

# The establishment of ISES Europe to future advancements – Exposure Models

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International Society of Exposure Science – Europe Chapter



ISES Europe

Regional Chapter

<https://ises-europe.org/>

## 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 next steps and activities



# 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



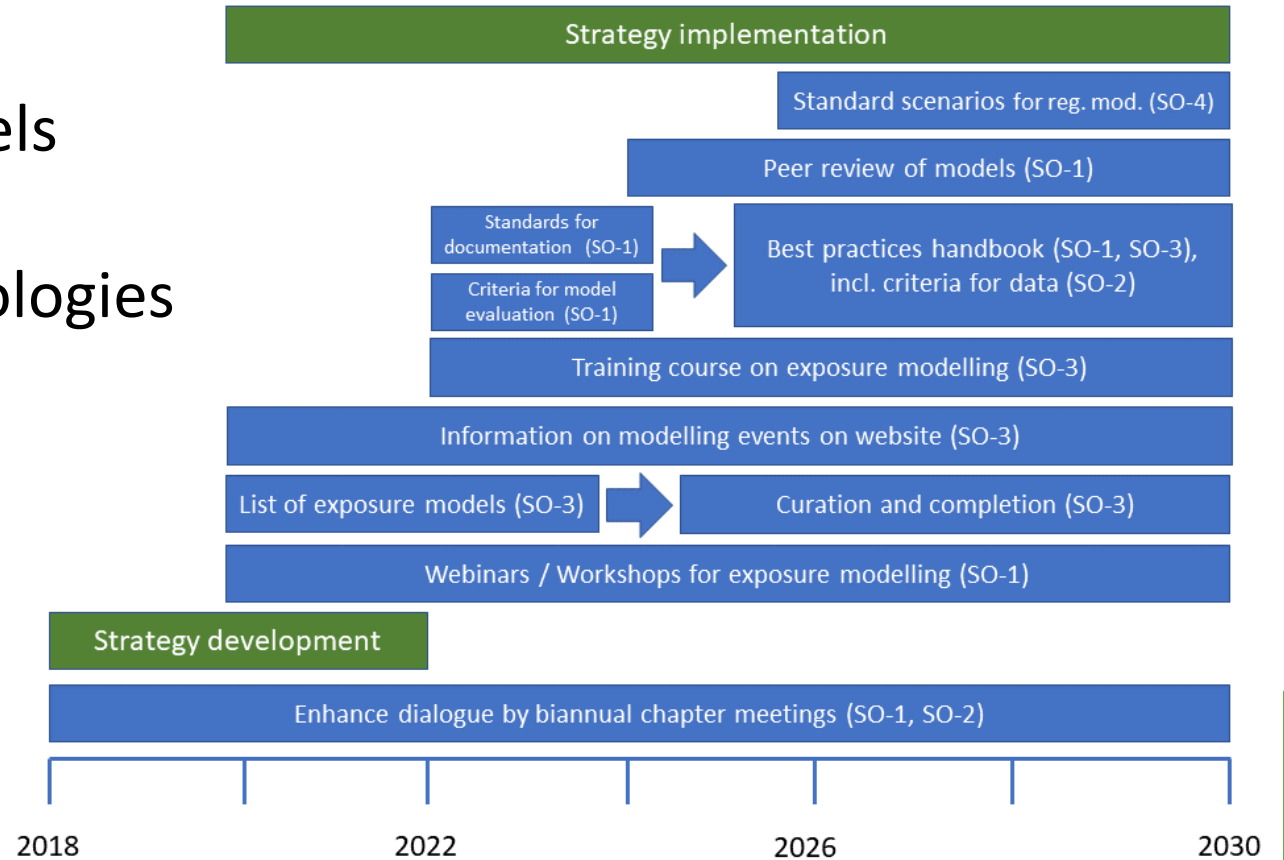
## Exposure Modelling as a Priority Area

- 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**)

