Joint RAC-SEAC Workshop on Impact Assessment:

Approaches for translating the results of environmental risk assessments for use in socioeconomic impact assessment under REACH. Presentation and discussion of project results

ECHA, Helsinki, 10th March 2011, 14.30 – 17.30 EET

Staff from wca environment presented the results of a recent project to the European Chemicals Agency's (ECHA) Risk Assessment Committee (RAC) and Socioeconomic Analysis Committee (SEAC). The project, *Refinement of Environmental Risk Assessment Outputs for Use in Socioeconomic Impact Assessment Under REACH"*, was undertaken for the Luxembourg Environment Agency and was managed by RAC member Hans-Christian Stolzenberg. The final report was available to RAC and SEAC members on Circa for a period of two weeks after the workshop to allow for written comments. The final project report and this workshop documentation are publicly available via ECHA's website for reference material related to socioeconomic analysis[1].

The workshop comprised three presentations. Each was followed by a short Q&A session, with an extended period of discussion at the end of the workshop.

Introduction and Sophisticated Approaches – Mark Crane

Mark Crane introduced the workshop and its associated project. Limitations with current risk assessment methods and outputs for use in SEA were discussed. The talk explained the criteria for the selection of the example chemicals used in the project. The "Sophisticated Approach" of using ecosystems services for SEA was also discussed, and it was suggested that this approach would not currently be of great use in SEA because data for quantifying impacts on ecosystem services are generally unavailable in chemical environmental risk assessments.

- There was a comment that SEAC's task is to give an opinion on the *appropriateness* of a restriction as well as its *proportionality* (as was suggested in the presentation). Additional discussion was focussed on the use of Ecosystem Services in SEA.
- The Millennium Ecosystem Assessment (2005) defines ecosystem services as *the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation, and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious, and other nonmaterial benefits.* This final non-market benefit is difficult to quantify, but often the most important for people.

[1] http://circa.europa.eu/Public/irc/secureecha/socio-economic_analysis_committe/library?l=/reference_material&vm=detailed&sb=Title

- As SEA attempts to find endpoints relevant to human wellbeing the ecosystem services approach is therefore well suited to this. However, it is currently very difficult to operationalise and quantify ecosystem services benefits (particularly non-market benefits) from restricting or authorising certain chemical substances because the data required to do this are either unavailable of highly uncertain.
- Environmental impacts of non-market benefits could be quantified in a socioeconomic analysis (e.g. through a willingness-to-pay assessment). However, such an approach would generally be limited to an assessment of "natural" services such as water purification, rather than "cultural" services and data are sparse even for impacts on natural services. Previous studies suggest that cultural services are often of most importance to human wellbeing.
- Ecosystem services approaches may be useful for risk communication but this depends upon individual preferences – some people may find that techniques such as causal chains are a useful way of communicating links between exposure and potential impact, while others may simply find them confusing.

Life Cycle Impact Assessment (LCIA) – Dean Leverett

Dean Leverett outlined the principles of LCA and LCIA, and some of the commercially available software (SimaPro and GaBi 4) for applying LCIA models and deriving impact values for various environmental compartments. The limitations of commercially available LCIA[2] software tools for use in SEA were discussed in detail (particularly the absence of the required data for large numbers of chemicals), and it was suggested that these limitations may mean that LCIA has restricted potential within SEA without considerable further development and investment. It is likely that regulators would have an issue with the lack of transparency available in the commercial software (as they are "black-box" tools with limited access to underlying calculation processes) and it was unclear how easy it would be assess underlying data quality. Where data are available it would be important to understand how databases are updated by the software developers. Multiple LCIA models could potentially be used to corroborate estimates of impact although the rationale for preferring one LCIA model over others requires additional thought. In order to increase the number of substances in LCIA databases (i.e. those potentially subject to a restriction) the assistance of one or more of the LCIA model developers would be necessary.

Exposure-based proxies and probabilistic risk assessment – Luke Surl

Luke Surl presented a methodology for assessing the environmental impact of a substance using probabilistic modelling combined with EUSES to determine a probability distribution for exposure, in combination with a Species Sensitivity Distribution (SSD) or a dose-response curve.

[2] An additional LCIA methodology (USEtox - developed under the UNEP and SETAC Life Cycle Initiative) was identified after the completion of this project, although it is not available commercially. This methodology addresses several of the specific limitations identified for the LCIA ecotoxicity methodologies assessed as part of this project. However, its database is restricted to 7 of the 19 chemicals included in the project.

The method produces results that can be converted to Fractions of Species Affected in the environment, or amounts of media affected for a particular impact level. This methodology is considered by wca environment to be the most likely to be successful in producing usable data for SEA. This is because it can be used with the data currently available in REACH dossiers, and uncertainties in these data are explicitly considered.

The following questions and comments were considered after this talk:

- The approach is also applicable to PBT and vPvB substances if treated as "threshold" substances as the probabilistic EUSES modelling can consider degradation (which is clearly related to persistence) and secondary poisoning can be modelled as a dose-response from mammalian toxicity or avian data in the same way as direct ecotoxicity. However, extension of the approach to PBT and vPvB chemicals when treated as "non-threshold" chemicals under the REACH authorisation regime requires further consideration.
- Whilst the approaches requires a moderate increase in complexity the wca team consider the this would deliver i) consistent comparisons (because assessment factors are not included), ii) an indication, even if only relative, of the magnitude of possible impacts (which are not possible by comparing PEC/PNEC ratios), and iii) an assessment of the uncertainty of estimates of impact, which are three of the most important shortcomings of the current approach.
- The probabilistic modelling approach recommended here is also applicable to considering the variability of emissions. A sensitivity analysis could identify which input parameters (including emissions) have the most influence on the outputs.
- Where bioavailability estimates are available they can readily be incorporated into the proposed approach. It is likely that bioavailability estimates are of most importance for risk assessment of metals rather than organic chemical substances, however in some compartments (e.g. sediments and soil) this may be important.
- It is unlikely that there will be sufficient data to construct an SSD for many substances (and particularly for their potential alternatives) that would be compliant with REACH guidance on SSDs. However, an SSD can theoretically be constructed from less data including the simple base set of data from three trophic levels (i.e algae, water fleas, and fish). Although the latter would not comply with REACH guidance for establishing an "absolute" effects threshold with an SSD, it is of value in establishing relative differences in toxicity between alternatives, and describing the "impact" of increased exposure better than PEC/PNEC ratios. The approach can also be used with dose-response data from a single ecotoxicity test.

Conclusions and Recommendations

Overall, the following conclusions and recommendation could be drawn from the workshop:

1. At the present time, LCIA and Ecosystem Services are limited in their applicability and ability to support SEA much beyond more conventional methods of risk assessment. Primarily this is because of data limitations. Should sufficient additional data be made available, particularly for LCIA, then these methodologies should be reappraised.

2. Application of probabilistic methods in combination with species sensitivity distributions (use of dose-response curves from individual tests for those substances with low amounts of test data) to calculate the notional fraction of species affected in the environment, or amounts of media affected for a particular emission level could potentially be beneficial in SEA, as long as these measures were not misinterpreted.

3. Additional consideration of "non-threshold" chemicals (i.e. PBT and vPvB chemicals) under the REACH authorisation regime, and their appraisal within SEA is required.