1.1 Tier 1 models

Tier 1 models are screening-level conservative deterministic models that allow a conservative, bounding estimate of exposure or risk using relatively little input information. Exposure determinants are single values and the approach results in high-end exposure estimates.

1.1.1 ECETOC TRA

The ECETOC TRA (Target Risk Assessment) tool has been developed for use as a tier 1 instrument within REACH (ECETOC, 2009) . It addresses worker, consumer and exposure through the environment.

The consumer part of the ECETOC TRA is largely based on the algorithms documented in (EC HA, 2008a, ECHA, 2009)
and defaults contained in the ConsExpo fact sheets (available from RIVM). In the initial assessment, the TRA enables worst-case exposure estimates for broad product categories (so-called sentinels). If desired, an assessment of the more specific product type can be launched. For the sentinel product/article, the exposure estimate for each route corresponds to the highest exposure estimate of the individual product/article subcategories within the sentinel. The model allows for Tier 1.5 assessments using refinements discussed in ECETOC (2009).

External daily doses are calculated for the oral, inhalation and dermal routes. There is no aggregation of exposures.

The environmental exposure part of the ECETOC TRA is equal to the TGD Excel tool. Outputs of the model are long-term intakes by inhalation, drinking water and food (fish, crops, meat and milk).

1.1.2 E-FAST

E-FAST is available from US-EPA Office of Pollution Prevention

and Toxics (OPPT). It provides screening-level estimates of the concentrations of chemicals released to air, surface water, landfills, and from consumer products. E-FAST Version 2 is being designed to support both the US-EPA's new chemicals and existing chemical programs. Estimates provided are potential inhalation, dermal and ingestion dose rates resulting from these releases. Modelled estimates of concentrations and doses are designed to reasonably overestimate exposures, for use in screening level assessment.

Human exposure is calculated following inhalation, drinking water ingestion and fish ingestion from environmental releases along with inhalation and dermal exposures from consumer products. Exposure is calculated, except for dermal exposure where an absorbed dose can be generated.

Doses are generated for the categories adults, youths and children categories and for acute (one day) and cancer (lifetime) exposure duration. The consumer module has a series of predefined consumer products and distinguishes between days of use and days after use.

1.1.3 CEPST

**CEPST (Chemical Exposure Priority Setting Tool) is a tool, which is under development by the LifeLine Group, to provide a ranking of chemicals based on semi-quantitative estimates of exposures (Jayjock, M. A. et al., 2009)
. The focus of the tool is "near-field" exposure, which is direct exposure from sources in the microenvironment of people (comparable with consumer exposure). The tool would run on following input:**

Chemical identification and physical properties

2. Internet search for chemical use (products and substance levels in the product)

3. Expert panel deliberation and determination of sentinel product(s) for the chemical

4. Modeller assignment of chemical/scenario dependent variables.

Key element of the process is step 3 in which each substance is matched with its use in a sentinel product (i.e. the product and use that yields the highest exposure). Sentinel products (SP) are further organized in sentinel product functions (SPF). For example, the SP automotive antifreeze would be in the SPF of automotive chemicals.

From the above information a Sentinel Product Exposure State (SPS) is generated, which is the linkage of use with exposure algorithms and default exposure parameters. Both applicator and post-application scenarios are considered.

The tool focuses on estimated doses and allows the user to view the maximum dose, the sum of doses by route or for sum of all routes (external or absorbed, with absorption fraction being 1 or 0); each for short term, subchronic and chronic exposure. Results are age-dependent. The tool runs for multiple chemicals and provides the ranking for each chemical.

Background information on the models used to provide the estimates is not available.

1.1.5 Summary on tier 1 models

Although a series of tier 1 models exist that could be used for screening level aggregate exposure assessment, none of these models provide the flexibility to be used for a broad type of exposure assessments. The models have all been developed within a regulatory context and thus only address specific exposure pathways. As an example, the ECETOC TRA and E-FAST models are suitable for exposure assessment within the regulations on chemical substances, but are not suitable to assess

exposure to pesticides or biocides.

Software models are generally not suited to incorporate measured concentrations (exposure levels), which could be an alternative approach if little data is available on emission from consumer articles or other sources.