Exposure to chemical agents originates either from environmental contamination (air, water), or from consumer products (food contact materials, construction materials, cosmetics, clothes, etc.) through multiple routes, namely inhalation, ingestion and dermal contact. Aggregate exposure, i.e. the quantitative exposure assessment to a single agent from all potential exposure pathways (the physical course taken by an agent as it moves from a source to a point of contact with a person) and the related exposure routes, raises specific issues that need to be addressed.

The objective of the project is thus the development of a tiered approach to aggregate exposure assessment and the compilation of a computational platform, able to perform quantitative aggregate exposure assessments for environmental and consumer products following a full chain approach (including emission-migration, media concentrations, exposure and internal dosimetry). The use of biomarkers to verify model predictions, to reconstruct population exposure and allocate to apportion exposure to sources (reverse modeling) will constitute a part of the tiered approach and the accompanying guidance. The tiered approach will guide the user through the preparation of the exposure assessment.

The methodology for quantitative aggregate exposure assessment will be implemented into a proof-of-concept computational toolbox, the core of which will be a synthetic dynamic modeling environment able to track and describe in mathematical terms all the steps of the full chain approach, implementing both mechanistic (e.g. dispersion models, Physiology Based ToxicoKinetic Models) and probabilistic methodologies (Markov Chain Monte Carlo or maximum likelihood estimates) based on outcome optimization and the current status of knowledge and data availability. The toolbox will not only provide “forward” mode of analysis, but it will describe in a more interactive (backwards and forwards) way the procedure from the source to the target tissue in a way that all intermediate stages can be estimated when needed, with a well-defined level of uncertainty. The TAGS toolbox will not be a single model developed ad hoc in the frame of the project. Rather, it should be understood as a computational system that can incorporate already existing state-of-the-art modelling systems that may address different parts of the tiered approach. The development work that will be done in the course of the project consists mainly of the development of the input/output protocols that would allow these pre-existing tools to communicate with each other (providing the so-called ‘information handshakes’).