Partner search request – expertise offer for Horizon Europe call

Innovative and advanced monitoring and modelling systems for revised air quality policies

HORIZON-CL6-2025-01-ZEROPOLLUTION-01

Research group profile

Name of the Research Group/Laboratory/Department: ELTE Urban Air Quality Research Group		
Contact details of the Research Group/Department	Name of the Head of the Research Group/Laboratory/ Department	**Dr. Róbert Mészáros**, *Associate Professor (PhD, habil.), meteorologist, Head of Department, Department of Meteorology, Institute of Geography and Earth Sciences, Eötvös Loránd University, Budapest, Hungary*
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Presentation of the Research Group/Laboratory/ Department	Present the main research areas and goals of the group (in ca. 1000 characters). In addition to the description, list the keywords of the research areas.	The ELTE Air Quality Research Group investigates the origin, spatiotemporal dynamics, and health impacts of atmospheric pollutants, with a special emphasis on particulate matter (PM) in urban environments. We develop and deploy mobile monitoring platforms – most notably, bicycle-mounted sensor suites – to map pollution at street level with meter-scale resolution and minute-scale frequency. Our instrumentation combines reference-grade aerosol monitors with low-cost sensors (AirVisual Pro & Outdoor, Atmotube, AirQino, Alphasense OPC-N3, and a proprietary PM module) integrated through an in-house data processing and quality assurance (QA/QC) pipeline. The group also conducts indoor air-quality surveys, low-volume sampler chemical speciation, and applies AI/deep-learning techniques for source attribution and exposure modelling. These capabilities align closely with the objectives of Horizon Europe's Zero Pollution agenda, enabling improved exposure assessment, including for vulnerable groups, and evidence-based mitigation strategies. ***Keywords***: urban air quality, urban climate, aerosol PM2.5/PM10, mobile monitoring, low-cost sensors, data quality assurance, indoor–outdoor exposure, machine learning, micrometeorology
	Present briefly the research group 's members (name; position – PhD student, postdoc, etc; area of	**Dr. Róbert Mészáros** – Associate Professor, Group Head; 25 + yrs in meteorology & aerosol science, mobile measurements, indoor/outdoor air-quality research, project leadership (UPSURGE, National Climate Lab).

	expertise). If you have a dedicated website about your group, please add the link.	https://nimbus.elte.hu/~mrobi/index-en.htm **Prof. Dr. Zoltán Barcza**, DSc – Professor; greenhouse-gas fluxes, eddy-covariance & ecosystem carbon modelling, links air-quality mitigation with climate action. https://bzoli.web.elte.hu/index.html **Dr. Ádám Leelőssy** – Assistant Professor; atmospheric dispersion & air-quality modelling, machine-learning methods in environmental forecasting. https://leeladam.web.elte.hu/ **Ágoston Vilmos Tordai** – PhD Candidate; mobile PM monitoring, sensor development, integrated QA/QC software, 7 yrs micrometeorological field-measurement design & data analysis. https://tordai.web.elte.hu/ **Adrienn Varga-Balogh** – Junior Research Fellow; urban air-quality data analysis, downscaling of CAMS PM forecasts, COVID-era mobility impacts on air quality, statistical & machine-learning techniques for pollutant trends. **Veronika Oláhné Groma** – Group Leader, Energy Strategy and Environmental Effects (E-SEE) Research Group, HUN-REN Centre for Energy Research Environmental Physics Department; aerosol particle research, $PM_{2.5}$ sensor performance evaluation and calibration, low-cost air quality sensor networks, environmental monitoring methodology https://www.ek.hun-ren.hu/en/environmental-physics-department/
	Describe the group's main achievements, expertise, unique research infrastructure (previous projects, awards etc.) (in ca. 500 characters)	• Unique bicycle-based monitoring methodology (> 250 urban routes, 2022–25). • Sensor-validation framework: laboratory & field calibration protocols for low-cost PM sensors (AirVisual, Atmotube, AirQino, Alphasense). • Integrated data-processing / QA platform (MATLAB & Python) for advanced QC, outlier detection, data correction and automated reporting. • Low-volume sampler campaign for parallel PM composition analysis. • Contribution to National Multidisciplinary Laboratory for Climate Change (RRF-2.3.1-21-2022-00014) and Horizon Europe UPSURGE (Budapest demo).

		Potential Roles in Horizon Europe Consortia • Measurement & sensing: mobile/indoor/outdoor campaigns, sensor testing & development. • Data management & analytics: QA/QC pipelines, machine-learning source apportionment, exposure modelling. • Dissemination & outreach: workshops for schools, public demo days, awareness raising activities - collaboration with municipalities
	Main references, publications, videos with links	Atfeh, B., Barcza, Z., Groma, V., Tordai, Á. V., and Mészáros, R.: Performance Assessment of Low- and Medium-Cost PM2.5 Sensors in Real-World Conditions in Central Europe, Atmosphere, 16, 10.3390/atmos16070796, 2025. Groma, V., Alföldy, B., Börcsök, E., Czömpöly, O., Füri, P., Horváthné Kéri, A., Kovács, G., Török, S., and Osán, J.: Sources and health effects of fine and ultrafine aerosol particles in an urban environment, Atmospheric Pollution Research, 13, 10.1016/j.apr.2021.101302, 2022. Kovács, A., Leelőssy, Á., Tettamanti, T., Esztergár-Kiss, D., Mészáros, R., and Lagzi, I.: Coupling traffic originated urban air pollution estimation with an atmospheric chemistry model, Urban Climate, 37, 10.1016/j.uclim.2021.100868, 2021. Tordai, Á. V., Mészáros, R.: Bicycle-based aerosol measurements in the inner city of Budapest, EGU General Assembly 2024, Vienna, Austria, 14–19 Apr 2024, EGU24-12180, https://doi.org/10.5194/egusphere-egu24-12180, 2024 Varga-Balogh, A., Leelőssy, Á., Lagzi, I., and Mészáros, R.: Time-Dependent Downscaling of PM2.5 Predictions from CAMS Air Quality Models to Urban Monitoring Sites in Budapest, Atmosphere, 11, 10.3390/atmos11060669, 2020.
Brief presentation of your organization (ELTE)	Eötvös Loránd University (ELTE) is one of the oldest and largest universities in Hungary. Currently, it has nine faculties and runs 51 bachelor, 115 master programmes and hosts 17 doctoral schools. According to global university rankings ELTE is one of the best public universities in Hungary, ranks among the top 2,6% higher education institutions worldwide. It has an extensive international network of partner organizations, collaborating with more than 500 Erasmus partner institutions and 150 further bilateral international partners. ELTE is a member of the following international university networks: EUA (European University Association), EUF (European University Foundation), Charm-EU (Challenge-Driven, Accessible, Research-based and Mobile European University), CENTRAL (Central European Network for	

	Teaching and Research in Academic Liaison), Coimbra Group, DRC (Danube Rectors' Conference), UNICA (Network of Universities from the Capitals of Europe), Utrect Network, CELSA (Central Europe Leuven Strategic Alliance). Research groups of ELTE participated in 34 projects in EU Horizon 2020 progamme (including 7 ERC grants) and are supported in 33 Horizon Europe projects. ELTE has received 13,9 million euro funding from Horizon Europe so far. Apart from focusing on research excellence, ELTE also aims to strengthen innovation, cooperation with businesses and exploitation of research results. It has strategic cooperation with big companies (e.g. Ericsson, Mol, Morgan Stanley) and 14 spin-off companies have been created at ELTE so far.