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Modelling Nanoparticle Fate and Transport at Large Spatial Scales

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"The workshop highlighted the general need for water quality predictions at large scale and over time; NanoFASE is delivering a timely addition to our capabilities."

Engineered nanomaterials are increasingly being used in a range of consumer products and will likely be released into the environment from these products during their production, use or end-of-life phases. Nanomaterials are defined by their size (one dimension less than 100 nm) rather than their chemical composition. The high surface-to-volume ratio of nanomaterials imparts a high reactivity which is of interest for novel applications but may raise concern for human health and the environment. The first part of the presentation will describe models of fate and exposure at the EU scale that were made in the NanoFATE FP7 project. These models represent first-pass assessment of the spatial variability of nanosilver and nanozinc oxide concentrations in surface water following release from sewage treatment plants, and a first comparison of the predicted concentrations against ecological risk thresholds. Generally concentrations were predicted to be below likely effect levels except for local hotspots around large sewage discharges or areas of high population density. These models were rather simple, with limited instream processing, and most importantly having release estimates based on single production volume values for the whole of Europe. More sophisticated modelling of nanomaterial fate has to confront the challenges of establishing robust spatial release patterns and the complex interplay of transport and transformation rates in determining fate. In the second part of the presentation, the development of a new model in the NanoFASE H2020 project will be described, with a particular focus on advances in estimating the release of nano materials into the environment and the handling of the nano material fate processes in the river model.

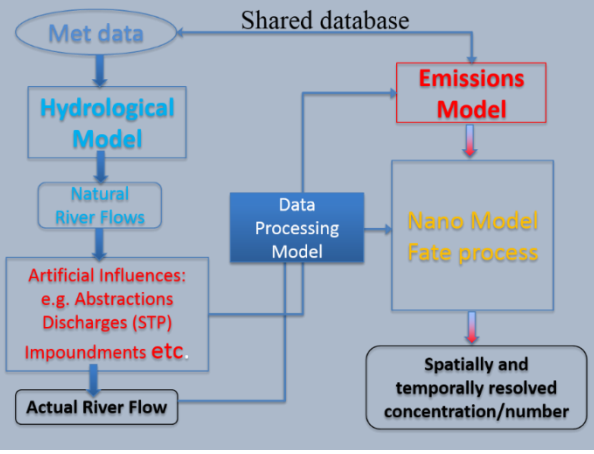

Figure 1. Schematic of the design of the NanoFASE model showing the links between the hydrology (transport) model, the chemical loading model and the nano-particle fate model.

This work relates to:
WP2 Multimedia fate modelling
WP4 Release forms and quantities from product life cycle
WP8 Effect of ENM form on environmental fate in water and sediments

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