



Federal Institute for Occupational
Safety and Health

Best practice in Exposure Modelling



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Regional Chapter

Best practice in Exposure Modelling

Thoughts from the
European Exposure Science Strategy 2020–2030

Dr. Urs Schlüter

Federal Institute for Occupational Safety and Health – BAuA

ISES Europe – Councillor 'Relations, Outreach and Communication'



Contents

- **Why exposure modelling ?**
- **European Exposure Science Strategy 2020–2030 for exposure modelling**
- **Some thoughts of the sub-groups (in the model working group) about best practice**



Why Modelling ?

Practical reasons

- Rapid and inexpensive availability of results

Monitoring reasons

- Exposure durations too short for meaningful monitoring
- No suitable measurement method
- Unfavourable climatic conditions, outdoor work

OSH reasons

- Planning of new workplaces
- Retrospective determination of exposures
- Simulation of influence of changes in technical or organisational measures



Exposure Modelling as a Priority Area

- For a risk based regulation of chemical substances, **exposure assessment is required**
- For most uses under chemical regulations **no measurements of exposure** are available
- For many situations (especially new substances, new uses) potential **exposure has to be predicted**
- Measurements are not always possible (e.g. HBM cannot assess **sources of exposure**)

Fantke, P., et al. (2022).
"The European exposure
science strategy 2020-
2030." Environ Int 170:
107555.

