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*Supplement of*

## **Communicating results and uncertainties of radioecological modelling – a transdisciplinary workshop**

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# Communicating Results and Uncertainties of Radioecological Modelling – A Transdisciplinary Workshop

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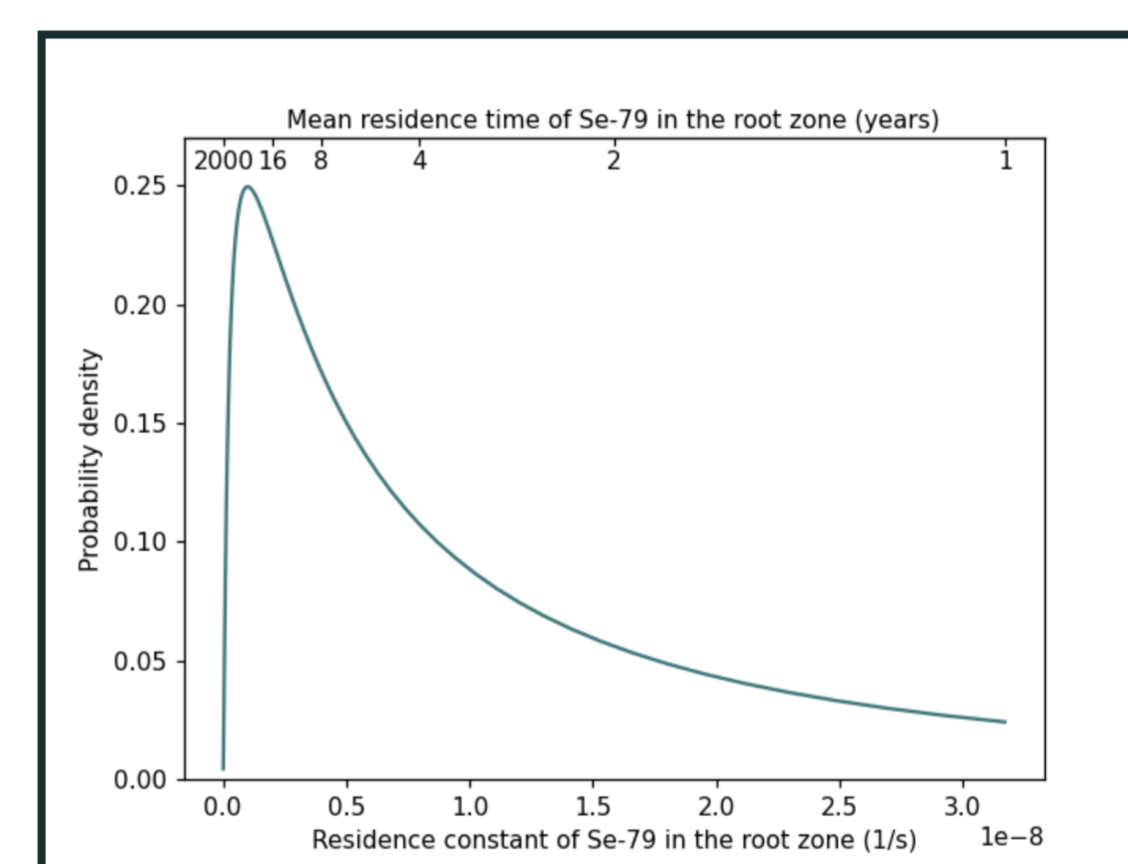
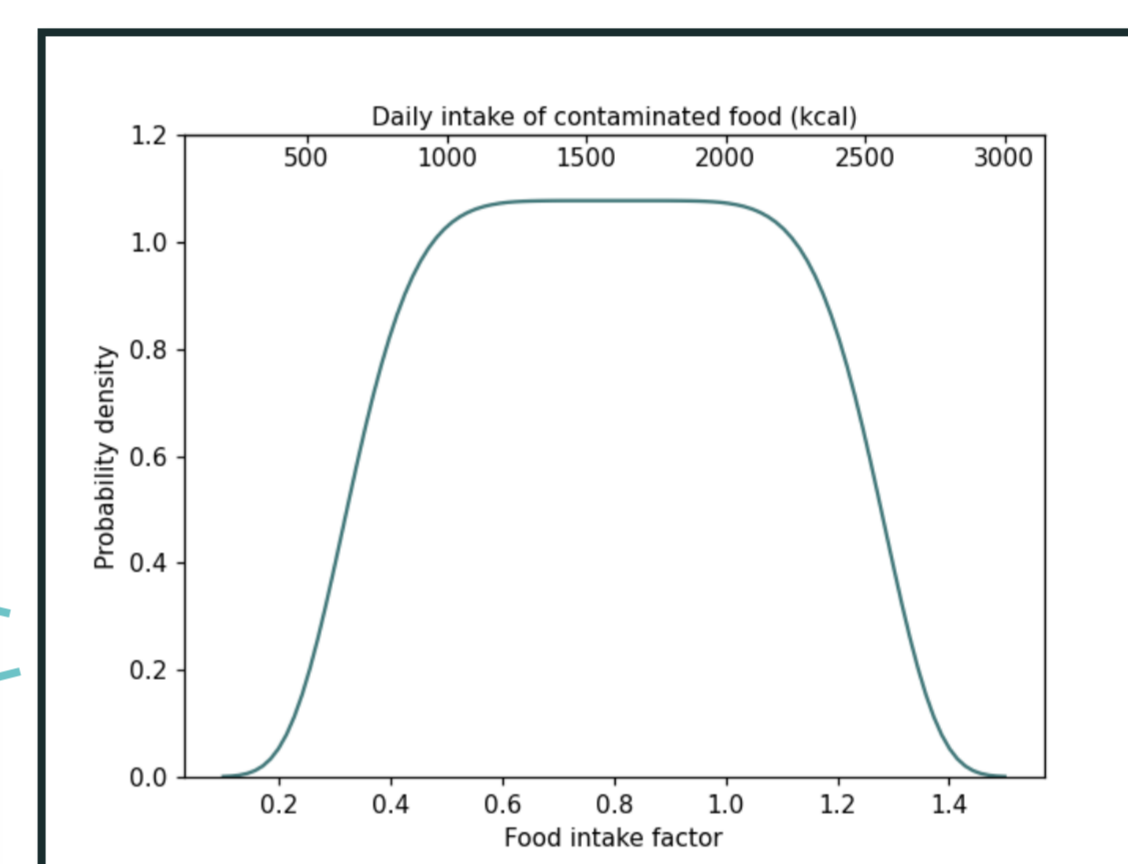
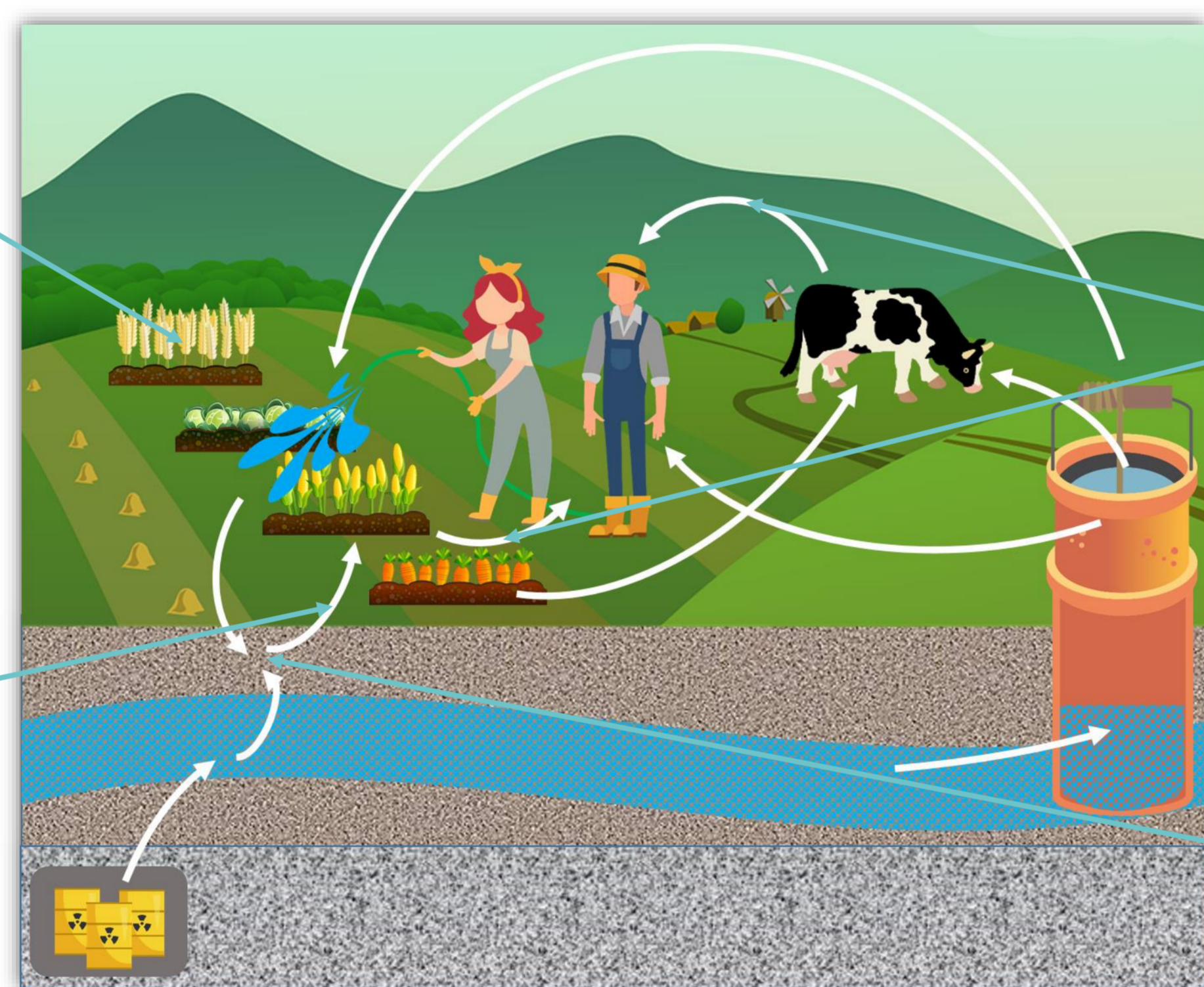
