



## Proposals for NORMAN Joint Programme of Activities 2024

<b>Title</b>	<b>(Micro)plastics – leaching of additives and non-intentionally added substances (NIAS)</b>
<b>Type of activity</b>	Research
<b>Leader</b>	Nikiforos Alygizakis (EI/NKUA), Andrea Brunner (TNO)
<b>Topic / activities</b>	<p><b>Background / Justification for the proposed activity:</b> Plastic pollution poses a significant threat to our ecosystems, with microplastics and leaching of chemicals from micro- and macro-litter contributing to the complexity of environmental contamination. Traditional monitoring methods often overlook emerging contaminants, necessitating a comprehensive untargeted approach to identify and understand the impact of plastic additives and other plastic associated chemicals. High-resolution mass spectrometry (HRMS) has emerged as a powerful tool for detailed chemical analysis. This proposal aims to conduct such HRMS based non-target screening of (micro)plastic leachates, including both analyses of reference material and retrospective screening for plastic related chemicals in NORMAN Digital Sample Freezing Platform (DSFP).</p> <p><b>Description of the proposed activity and expected outcomes for 2024</b></p> <p>1. <u>Compilation of the list of plastic additives, NIAS and their transformation products (TPs)</u> The NORMAN Suspect List Exchange (SLE) contains suspect lists S46, S47 and S48, which encompass a wide range of plastic additives and associated compounds, allowing to identify and quantify their presence in environmental samples archived in DSFP. Some plastic-related substances are in other SLE lists (e.g. bisphenols (S20) and their alternatives (S67, S97), compounds in plastic toys (S91, S93), etc.). Additional lists are available from e.g. the UNEP report “Chemicals in Plastics”, the scientific literature and ongoing studies, often carried out with participation of NORMAN members. As an example, the Joint Nordic Screening Group organised a workshop on ‘Chemical additives in plastics as an environmental concern in the Nordic countries’ in November 2023. All available lists contributed by the participants will be compiled into a single SLE list of plastic additives, NIAS and their TPs. Information on substances, which are not yet in NORMAN Substance Database, will be generated/compiled. This holds specifically for main fragments in the mass spectra, retention time index (RTI, LC-HRMS), retention index (RI, GC-HRMS), ecotoxicity threshold values (Lowest PNECs), physico-chemical properties and additional hazard data (PBMT, ED, CMR). The information will allow for including the substances in suspect screening list and their follow up risk assessment.</p> <p>2. <u>Retrospective screening of selected samples from DSFP</u> Retrospective screening of ca. 400 environmental samples will be performed using the compiled suspect lists (cf. above). The samples will be representative for both freshwater and marine environment, including water, suspended particulate matter, sediment and biota compartments. Studies in which both NTS with GC- and LC-HRMS were carried out simultaneously with analyses of micro- and macro-litter (as required by the MSFD) will be preferred.</p> <p>3. <u>Non-target screening of (micro)plastic leachates</u> Employing LC- and GC-HRMS, non-target screening analyses will be conducted on leachates from (micro)plastics. From an environmental point of view, leachates are more relevant than the plastic particles themselves as they reflect the transfer of the chemicals to the environment. This approach aims to identify and characterise a broader spectrum of compounds released from plastics, going beyond the predefined suspect lists. Compounds detected in this analysis will be further investigated for their presence in the retrospective screening data (cf. above), establishing a direct link between leachates and environmental samples. The leachates will be prepared by TNO and distributed to all interested participants for analysis by various HRMS techniques.</p> <p><u>Expected outcome for 2024</u></p> <ul style="list-style-type: none"> <li>• Compilation of the suspect list of plastic additives, NIAS and their TPs for the NORMAN SLE</li> <li>• Comprehensive identification and semi-quantification of suspected plastic additives, NIAS and their TPs in real world samples archived in DSFP through retrospective screening</li> <li>• Discovery of novel contaminants in plastic leachates through non-target screening</li> <li>• Integration of datasets on non-target screening of plastic-related chemicals and analysis of micro-litter/macro-litter to improve the understanding of the correlation between the occurrence of (micro)plastics and presence of plastic additives, NIAS and their TPs in the environment</li> <li>• Environmental risk assessment of the identified plastic additives, NIAS and their TPs using NORMAN Prioritisation Framework</li> </ul> <p><b>Added value / Link with other NORMAN activities and / or other projects</b></p> <p><u>DSFP development and use</u> The proposed activity seamlessly integrates with DSFP, leveraging its wealth of HRMS data to conduct retrospective screening. The focused investigation of plastic-related compounds will test and demonstrate DSFP's capabilities and its possible limitations.</p> <p><u>NORMAN Database System (NDS)</u> The activity will contribute valuable data on newly introduced substances to the NDS modules SLE, SusDat, DSFP, MassBank Europe and Substance Factsheets, enriching the collective knowledge on plastic additives, NIAS, related TPs and their leachates. This shared resource will be helpful for future</p>



	<p>research and policy development.</p> <p><u>Cross-Working Group Activity Non-target Screening (NTS)</u>  The activity will be closely coordinated with the CWG NTS. Features of the 'smart' screening of a group of suspected substances using the NORMAN infrastructure will be tested.</p> <p>The activity aligns with NORMAN's mission to act as a science-to-policy interface. The outcomes will contribute to informed decision-making and policy development in addressing the adverse effects posed by plastic additives, NIAS and their TPs released from (micro)plastics in the environment.</p>
<b>Participants</b>	TNO, Helmholtz-Zentrum hereon GmbH, KWR, Aarhus University (AU), NIVA (tbc), OSPAR (tbc), EI, NKUA, all other interested organisations
<b>Proposed in-kind contribution</b>	<p>All participants: Lists of additives, NIAS and their TPs from the previous and on-going studies</p> <p>NKUA: Generating Retention Time Index (RTI, LC-HRMS), ecotoxicity threshold values (Lowest PNECs) and applicability domain information for substances newly included in SLE/SusDat</p> <p>EI: Suspect screening of additives, NIAS and their TPs in selected samples from DSFP; generating main fragments in the LC-HRMS mass spectra, compilation of Retention Index (RI, GC-HRMS), physico-chemical properties and additional hazard data (PBMT, ED, CMR) for substances newly included in SLE/SusDat</p> <p>EI, all participants: Correlation of suspect screening data with data on the occurrence of microplastics and macroplastics (micro-litter and macro-litter) in selected freshwater and marine environment studies</p> <p>TNO: Preparation and distribution of (micro)plastic leachate samples to all interested participants</p> <p>AU: Extended list of plastic additives and their TPs from ongoing studies, contributions to analyses of leachate samples with HRMS techniques and to environmental risk assessment</p> <p>NKUA, Helmholtz-Zentrum hereon GmbH (tbc): Analyses of leachate samples with HRMS techniques</p>
<b>Contribution needed from NORMAN Association<sup>1</sup></b>	<p>Leachate sample preparation and distribution (TNO, 3000 €)</p> <p>Optimising workflow for retrospective screening of GC-amenable additives, NIAS and their TPs in DSFP samples obtained by GC-HRMS techniques (NKUA and EI, 4500 €)</p> <p>Overall coordination and compilation of results, development of new SLE lists of additives, NIAS and their TPs suspected/present in the samples, risk assessment of identified/ semi-quantified substances (EI, 2250 €)</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.)