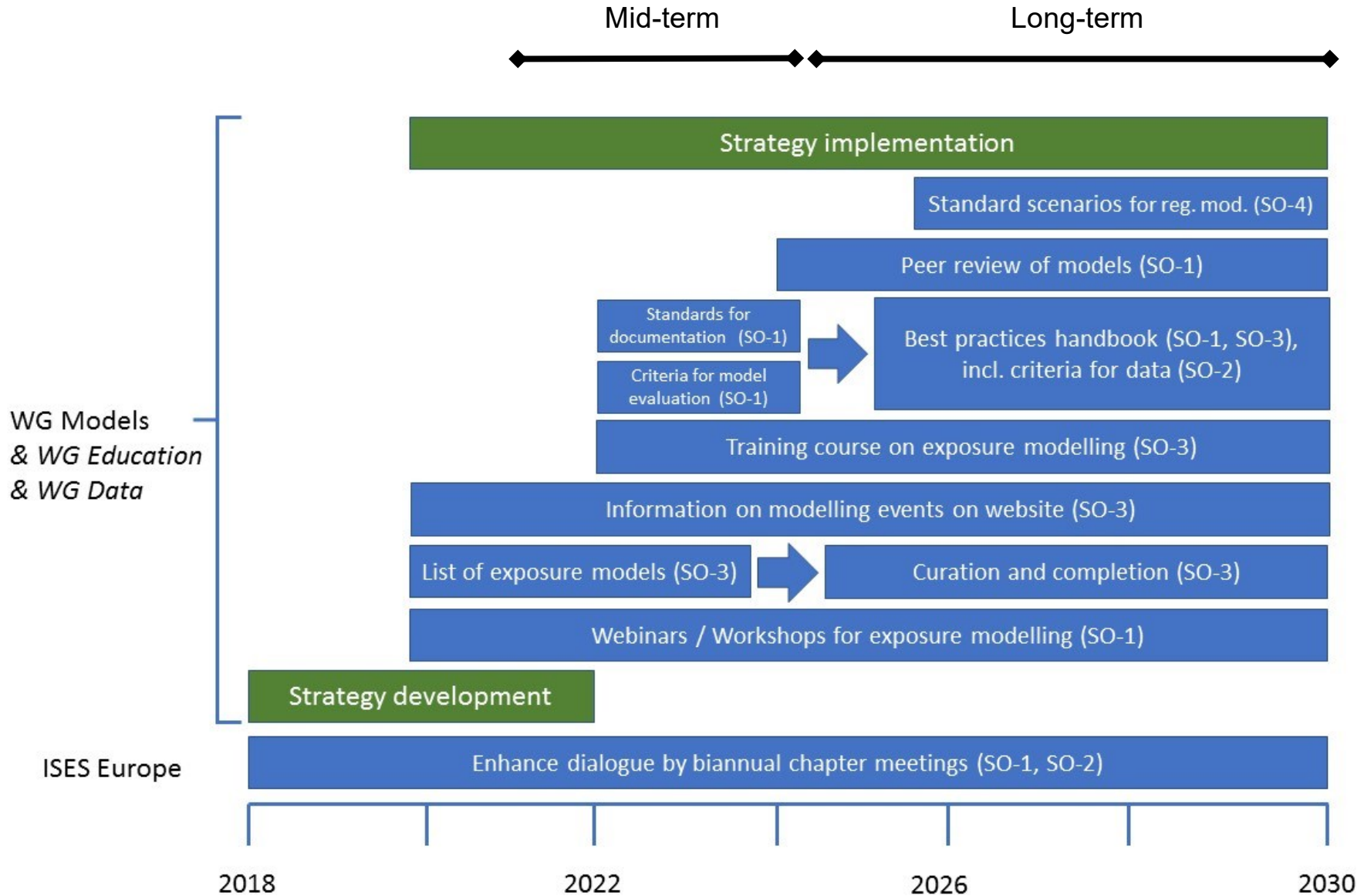


# Strategic Objectives (SO) for Exposure Modelling

- 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)



## 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



# 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: 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

## Criteria for evaluation of exposure models



## Establishing a Go-To Hub:

# The Development of a Repository of Guidance and Standard Documents in Support of Good Modelling Practice (GMP) in Exposure Science

**Poster Session:** P5 - Advances in exposure modelling I

**Date:** 20th of March 2024, **13:30 - 14:30**

**Room:** **Foyer**

**Gerald Bachler**, Angelika Derler, Natalie von Goetz, Stefan Hahn,  
Alicia Paini, Steven Verpaele, Maryam Zare Jeddi



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# Poster presentation: Reflection on the landscape of education in the area of exposure modeling

Poster Session: P5 - Advances in exposure modelling I

Date: 20th of March 2024, **13:30 - 14:30**

Room: **Foyer**

Poster pitch presented by **Dr. Wouter Fransman**

**K.S. Galea, A. Paini, G. Bachler, C. Alejandre-Colomo, P. Fantke, W. Fransman, C. Jung, A. van Nieuwenhuyse, N. von Goetz, A. Conolly**