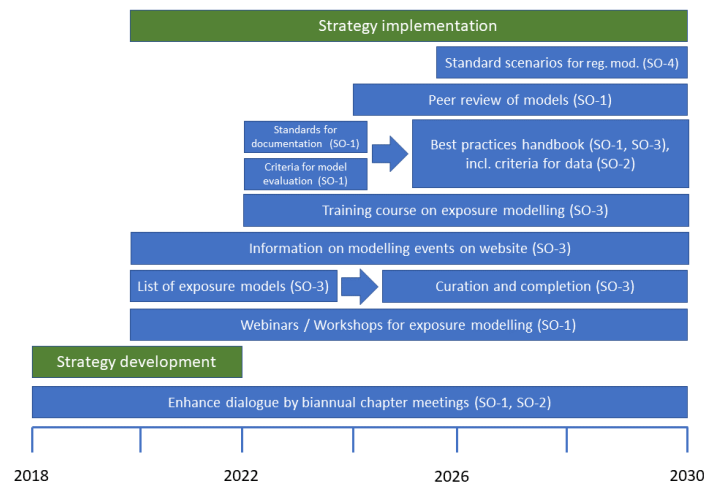


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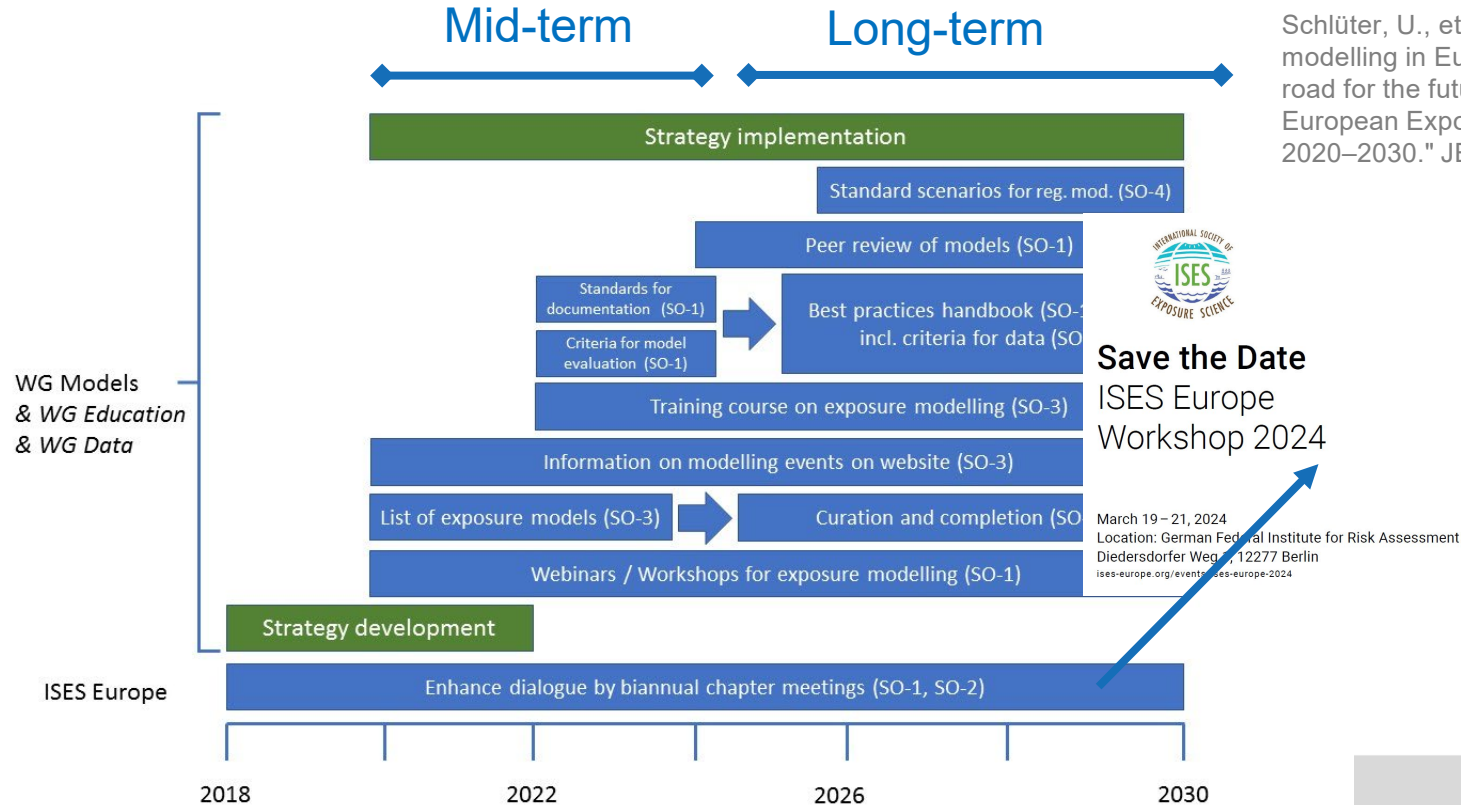
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Strategic Objectives (SO) for Exposure Modelling

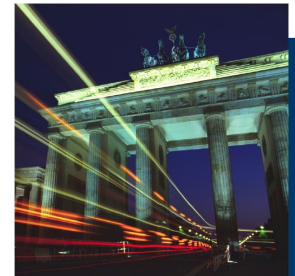
- SO-1: Improvement of existing models and tools
- SO-2: Development of new methodologies
- SO-3: Improvement of model use
- SO-4: Regulatory requirements for exposure modelling



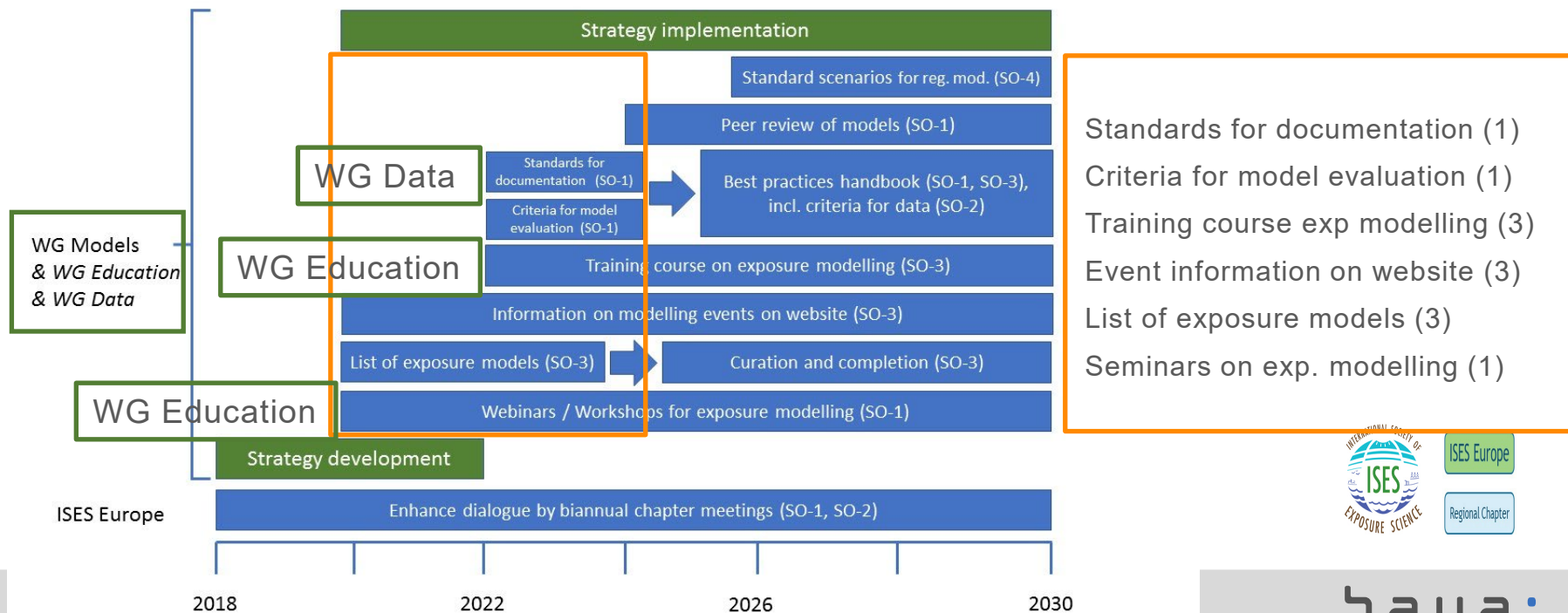
Roadmap for Strategy Implementation (actions)



