Australian Government

Australian Pesticides and Veterinary Medicines Authority

SEPTEMBER 2017

APVMA Model Evaluation Framework

Discussion paper

Comments and enquiries regarding copyright:

Director Public Affairs and Communication
Australian Pesticides and Veterinary Medicines Authority
PO Box 6182
KINGSTON ACT 2604 Australia

Telephone: +61 2 6210 4988

Email: communications@apvma.gov.au.

This publication is available from the APVMA website: www.apvma.gov.au.

CONTENTS

1 INTRODUCTION

The APVMA is seeking to implement a Model Evaluation Framework to evaluate software models that generate outputs for regulatory assessments. Software models have excellent potential for improving risk assessments in an efficient and repeatable manner. The APVMA is frequently presented with models and data generated from models that are used to support registration applications. The suitability and quality of these models needs to be assessed in a standardised manner to ensure evaluation rigor and fairness[1].

To use modelling for regulatory purposes the APVMA must be satisfied that the model is scientifically sound and fit for purpose. Therefore, the APVMA has developed a model evaluation process, where candidate models can be evaluated against set criteria to ensure they meet regulatory requirements. The evaluation framework is based on the guidance of an overseas chemical regulator with further input from other scientific regulators and expert modellers.

This approach is consistent with the Australian Government's policy of adoption of international assessments, standards and assessment methodology, where appropriate.

The purpose of this discussion paper is to seek the views of industry on the various elements of the model evaluation process. This input will help shape the final proposal, which will be provided for further consultation.

1.1 About this paper

This discussion paper explores a range of issues related to the use of the Model Evaluation Framework and poses a number of questions for feedback from industry.

1.2 How to have your say

The APVMA is inviting submissions from any interested person or organisation, on the proposal to implement a APVMA Model Evaluation Framework. Submissions should be submitted no later 5 pm on 3 October 2017.

Please address your submissions to:

Case Management and Administration Unit
Australian Pesticides and Veterinary Medicines Authority
PO Box 6182
Kingston ACT 2604
Phone: +61 2 6210 4701
Fax: +61 2 6210 4721

Email: enquiries@apvma.gov.au

[1] The proposed model must be consistent with the requirements for the making of lawful decisions which includes the APVMA decision maker being in a position to substantiate information or conclusions.

2 THE FRAMEWORK AND DISCUSSION POINTS

2.1 The Framework

The Model Evaluation Framework process is performed in two steps. The first requires the model proponent to demonstrate the model's suitability against three criteria, divided into several sub-criteria. Once these criteria have been adequately addressed, the APVMA will conduct the final evaluation step.

The details of the criteria and sub-criteria by which the model will be evaluated are presented in Table 1. This table provides examples of what is required to fully, partially or inadequately address each of the sub-criteria.

Table 1: Criteria to meet the APVMA Model Evaluation Framework

Criteria	Fully	Partial	Inadequate
Criteria 1. Transparent and traceable, such that all parameter data, assumptions and calculations can be traced to their original source in an unbroken manner, and outputs are reproducible			
Can all model assumptions, parameter and calculation data be traced to their original source in an unbroken manner?	All primary citations can be traced in an unbroken manner.	Not all primary citations are available but at least all secondary citations are available.	Little or limited information.
Is the described methodology of the model sufficiently transparent such that results can be reproduced?	The results of the model can be reproduced with no ambiguity or doubt in the methodology.	The results of the model can be reproduced. Any ambiguity in the results or doubt in the methodology should be clearly noted and able to be reasonably resolved.	The results of the model cannot be reproduced from the described methodology.
Criteria 2. Qualified for its regulatory purpose within an Australian risk framework			
Does the model define the problem it attempts to address and how it achieves this?	Problem fully defined. Methods and premises are fully explained in relation to solving stated purpose.	Problem partially defined and reasonably well articulated.	Problem poorly defined and not well articulated.
Is it suitable to the Australian regulatory framework or stated purpose?	The phenomena and interactions are relevant and adequately represent the scenarios required for a regulatory or stated purpose.	The phenomena and interactions are mostly relevant and generally represent the scenarios required for a regulatory or stated purpose.	Poorly suited. The phenomena and interactions are not relevant and generally do not represent the scenarios required for a regulatory or stated purpose.

