Proposal for NORMAN Joint Programme of Activities 2025

Title	Blueprint for linking ecotoxicity to different levels of biodiversity damage, building on and integrating various NORMAN data streams
Type of activity	Research and database development
Leader	Peter Fantke, Environmental Institute (EI)
Topic / activities	*Background / Justification for the proposed activity:* Various efforts within and outside the European Union are currently working on linking chemical ecotoxicity effects at organism level to damage at ecosystem level to provide a quantitative relationship between chemical exposure and biodiversity loss. Despite some available metrics and data, currently no operational workflow exists that can support prioritisation of chemicals based on damage on biodiversity. This is partly due to the variety of existing damage level indicators ranging from species loss to damage on ecosystem functioning, but also because currently useful data streams are rather disconnected, and modelling approaches focus on merely individual indicators and pathways. A small-scale workflow showcasing how data and models can be effectively integrated into a kind of a blueprint of how to connect chemical ecotoxicity to various levels of biodiversity damage is hence urgently needed. Such a blueprint could then serve as a sort of template for conducting larger-scale analyses for various types of regions, ecosystems and stressors, which would ultimately serve as complementary line of evidence in the prioritisation of chemicals for substitution and phase-out. *Description of the proposed activity and expected outcomes for 2025:* **Main goal** of the proposed activity is to create an **operational «blueprint» approach for quantitatively linking chemical pollution to different levels of damage on biodiversity**. Different steps will be followed. We will start by developing a conceptual overview of how to link chemical pollution to damage on biodiversity (i.e. measurable impact expressed in terms of what we value about ecosystems) at different levels, including **genetic diversity, species diversity, functional diversity and ecosystem services**, and how relevant data and models can be integrated. Next, quantitative links will be created and metrics defined to translate ecotoxicity effects into biodiversity damage. Finally, an **illustrative case study will be developed** with an operational workflow defined to quantify biodiversity damage, with **recommendations how to apply this workflow more broadly**. The steps translate into specific tasks: • **Task 1**: Develop a consistent **impact pathway** for chemicals and their impact on ecological functions and biodiversity at different levels of damage and clarify how different types of data and modelling steps can be integrated into this impact pathway framework. • **Task 2**: Define **a set of quantitative, complementary biodiversity damage metrics** that are suitable for possible implementation in policy frameworks (e.g. the Cooperate Sustainability Reporting Directive, CSRD) and discuss approaches to translate ecotoxicity impacts to different biodiversity damage levels, building on existing studies and data for species richness, genetic diversity, functional diversity and damage on ecosystem services from public databases (e.g. RIVM species monitoring data, Monarch Initiative data on generic variance, DISPERSE Functional Trait database). • **Task 3**: Execute **an illustrative source-to-damage quantification case study**, based on good available data (e.g. from SOLUTIONS project/Joint Danube >Survey 4 (2019 and from the recent JPAs of WG-2 on linking EBMs, exposure and eDNA data for samples from the Environmental Specimen Bank, https://umweltprobenbank.de/en/), and discuss requirements for expanding to a wide range of chemicals, ecosystems and regions. Given the data (e.g. NORMAN Ecotoxicology database; to be extended for specific ecotoxicity threshold values for additional specific endpoints, cf. JPA 2024 WG-1 Prioritisation) and approaches already available for specific biodiversity damage modelling elements (e.g. msPAF-to-PDF translation in USEtox, https://usetox.org), an **initial focus will be on freshwater aquatic biodiversity**. It is planned to **adapt** this workflow on **terrestrial ecosystems**, if possible, mainly via strong interaction with related EU-funded projects, such as TerraChem, in which EI, UBA and RIVM are involved. **Expected outcomes** are to (a) build on and **integrate various existing data streams** (such as biomonitoring, target/suspect-screening and ecotoxicity effect test data available in the NORMAN Database System), (b) an aligned definition of **biodiversity damage metrics** ranging from damage on species richness, genetic diversity, functional diversity and ecosystem services, (c) **recommendations for how to scale up the proposed workflow** and how to integrate the proposed metrics as **complementary criteria for chemical prioritisation efforts, and** (d) a quantitative link between ecotoxicity data and biodiversity damage as **new line of evidence for chemicals management**. *Added value / Link with other NORMAN activities and / or other projects:* The proposed activity will have the following links and support elements related to other NORMAN activities and EU environment policy: • Provide input for the prioritisation of chemicals under NORMAN WG-1 activities • Complement chemical risk assessment criteria, stiving to support the EU biodiversity strategy 2030 • Strengthen the link between chemical pollution and biodiversity loss (cf. NORMAN WG-2) • Provide a link between suspect/non-target screening and modelling (NORMAN CWG-NTS) • Contribute to the development of European infrastructure (Common Data Platform) by transparently archiving all open access (incl. training/validation) datasets and sources of all parameters utilised by the used models in a harmonised format (new NDS module; cf. JPA2024 Databases; see also outcomes of the NORMAN AI Workshop, Leipzig, 2024) • Help identify environ. contaminants of emerging concern (NORMAN WG-1, WG-2-WG-7, WG-8) • Provide input for larger-scale efforts to link chemical pollution to biodiversity that currently build on

	individual metrics and disconnected data/model interfaces (e.g. TerraChem project).
Participants	The following organisations and their experts will contribute to the activity, **all members of the NORMAN network are invited to join**: • **EI**, Environmental Institute, Slovak Republic (lead): **Peter Fantke**, **Jaroslav Slobodnik**; source-to-damage impact modelling, chemical data science • **RIVM**, National Institute for Public Health and the Environment, Netherlands: **Leo Posthuma**; ecotoxicity analysis and species sensitivity distributions • **GUF**, Goethe University Frankfurt, Germany: **Henner Hollert**; EBMs, ecological and biodiversity damage modelling and species network analysis • **UBA**, German Federal Environment Agency: **Gabriele Treu**; regulatory processes and requirements for chemical risk and biodiversity assessment *It is expected that the NORMAN members who wish to participate in this activity will furthermore ensure that relevant cross-fertilization happens across ongoing and upcoming projects that the respective experts are involved in, while enabling to apply for additional funding and further strengthen collaboration among involved experts and beyond to jointly engage in possible follow-up activities and projects.*
Proposed in-kind contribution	In-kind contributions are foreseen in all proposed activities as a complementary component to NORMAN-provided funding: • **EI**: in-kind coordination activities, contribution to alignment of activities with existing EU projects (e.g. TerraChem), and interaction with data from the various NORMAN Database System modules. • **RIVM**: internal knowledge on ecotoxicity data assessment and biodiversity damage-level monitoring and analysis. • **GUF**: internal expertise on EBMs, ecological networks and functional aspects, as well as on biodiversity assessment. • **UBA**: internal knowledge on policy-relevance, regulatory requirements and processes around biodiversity impacts from chemicals. ***All partners*** *will contribute to writing a scientific publication based on the outcomes of the proposed activity, involving other NORMAN members interested to join.*
Contribution needed from NORMAN Association[1]	The estimated duration of the proposed activity will be 15 months. With that, the activity will be mainly implemented during 2025, while the actual end date will be a function of the defined starting date. For successfully completing the proposed activity, the following estimated budget would be required: EI: Project lead, metrics/framework definition, case study, design of the NDS module for storage of training/validation datasets of used models – 10,500 € RIVM: Input on ecotoxicity & ecological metrics and approaches – 1,500 € GUF: Input EBMs, biodiversity aspects and damage modelling – 1,500 € UBA: Input on regulatory process and requirements – 1,500 € Total: 15,000 €

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[1] 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.)