

## Proposals for NORMAN Joint Programme of Activities 2025

<b>Title</b>	<b>Analytical assessments of organic micropollutants in the Danube River using a combination of passive sampling, targeted analysis, non-target screening and in Joint Danube Survey JDS5</b>
<b>Type of activity</b>	Field study
<b>Leader</b>	RECETOX
<b>Topic / activities</b>	<p><b>Background / Justification for the proposed activity:</b></p> <p>In Summer 2025 the Joint Danube Survey (JDS 5) will be organised. One of the survey objectives is to identify river basin specific pollutants and characterise their fate in the aquatic environment and associated environmental risks. JDS5 offers NORMAN experts an excellent 'playground' for testing different analytical and monitoring approaches on a large transboundary river basin.</p> <p>We propose to apply passive sampling (PS) in JDS 5 as monitoring tool for trace organic pollutants in the Danube river. PS has a great potential application in routine investigative monitoring under WFD. Passive samplers accumulate pollutants in a similar way as organisms do and concentrate sufficient amounts of pollutants from water for analysis where spot sampling methods often fail. NORMAN has already successfully demonstrated applicability of PS for chemical and effect based monitoring of a broad range of organic chemicals and their prioritization in the previous JDS3 and JDS4 surveys (Novák et al., 2018; Vrana et al., 2018, Šauer 2023 et. al. 2023, Beggs et al. 2023) and the PS methodology developed by NORMAN has now become an integral part of Danube surveys.</p> <p>The proposed application of temporally integrative sampling approach will result in samples that provide a representative picture of pollution situation at 10 defined sites of the Danube river. Passive samplers from water will be investigated by target chemical analyses (priority and river basin specific pollutants), suspect and non-target screening mutually agreed among project partners.</p> <p><b>Objectives:</b></p> <ol style="list-style-type: none"> <li>1. Repeated sampling of trace organic pollutants after 6 years using the methodology successfully tested in JDS4</li> <li>2. Comparing data with the available 2019 baseline in the Danube, continuing a temporal trend monitoring of relevant substances (incl. new priority substances – e.g. pyrethroids)</li> <li>3. Monitoring previously identified toxicity drivers in complex pollutant mixtures present in Danube water</li> <li>4. Comparing bioaccumulative substances in passive sampler extracts from water and biota (chemometer approach)</li> <li>5. Monitoring contribution of large urban WWTP effluents to the water quality in the Danube</li> </ol> <p><b>Description of the proposed activity and expected outcomes for 2025:</b></p> <p>For sampling we propose installation of passive samplers at 10 representative sites selected from the 48 JDS5 sites where full scale investigations will be performed. Sites will be selected from the so called "supersites" where other in depth investigations will be performed in parallel to PS activity (especially non-target screening (NTS) in fish and the sites should overlap with the sites sampled in JDS4.</p> <p>Three types of passive samplers will be applied: for hydrophobic, polar compounds, and a specific sampler for PFAS, respectively. The samplers for hydrophobics will be based on silicone materials, whereas passive samplers for polar compounds will be made from available SPE extraction adsorbents (Affinisep HLB disks). For PFAS, validated MPT samplers developed at the University of Queensland will be applied. Samplers will be deployed for approximately 6 weeks during the period May-July 2025. Similarly to JDS4 we propose deployment of samplers at stationary sites (dams, bridge pillars, buoys). The extended deployment period will allow integrative accumulation of chemicals in passive samplers to better detectable levels. The principle of stationary PS methodology remains equal to the methodology applied in JDS4, and the results can be evaluated using usual passive sampler calibration parameters and compared to results obtained in JDS4.</p> <p>Samples (from polar, non-polar and PFAS passive samplers) will be subjected to chemical.</p> <ol style="list-style-type: none"> <li>1. Analysis of selected target priority substances; river basin specific pollutants and a wide-scope target analysis</li> <li>2. Suspect screening and NTS of extracts from passive samplers:</li> </ol> <p><b>Schedule:</b></p> <ol style="list-style-type: none"> <li>1. Steering group meeting in March 2025 finalizing the methodology (RECETOX).</li> <li>2. Sampling with a battery of passive samplers installed in the JDS 5 (May – July 2025)</li> <li>3. Analysis of the passive samplers in partner laboratories (2025-2026)</li> </ol> <p><b>Added value / Link with other NORMAN activities and / or other projects</b></p> <p>Expected outcomes for 2025: Monitoring data (absolute or relative contaminant concentrations)</p> <p>JDS5 provides a great opportunity to benefit from other relevant knowledge and data on water quality collected during the expedition. The study will allow a firmer establishment of the NORMAN-derived passive sampler methodology a tool for investigative and trend monitoring under WFD.</p>