Criteria	Fully	Partial	Inadequate
Is the model suitably simplified such that all input data is available?	Suitably simplified such that all or most of the data is of acceptable quality.	Data available but many extrapolations or default values required.	Limited data are available, with most entries requiring default values or unsubstantiated assumptions.
Are the effects of simplification well understood?	All parameters which are likely to be most significant are included.	Most parameters likely to be significant are included or the importance of parameters only partially understood.	Parameters likely to be significant not included or the importance of parameters not understood.
Does the model use Australian parameter data where these are available?	All parameter data where Australia is likely to be unique are available.	Some parameter data where Australia is likely to be unique are available.	All parameter data is obtained from overseas studies, even though suitable Australian data are available.
Are all relevant and available parameter data used?	The parameter data have been assessed for their quality and all relevant and available data are used. The rejection of data is fully justified. Any statistical treatment of data is selected from valid methods, fully explained and justified.	The parameter data have been assessed for their quality and most of the data available are used with only partial justification for the rejection of data. Any statistical treatment of data is selected from valid methods, but the choice of method is not fully explained or justified.	Limited use of the parameter data available with little or no justification for the rejection of data. Little determination of the quality of the data. Little justification for any of the statistical methods used, some of which may not be valid.
Is the nature of variance[2] (heterogeneity) and true uncertainties [3](lack of precise knowledge) in parameter data considered and correctly treated?	The uncertainty and variability of data is well understood and all of the data is correctly treated.	There are some aspects where it is unknown to whether deviations in the data are due to uncertainty or variability. These aspects are not considered critical in determining the model output.	There is little understanding of whether deviations in the data are due to uncertainty or variability. It is unknown to whether the treatment of the data is correct.
Do the data match the temporal or spatial scale under consideration?	Data are well matched to the scale.	Partial match of data to the scale.	Poor match of data to scale.

[2] Variability refers to quantities that are distributed within a defined population (e.g. age)

[3] True uncertainty refers to a parameter that has a single value, which cannot be known with precision due to measurement or estimation error.

Criteria	Fully	Partial	Inadequate
Is the level of conservatism in the model well defined?	Level of conservatism such as realistic worst-case scenario is well characterised.	Level of conservatism such that the realistic worst-case only partially characterised. Potential for compounding conservatism or underestimation of risk.	Level of conservatism poorly understood such that the realistic worst-case is poorly characterised. Significant potential for compounding conservatism or underestimation of risk.
Criteria 3. Verified to demonstrate that it obeys scientific principles			
Are the scientific concepts well-articulated?	Clearly articulated.	Principles clear but some reservations about details.	Unclear.
Is the model scientifically plausible?	Highly plausible. The model fully represents the current scientific understanding of the scenario being modelled.	Plausible. The model is consistent with current scientific understanding of the scenario being modelled, but there may be some conjecture or contentious aspects.	Implausible. The model is inconsistent with current scientific understanding of the scenario being modelled.
Is the model mechanistic?	Based on well understood scientific principles. E.g. conservation of energy, first order kinetics.	Part understanding of scientific principles. For example, Kleiber's law which relates metabolic rates with body mass where many of the general principles of surface area to volume, ratios are well understood but there may be many other confounding factors that affect analysis.	Limited understanding of scientific principles and reliance on empirical formulas or statistical fit to data.

Validation

The APVMA will conduct the validation step. The validation step will involve checking correctness of data and calculations, determining the uncertainty and sensitivity of the model and comparing the model's outputs with measured real-world values, where possible. This can be an ongoing process as further data are made available and the model is calibrated.

Industry Discussion Point 1
Does the APVMA Model Evaluation Framework provide a sound basis for selecting models for regulatory purposes?

