NanoFASE Deliverable D6.1

Publication on review of airborne ENM and possible implications

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Research Report Summary

In spite of the still increasing number of ENM applications, large knowledge gaps exist with respect to their environmental fate, especially after release into air. This review aims at summarizing the current knowledge on emissions and behaviour of airborne engineered nanomaterials (ENMs). The whole ENM lifecycle is considered from the perspective of possible releases into the atmosphere. Although in general, emissions during use phase and end-of-life seem to play a minor role compared to entry into soil and water, accidental and continuous emissions into air can occur especially during production and some use cases such as spray application. Implications of ENMs on the atmosphere as e.g. photo-catalytic properties or the production of reactive oxygen species are reviewed as well as the influence of physical processes and chemical reactions on the ENMs. Experimental studies and different modelling approaches regarding atmospheric transformation and removal are summarized. Some information exists especially for ENMs, however, many issues can only be addressed by using data from ultrafine particles as a substitute and research on the specific implications of ENMs in the atmosphere is still needed.

The available information on the fate of airborne engineered nanomaterials has been reviewed and published in an open access review paper:

Astrid C. John, Miriam Küpper, Astrid M.M. Manders-Groot, Bruno Debray, Jean-Marc Lacome, Thomas A. J. Kuhlbusch: Emissions and Possible Environmental Implication of Engineered Nanomaterials (ENMs) in the Atmosphere, *Atmosphere* **8(5)**: 84, 2018, doi:10.3390/atmos8050084

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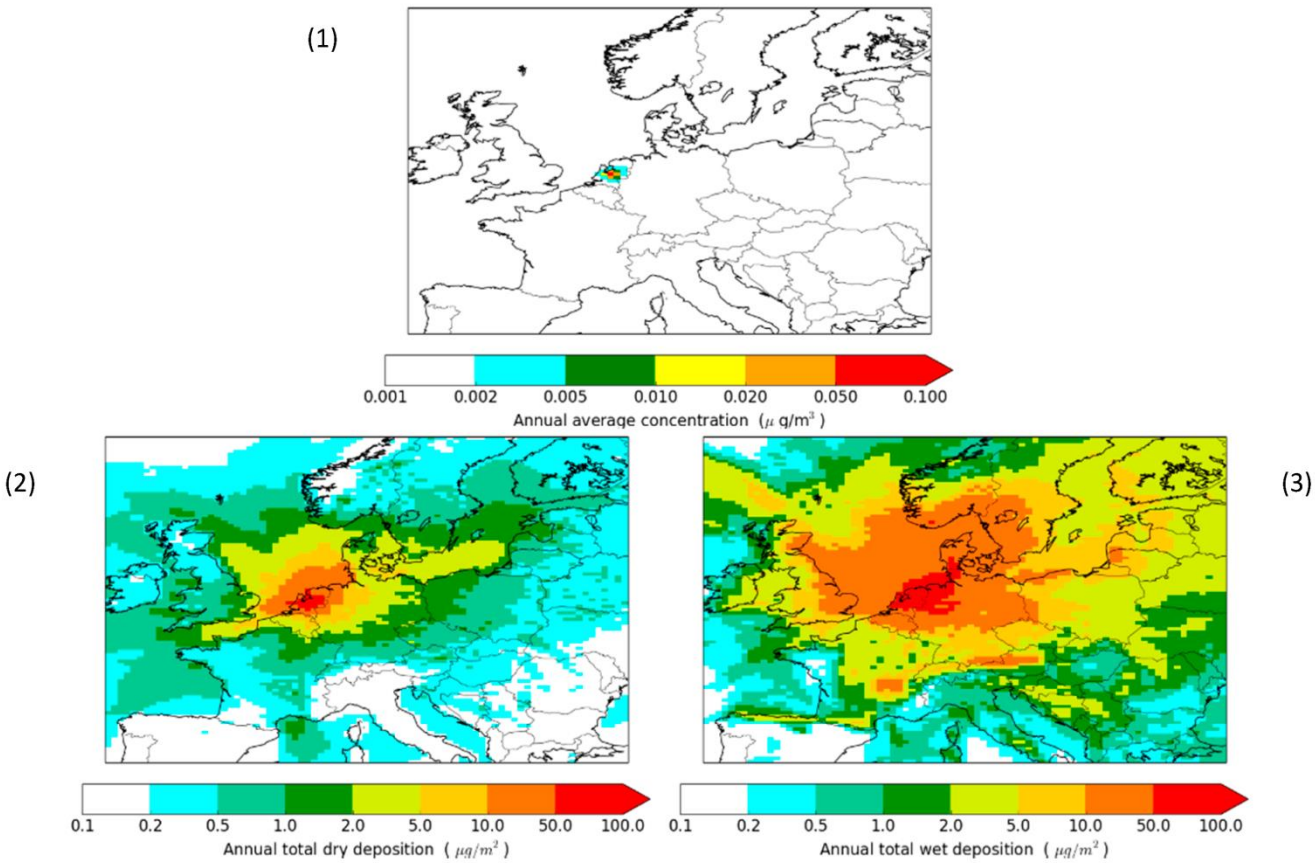

Figure 1: Annual average concentration (1) and total dry (2) and wet (3) deposition for a passive tracer released from a point source in The Netherlands with emission rate of 10 kg/h. Results from model simulation with LOTOS-EUROS for 2012. (figure from John et al., *Atmosphere* **8:**84, 2017)

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