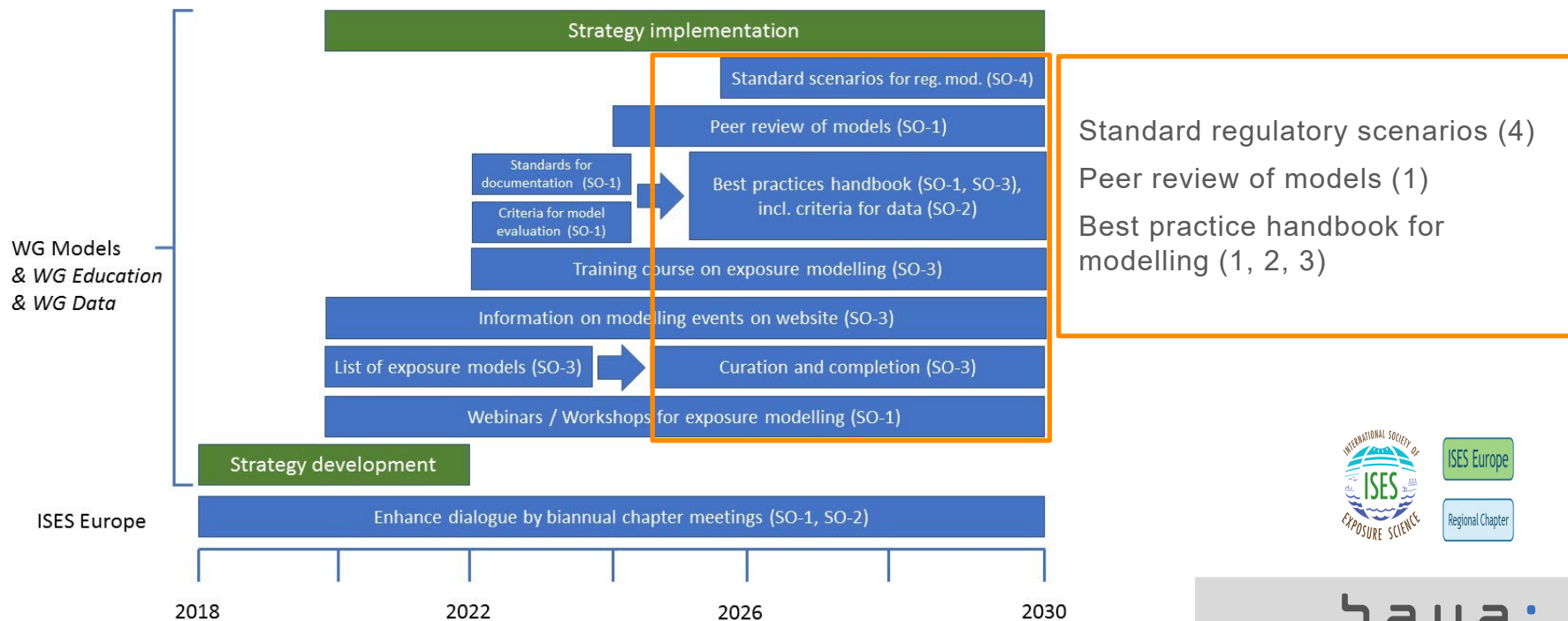
Schlüter, U., et al. (2022). "Exposure modelling in Europe: how to pave the road for the future as part of the European Exposure Science Strategy 2020–2030." JESEE 32(4): 499-512.