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**REFLECTION ON THE LANDSCAPE OF EDUCATION IN THE AREA OF EXPOSURE MODELLING**

K.S. Galea (1), A. Paini (2), G. Bachler (3), C. Alejandre-Colomo (4), P. Fantke (5), W. Fransman (6), C. Jung (7), A. van Nieuwenhuyse (8), N. von Goetz (9,10), A. Conolly (11)

**INTRODUCTION**

Exposure science is critical for protecting health and the environment. Models that estimate exposures are essential tools alongside measurements. However, models have limitations like uncertainty and lack of evaluation. Despite predictive limitations, regulators rely heavily on models. Improved education can address some modeling challenges. The European Chapter of the Society of Exposure Science (ISES Europe) aims to improve models and training. A survey was conducted to identify the prioritized items for modelling curriculum topics, which will inform course requirements. The goal is to establish formal modelling training in Europe, currently lacking. Advancing modeling practice and education is key to achieving health goals.

**METHODS**

Questionnaire to assess needs and interest in exposure modelling training, incorporating 5-point Likert scale, multiple choice questions and free text for:

Section A: Respondent background  
Section B: Previous course attendance  
Section C: Interest and preferences for future training

**RESULTS**

**Section A:** Most respondents were from government (38%), consultancy (19%), and industry (18%), with some in academia and research (Figure 1).

25% of respondents had over 20 years exposure assessment experience; 22% had 10-20 years experience; and 50% had less than 10 years.

Main areas of interest were occupational (57% of respondents), consumer (44%), and environmental (44%) exposure science.

**Section B:** 59% of respondents held PhD/MPH, 40% held Masters as highest qualification. Only 4 respondents with undergraduate degrees had modelling training, compared to 18 with Masters and 14 with PhDs.

**Section C:** 67% of respondents were interested in exposure modelling training modules, such as: model usability/limitations, risk assessment, machine learning, uncertainty propagation, model evaluation, method development, big data, stats, regulations, case studies.

38% prefer virtual formats, 28% in-person, 27% blended. 55% willing to pay. Most important factors in choosing a course were topic coverage and lecturer expertise; cost and certificates were less influential.

**DISCUSSION AND CONCLUSIONS**

The survey aimed to identify exposure science modelling training needs. Respondents likely represented many European exposure scientists. Exposure modelling was rarely part of degree programs. Past modelling courses were often one-offs or no longer available, though experts are available to teach. Despite demand for training, few regular academic courses producing modelling graduates. Our survey suggests that there is a demand for training in exposure modelling and provides insight to inform the development of modules that are suitable to fulfil the training needs of exposure scientists and practitioners.

The authors declare no conflicts of interest and received funding support from their institutions only.

**Figure 1. Respondent background**

Background	Percentage
Government	38%
Industry	18%
Consultancy	19%
Academia	10%
Research	15%
Other	8%

**Figure 2. Type of course**

Course Type	Percentage
Specific exposure models	57%
Modelling of specific chemicals	44%
Regulatory risk assessments	44%
General risk assessment concepts	22%

**INTERNATIONAL SOCIETY OF EXPOSURE SCIENCE**

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Schikler, Urs et al. "Exposure modelling in Europe: how to pave the road for the future as part of the European Exposure Science Strategy 2020-2030?" *Journal of Exposure Science & Environmental Epidemiology* vol. 32,4 (2022): 499-512. doi:10.1038/s41375-022-00415-4  
Conolly, Alison et al. "Frameworks for developing an exposure science curriculum as part of the European Exposure Science Strategy 2020-2030?" *Environment International* vol. 148 (2022): 107477. doi:10.1016/j.envint.2022.107477

# Survey next steps – development of training modules

## Step 1 - Development of 1hr introductory lecture, learning objectives inc.

- What are exposure models?
- Purposes of exposure models in different research areas
- How did they relate to exposure measurements / fit in with wider exposure assessment approaches?
- Types of exposure models available, introducing a tiered approach to modelling
- Exposure models for various routes of exposure (inhalation, dermal, ingestion)
- General advantages and limitations of exposure models
- General things to consider when using exposure model

**Interested in getting involved? Get in touch!!**

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# 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



**Thank you very much for your attention!  
Questions?**

**JOIN US FOR THE WORKING GROUP MEETING  
on Wednesday, 20th March, 10:00 - 11:00  
in room: D146**

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