	<p><b>References</b></p> <p>Vrana, B., Smedes, F., Allan, I., Rusina, T., Okonski, K., Hilscherová, K., Novák, J., Tarábek, P., Slobodník, J., 2018. Mobile dynamic passive sampling of trace organic compounds: Evaluation of sampler performance in the Danube River. <i>Sci. Total Environ.</i> 636, 1597–1607. <a href="https://doi.org/10.1016/j.scitotenv.2018.03.242">https://doi.org/10.1016/j.scitotenv.2018.03.242</a></p> <p>Novák, J., Vrana, B., Rusina, T., Okonski, K., Grabic, R., Neale, P.A., Escher, B.I., Macová, M., Ait-Aissa, S., Creusot, N., Allan, I., Hilscherová, K., 2018. Effect-based monitoring of the Danube River using mobile passive sampling. <i>Sci. Total Environ.</i> 636, 1608–1619. <a href="https://doi.org/10.1016/j.scitotenv.2018.02.201">https://doi.org/10.1016/j.scitotenv.2018.02.201</a></p> <p>Šauer, P., Vrana, B., Escher, B.I., Grabic, R., Toušová, Z., Krauss, M., von der Ohe, P.C., König, M., Grabicová, K., Mikušová, P., Prokeš, R., Sobotka, J., Fialová, P., Novák, J., Brack, W., Hilscherová, K., 2023. Bioanalytical and chemical characterization of organic micropollutant mixtures in long-term exposed passive samplers from the Joint Danube Survey 4: Setting a baseline for water quality monitoring. <i>Environ. Int.</i> 178, 107957. <a href="https://doi.org/10.1016/J.ENVINT.2023.107957">https://doi.org/10.1016/J.ENVINT.2023.107957</a></p> <p>Beggs, C., Mackie, R., Vrana, B., Prokeš, R., Gorji, S.G., Schulze, B., Thomas, K. V., Mueller, J.F., Kaserzon, S.L., 2023. Estimation of per- and poly-fluoroalkyl substances mass loads in the Danube River using passive sampling. <i>Sci. Total Environ.</i> 892, 164458. <a href="https://doi.org/10.1016/j.scitotenv.2023.164458">https://doi.org/10.1016/j.scitotenv.2023.164458</a></p> <p>Rojo-Nieto, E., Wernicke, T., Muz, M., Jahnke, A., 2024. From Trophic Magnification Factors to Multimedia Activity Ratios: Chemometers as Versatile Tools to Study the Fate of Hydrophobic Organic Compounds in Aquatic Ecosystems. <i>Environ. Sci. Technol.</i> <a href="https://doi.org/10.1021/ACS.EST.4C07940">https://doi.org/10.1021/ACS.EST.4C07940</a></p>
<b>Participants</b>	<p>RECETOX (CZ) – passive samplers preparation, deployment, retrieval, targeted analysis, suspect screening by LC/QTOF</p> <p>ICPDR – identification of representative sampling sites, assistance with permits to access sampling sites</p> <p>EI (SK) assistance with the logistics of sampling, NTS (LC-HR-MS and GC-HR-APCI-MS)</p> <p>NIVA (NO) – NTS</p> <p>UFZ (DE) – : NTS (LC-HRMS), contribution of large urban WWTP effluents – to be discussed</p> <p>UFZ (DE) – : GC-EI-HRMS target screening, testing of water passive equilibrium sampling chemometers, comparison of bioaccumulative compounds with passive samplers and fish from supersites</p> <p>UoA (GR) - Wide-scope target and suspect screening analysis; LC-ESI-QTOFMS and GC-APCI-QTOFMS</p> <p>University of Queensland, (Australia) – providing PFAS samplers and their analysis</p>
<b>Proposed in-kind contribution</b>	
<b>Contribution needed from NORMAN Association<sup>1</sup></b>	<p>15 000,- EUR</p> <p>Estimated cost of sampler preparation, deployment and retrieval, sample extraction and distribution to interested partners and analysis of a basic set of target analytes (priority substances, RBSP). The remaining costs have to be covered by in kind contribution of collaborating partners.</p>

<sup>1</sup> Please, provide here a transparent justification of the requested resources and of the in-kind contribution, thereby distinguishing between the costs associated with “person-months” for the organisation, the “travelling costs” for invited speakers and the costs for the logistics (e.g. meals, room rental etc.)