIĆ^{1,2}, Dejan ŽIVANOVIĆ^{1,3}, Marija JEVTIĆ^{1,4,5}

¹Faculty of Medicine, University of Novi Sad, Novi Sad, Serbia; ²Institute for Pulmonary Diseases of Vojvodina, Novi Sad, Serbia; ³Academy of Human Development, Belgrade, Serbia; ⁴Institute of Public Health of Vojvodina, Novi Sad, Serbia; ⁵Research Center on Environmental and Occupational Health, School of Public Health, Université Libre de Bruxelles (ULB), Brussels, Belgium

Presenting author's name: Jovan JAVORAC

Presenting author's e-mail: jovan.javorac@mf.uns.ac.rs

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Abstract:

Nitrogen dioxide (NO₂) can impair antioxidant defenses in chronic obstructive pulmonary disease (COPD) patients, leading to increased airway inflammation and bronchial reactivity, which may exacerbate COPD. This study evaluated the impact of rising NO₂ concentrations on severe acute exacerbations of COPD (AE-COPD) of non-infectious origin. Over five years (2017-2022), average daily NO₂ concentrations from monitoring stations in Novi Sad, Serbia, and daily hospitalizations for severe AE-COPD at the Institute for Pulmonary Diseases of Vojvodina were analyzed. Quasi-Poisson generalized linear models and distributed lag nonlinear models (DLNM) calculated the relative risk of severe AE-COPD per 10 µg/m³ increase in NO₂. During the study, there were 552 hospitalizations for severe non-infectious AE-COPD, with an average daily NO₂ concentration of 14.54 µg/m³ (range 1.82-78.00 µg/m³). For the overall sample, each 10 µg/m³ increase in NO₂ was associated with a cumulative relative risk (RR) over eight days of 0.67 (95% CI 0.33-1.37) for AE-COPD hospitalization, which was not statistically significant. However, significant effects were observed for women (RR 2.55, 95% CI 1.50-4.31) and men (RR 1.94, 95% CI 1.04-3.62). Age-specific effects were also notable: RR for individuals under 65 years was 2.19 (95% CI 1.05-4.59) and for those 65 years or older, 2.37 (95% CI 1.45-3.89). When adjusting for other pollutants (PM_{2.5} and SO₂) and meteorological factors (temperature and humidity), these effects lost significance. The study suggests that increased NO₂ concentrations are linked to a higher risk of severe AE-COPD in both genders and across age groups. However, these associations may be confounded by other environmental factors. The findings highlight the need for policies to reduce NO₂ emissions and improve air quality to protect respiratory health and reduce severe COPD exacerbations. Further research is needed to clarify these relationships and enhance strategies for mitigating air pollution's impact on respiratory diseases.

Identification of waste burning based on the physicochemical properties of aerosols emitted from chimneys

*András HOFFER¹, Ádám TÓTH², Beatrix JANCSEK-TURÓCZI^{1,2}, Tibor AJTAI³, Szabolcs HODOVÁNY³,
András GELENCSÉR^{1,2}*

¹HUN-REN-PE Air Chemistry Research Group, University of Pannonia, Veszprém, Hungary; ²Res. Inst. of Biomolecular and Chemical Engineering, University of Pannonia, Veszprém, Hungary; ³HUN-REN-SZTE Research Group on Photoacoustic Spectroscopy, Szeged, Hungary

Presenting author's name: *András HOFFER*

Presenting author's e-mail: hoffe.andras@mk.uni-pannon.hu

Keywords: *waste burning, in-situ measurements, aerosol physical parameters*

Abstract:

Waste generation in households is a growing concern worldwide. In our previous work we found that the contribution of waste burning to the PM₁₀ mass concentration at sampling stations in Hungary and Romania was as high as a few percent during the heating season. Waste burning in households is difficult to verify on the spot, though it would be required to legitimize interventions by authorities.

In this work, we co-burned various waste types with firewood, as well as various coal samples in a fireplace under controlled conditions and measured the different physical and chemical parameters of the emitted aerosol with the aim of determining the key parameters that can be used to detect waste burning on-site. In total, more than 1000 solid fuel doses were burned and the data measured after dilution were evaluated.

The parameters that showed the largest difference between the burning of legal and illegal fuel types were determined. Based on the NO_x/CO₂ ratio of the flue gas, the burning of furniture panels and oriented strand board can be distinguished from the burning of wood and other waste types. The geometric mean of the number size distribution, the PM₁₀/CO₂ ratio and the BC/CO₂ ratio can be used to distinguish plastic waste burning from firewood burning. A neural network was also trained to detect waste burning with 16% of the total data and the trained neural network was tested with the remaining data. It was found that plastic waste burning could be identified with an average probability of ~79%, with values ranging from 55% to 90% for the waste types tested.

