NanoFASE

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# POLICY AND EXPLOITATION FACTSHEETS

## FACTSHEET 6

EFFECT OF ENGINEERED NANOMATERIAL (ENM) FORM ON ENVIRONMENTAL FATE IN SOILS

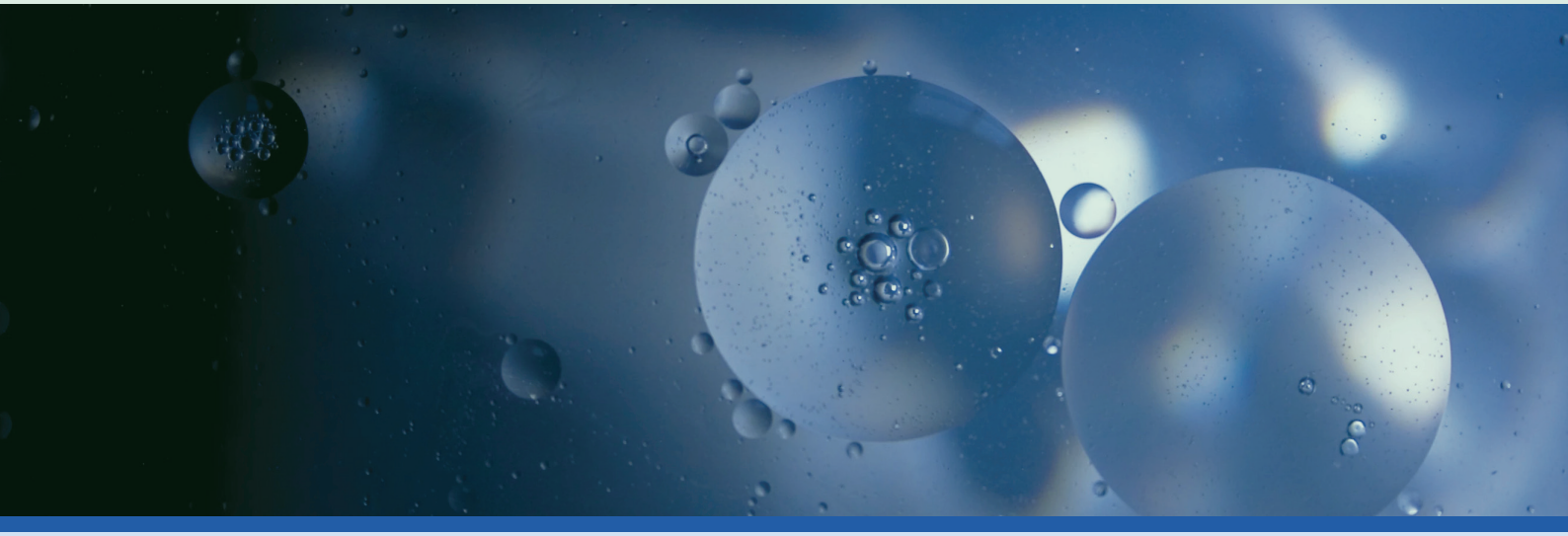
More than a decade of research on environment effects of ENMs in soils has resulted in an enhanced qualitative understanding of the physicochemical properties of soils and ENMs themselves that contribute to the transport of ENMs into deeper soil layers. This has sparked a paradigm shift where the equilibrium description of exposure and transport of ENMs has been replaced with a dynamic description of ENMs. Quantitative understanding is, conversely, lacking. Saturated column tests, currently the only accepted functional test for transport parameters of ENMS in soils, largely fail to deliver all model parameters needed to describe ENM transport and bioavailability in the field, neglecting important parameters such as dissolution, bioturbation, detachment, heteroaggregation and interaction with air/water interfaces. The work of NanoFASE as related to the new paradigm of a dynamic description of ENMs, integrated with quantitative risk assessment of ENMs in soils, can be used to overcome this deficit and support the development of functional tests that incorporate these parameters to improve risk assessment.

NanoFASE receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 646002.

## RECOMMENDATIONS

The work of the NanoFASE project related to assessing the effect of ENM form on environmental fate in soils supports the following recommendations:

- Understanding forms of release, e.g. intact nanoparticles versus released ions, is a critical evaluation step.
- Dissolution tests in pore water are important to understand bioavailability and fate of ENMs in soils.
- Detachment is likely important to consider on longer-term scales: soil is not a sink study of transformation, and transformation processes in environmental reactors need to include assessment for the sulphides form.
- It is critical that future research efforts and projects avoid causing unintended effects that may negatively influence farmer and public acceptance of nanotechnology products in the food and feed chain.
- The use of nanomaterials as biocides and pesticides needs to be subject to specific assessment and regulation through different national and regional frameworks.
- Copper-based nanomaterials have been one of the first branches of nanopesticides to reach market; previously studies of their impacts on long-term soil quality indicate the need for a robust assessment of fate and exposure under different usage scenarios.



## RELATED NANOFASE DELIVERABLE REPORTS

**D7.1:** Research report on speciation and transformation of NM in soils.

**D7.2:** Soil property – NM fate relationships

**D7.3:** Report on differences in framework for assessment of intentional versus unintentional terrestrial NM exposures

**D7.4:** Spatial database of fate descriptors for ENM mobility/bioavailability in European soils

All NanoFASE deliverable reports are available at: **http://www.nanofase.eu/documents/reports**