2.2 Submission of models

Applicants will need to provide sufficient documentation and scientific evidence to meet Table 1 criteria 1-3 for the APVMA to evaluate models against the framework. If the model meets criteria 1-3 then the validation step will occur.

However, the validation step may not be possible for all models until further research is conducted. The model may still be provisionally endorsed by the APVMA depending upon the specific circumstances. A statement of reasons will be supplied to the applicant who will have the opportunity to resubmit the model once the matters have been satisfactorily addressed.

In addition to supporting documentation, access to the software and authorisation to use it, will be required to cross check functionality and performance.

Industry Discussion Point 2
What, if any, issues do you see with applicants submitting models and the provision or authorisation to the APVMA?

2.3 Claims of Confidentiality of information provided

If the proponent of a model wishes any of the information it provides to APVMA for evaluation purposes to be treated as confidential, the proponent must clearly identify the specific information in relation to which a claim to confidentiality is asserted. The proponent must stipulate that the APVMA is authorised to use the sensitive information for the purposes of assessing the proposed model against the APVMA Model Evaluation Framework.

The proponent must also agree to extend the authorisation in order for the APVMA to discharge its statutory obligations for example providing adequate reasons for regulatory decisions.

Industry Discussion Point 3
What, if any, issues do you see with applicants submitting all the data and providing a declaration as proposed?

2.4 Approved list of software models

Once a software model has been approved through the Model Evaluation Framework the APVMA will publish its title in a list of approved software models on the APVMA website. The list should assist applicants with producing well-presented and robust registration applications. It will also provide an opportunity for industry stakeholders to coordinate the selection and use of modelling software and possibly endorse particular models as industry preferred models.

The approved list of software models will include the name of the model and the risk assessment function for which it has been evaluated.

Industry Discussion Point 4
What, if any, issues are there with an approved list of software models?

2.5 Model updates

When a new version of an approved model becomes available, any new components will require an assessment using the Model Evaluation Framework. The applicant will be required to notify the APVMA that the model has a new version and provide the APVMA with documentation describing the changes made.

Industry Discussion Point 5
What, if any, issues are there with notifying the APVMA about a newer version of the software model?

REFERENCES

EFSA PPR Panel (EFSA Panel on Plant Protection Products and their Residues), 2014. Scientific Opinion on good modelling practice in the context of mechanistic effect models for risk assessment of plant protection products. EFSA Journal 2014;12(3):3589, 92 pp. doi:10.2903/j.efsa.2014.3589

Flato, G., J. Marotzke, B. Abiodun, P. Braconnot, S.C. Chou, W. Collins, P. Cox, F. Driouech, S. Emori, V. Eyring, C. Forest, P. Gleckler, E. Guilyardi, C. Jakob, V. Kattsov, C. Reason and M. Rummukainen, 2013: Evaluation of Climate Models. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assess¬ment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Oreskes N. (1998) Evaluation (Not Validation) of Quantitative Models Author(s): Source: Environmental Health Perspectives, Vol. 106, Supplement 6 (Dec., 1998), pp. 1453-1460 Published by: Brogan & Partners Stable URL: http://www.jstor.org/stable/4641214 Accessed: 06/01/2010 12:51

Oreskes N. Shrader-Frechette K. & Belitz K. (1994) Verification, Validation, and Confirmation of Numerical Models in the Earth Sciences Author(s): Source: Science, New Series, Vol. 263, No. 5147 (Feb. 4, 1994), pp. 641-646 Published by: American Association for the Advancement of Science Stable URL: http://www.jstor.org/stable/2883078 Accessed: 06/01/2010 12:50

Perko J., Seetharam S.C. and Mallants D. (2009); Vermariën E., Wilmot R., (Ed.) Simulation Tools used in Long-term Radiological Safety Assessments Project Near Surface Disposal of Category A waste at Dessel NIRAS-MP5-01 QUAL – LT Version 1, joint publication of ONDRAF/NIRAS (NIROND-TR 2008-11 E) and SCK•CEN, March

Sinclair Knight Merz (2013), Australian groundwater modelling guidelines: companion to the guidelines, National Water Commission, Canberra