Novel method for TPM determination – Combination of ENPME and Porous Tube Dilution

Claudia SCHÖN¹, Juhon LOUHISALMI², Kamil KRPEC³, Isaline FRABOULET⁴, Benjamin CEA⁴, Hans HARTMANN¹, Jarkeko TISSARI²

¹Technology and Support Centre in the Centre of Excellence for Renewable Resources (TFZ), Straubing, Germany; ² Department of Environmental and Biological Science, University of Eastern Finland, Kuopio, Finland; ³ Energy Research Centre, Technical University of Ostrava, Ostrava, Czech Republic; ⁴ The French National Institute for Industrial Environment and Risks, Verneuil-en Halatte, France

Presenting author's name: *Claudia SCHÖN*

Presenting author's e-mail: Claudia.schoen@tfz.bayern.de

Keywords: *wood combustion, log wood stoves, real life emissions, TPM measurement*

Abstract:

The determination of total particulate matter (TPM) emission is performed differently in various countries defined in relevant standards. Typically, TPM emissions are detected in the hot flue gas. Since the new EN 16510-1:2022 a European sampling method has been defined which is done at 180°C. However, part of the organic portion of TPM condense below this temperature and thus, this rather high temperature does not represent the TPM emissions exiting the chimney.

The TPM method in the hot flue gas was further developed and a cooling step by a porous tube diluter was included. This way, the hot flue gas sample passes first the TPM method described in EN 16510-1:2022 and then this hot “cleaned” flue gas passes a porous tube diluter with a dilution ratio of 1:8. Behind the porous tube an additional filter was installed to collect additional condensable particles at temperatures below 40 °C. This method has been used during real-life combustion conditions of four to five log wood stoves.

The novel TPM method always detected higher emissions compared to the standard TPM method in the hot undiluted flue gas. The increase in TPM emissions due to defined dilution was not the same for the different log wood stoves in this investigation. Moreover, no correlation between TPM increase and condensable organic gaseous carbon emissions (OGC minus methane) were found.

Using the novel TPM method an increase in TPM emissions were detected being different for each of the tested stoves. This increase seems to be stove dependent.

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Novel real-life test protocol for log wood stoves during round robin

Claudia SCHÖN¹, Juhon LOUHISALMI², Kamil KRPEC³, Isaline FRABOULET⁴, Benjamin CEA⁴, Hans HARTMANN¹, Jarkko TISSARI²

¹Technology and Support Centre in the Centre of Excellence for Renewable Resources (TFZ), Straubing, Germany; ²Department of Environmental and Biological Science, University of Eastern Finland, Kuopio, Finland; ³Energy Research Centre, Technical University of Ostrava, Ostrava, Czech Republic; ⁴The French National Institute for Industrial Environment and Risks, Verneuil-en Halatte, France

Presenting author's name: *Claudia SCHÖN*

Presenting author's e-mail: Claudia.schoen@tfz.bayern.de

Keywords: *Wood combustion, log wood stoves, real life emissions*

Abstract:

Log wood stoves are widely used in private households. Typically, they are tested at optimal combustion conditions at nominal load during type testing. This does not represent real-life operation in the field since the ignition phase, partial load or overload operation are not considered.

Based on already published test protocols for log wood stoves as well as from other experiences a novel real-life test protocol was defined. All combustion phases were included in order to get a real-life emission behavior. This test protocol includes the ignition phase (2 batches) at natural draught, followed by three batches at nominal load, two batches at partial load and one batch at overload. This test protocol was then applied on two different log wood stoves using a common beech fuel with bark during round robin. Both log wood stoves were sent to four laboratories to validate the novel real-life test protocol. Typical emission parameters such as CO, OGC, NOX and TPM emissions were recorded and evaluated.

This round robin showed the variance of emission parameters for two log wood stoves operated under real-life conditions. Generally, the variances were quite low and coefficient of variation for TPM, CO, OGC and NOX were 11.5 %, 15.8 %, 4.2 % and 8.7 %, respectively for stove A and 20.7 %, 13.8 %, 16.3 % and 8.7 %, respectively for stove B. This was partly affected by not strictly following the defined protocol since in some cases the recharging of the stove occurred too late making the re-ignition of the fresh fuel difficult. This has a considerable effect on the overall combustion and emission behavior of a stove.

This round robin showed the importance on following the instructions defined in the novel real-life test protocol. In addition, it showed the real emission behavior of stoves. Generally, more stoves should be tested using this novel test protocol.

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