Mid-term Action Points



Long-term Action Points



Sub-groups in the Model Working Group

Model Evaluation

- Input to the terminology discussion
- Repository of evaluation criteria/methods

Standardisation for Modelling

- Repository of modelling standards/guidance

Training for Exposure Modelling

- Survey on the landscape of education in exposure modelling
- First ideas for trainings/courses

Funding for Exposure Science (with other WGs)

- Application for a COST action in October 2023



First Steps for Existing Models (SO-1): Review of Models

Inventory of exposure models

- Exposure models used in Europe, along with basic description for
 - Workers,
 - General population,
 - Environmental exposure (ecosystem),
 - Dosimetry & PBPK.
- Supplemental information to the strategy paper

ISES Europe Exposure Model Inventory,
Exposure Platform Data & Information
Sharing,
<https://ises-europe.org/exposure-platform/data-and-information-sharing>

Criteria for evaluation of exposure models



Supporting Documentation for Model Calculations (SO-3)

Treat model calculations as accurate as measured data, e.g.:

- Identification of the performing assessor
- Description of the work area for which the model calculation was carried out
- Model applied, calculation method
- Sufficient specification of determinants to characterise the working conditions
- Statistical data on the result, if applicable
- Findings and, if applicable, RMMs

TRGS 402 „Ermitteln und Beurteilen der Gefährdungen bei Tätigkeiten mit Gefahrstoffen: Inhalative Exposition“, GMBI 2023 S. 898-920 [Nr. 42] (v. 11.09.2023)



Personnel Requirements on the Users (SO-3)

Knowledge about	Transfer of data of comparable workplaces	Control-Banding-Tools	Exposure Models (e.g. ART, Stoffenmanager®)	Deterministic models
the workplace	✓	✓	✓	✓
necessary RMM	✓	✓	✓	✓
workplace risk assessment	✓	✓	✓	✓
determination and assessment of inhalation exposure	✓	(✓)	✓	✓
interpretation of statistical parameters	(✓)	—	✓	✓
statistical background of models	(✓)	—	(✓)	(✓)
specific math (e.g. regression models, differential equations)	—	—	—	✓
application training of the specific model	—	(✓)	(✓)	(✓)

Beisser, R., et al. (2022). "Auswahl & Anwendung nichtmesstechnischer Methoden zur Ermittlung und Beurteilung der inhalativen Exposition." GefStoffe – RdL 88 (Nr. 7/8): 179-188.

✓ required

(✓) desirable

— unnecessary



Conclusions for the Strategic Objectives

ISES Europe can coordinate some important actions (but not all!):

- SO-1: Improvement of existing models and tools – activities started
- SO-2: Development of new methodologies – **probably not**
- SO-3: Improvement of model use – activities started
- SO-4: Regulatory requirements for exposure modelling – activities started

**Models and tools need sustainable funding
Support needed by institutions behind the WG members**



Vision for Exposure Modelling

Exposure Models should:

- Be well-documented and sustained
- Evaluated against independent data
- Fit for purpose, i.e. correctly adapted to the specific use
- Be available also in yet understudied areas

Exposure Modellers should:

- Be well-trained with appropriate scientific background
- Use best-practices (yet to be further developed)
- If possible integrate the whole source-to-dose continuum



Conclusion Measurements and Models... (John Cherrie)

“Essentially, all models are wrong, but some are useful”

“However, it is equally true that all measurements are ‘wrong’ ”

Two key things to remember:

- Treat models like measurement instruments
- Try to maximise the utility of the information you have, i.e. combine model and measurement data



George E.P. Box
(wikipedia.org)
John Cherrie
(hw.ac.uk)



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Thank you very much for your attention!
Questions?

Dr. Urs Schlüter

Bundesanstalt für Arbeitsschutz
und Arbeitsmedizin – BAuA

Friedrich–Henkel–Weg 1–25

44149 Dortmund, Germany

Tel. 0231/9071–2442

schluter.urs@baua.bund.de



BAuA – Dortmund

