Review and evaluation of exposure models in the 4FUN project

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• FP6 2-FUN project produced a prototype software containing a library of exposure models, coupling environmental multimedia and pharmacokinetic models.
• FP7 4FUN project will take the results from the 2-FUN project to the market, through a validation and standardization process and dissemination activities.
• Aim of Work Package 2: To analyse the strengths, weaknesses, opportunities and threats (SWOT) of existing exposure assessment tools (including 2-FUN) to identify possible improvement for the exposure assessment of the 4FUN model.

Introduction

Model evaluation approach

• To compare and evaluate models, a transparent and structured approach is necessary. Multi-Criteria Decision Analysis (MCDA) provides an effective framework for comparing exposure models according to a set of criteria.
• The selected evaluation criteria are organized in a hierarchical structure, base on 4 Lines of Evidence (see below).
• Identified criteria can strongly be related to regulatory frameworks, where exposure to man via the environment is important, such as REACH (EC 1907/2006), Biocidal Product Directive (98/8/EEC)/Regulation (EU 528/2012) and the Plant Protection Products Regulation (EC 1107/2009).

Lines of Evidence

Relevance

Exposure population
Compartments
Environmental processes
Time
Substance
...

Reliability

Validation, model, software, QSAR, Availability, User-Manual, Initialization, input parameters
Input parameters, helpdesk, manual, software, model-output, etc.
Output, method, sensitivity analysis, distribution type, scenario analysis

User friendliness

E.g. Does the model cover exposure to worker, general population, subpopulations?
Does the model calculate concentration in ground water, surface water, soil, marine water, air, etc.?
Does the model cover run-off, leaching, wet/dry deposition, degradation, etc.?
Is the model based on a dynamic approach?
Is the model focused on pesticide, biocides, organic in general, metals, etc.?
E.g. Is the model validated? Is the model developer well identified? Are QSARs used?
E.g. Is it possible to change the input parameters? Is a user-manual available? Is it possible to present the output in tabular form?
E.g. Is a scientifically sound probabilistic method used?

Uncertainty

Questions

E.g. Is the model validated? Is the model developer well identified? Are QSARs used?

Regulatory framework differences

PPP: worker, operator, bystander and resident. REACH/biocide: general population, industrial and professional use
PPP: surface and ground water, REACH/biocide: surface water + marine water
PPP specific processes: e.g. crop interception, REACH specific processes: e.g. sludge application from STP
PPP: dynamic approach, REACH/biocide: steady-state approach
PPP: mostly organic substances, REACH: organic, inorganic substances and metals

Model evaluation

• The questions proposed above will be presented through an on-line questionnaire to experts used to apply the selected multimedia models or to model developers themselves. They will perform a model evaluation using the pre-defined criteria.

More information on website 4FUN: http://4funproject.eu/en/home/

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