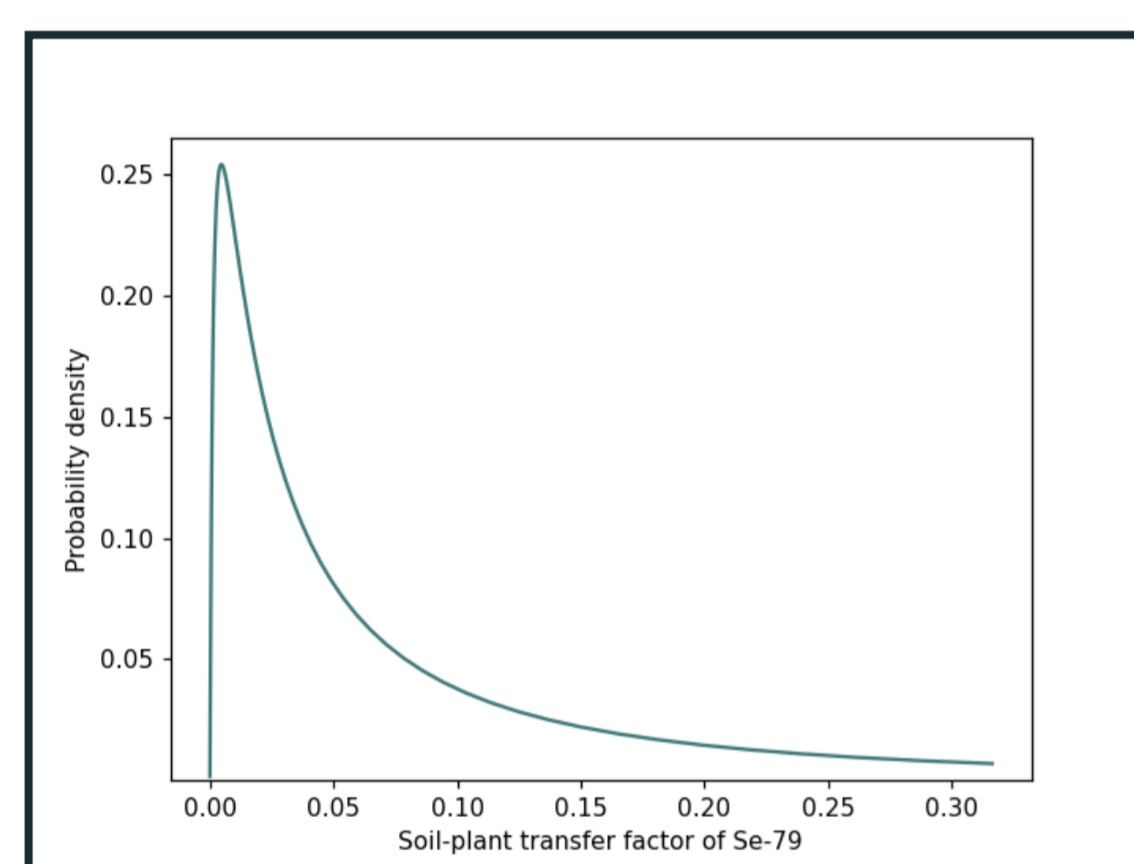
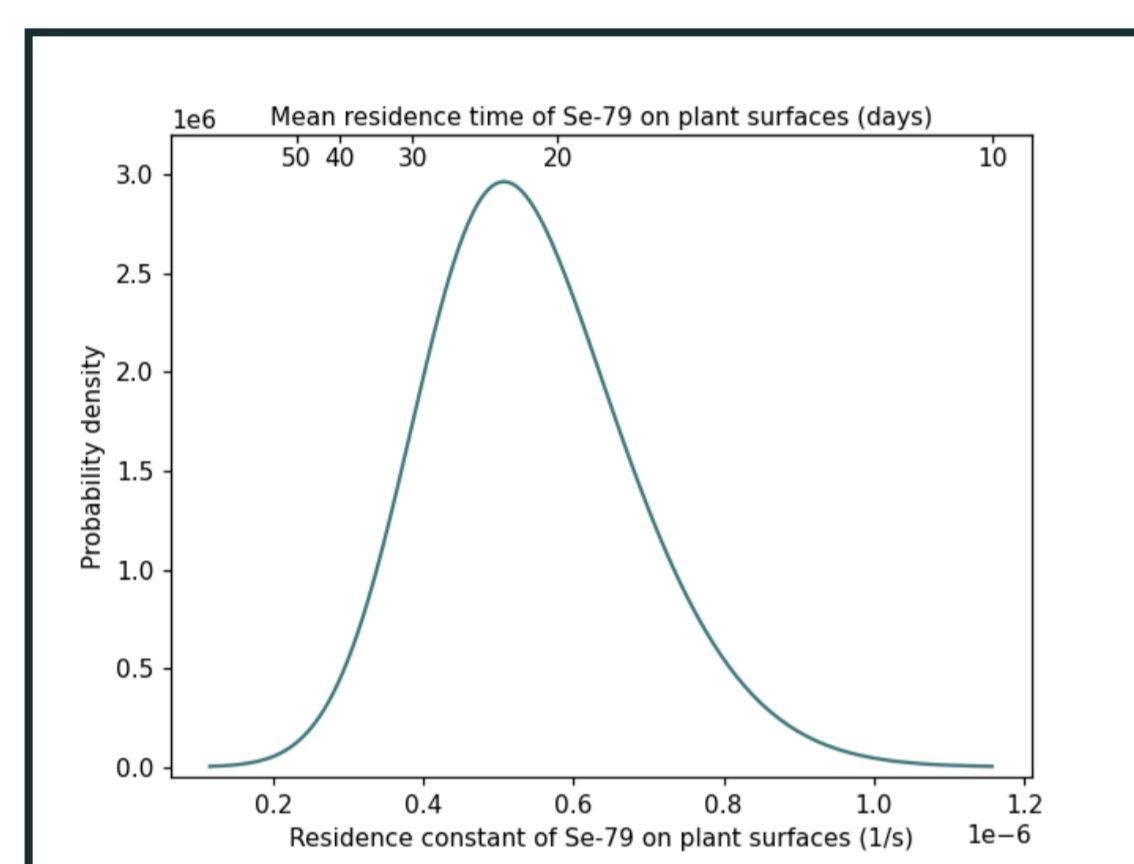
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## Motivation

In many countries, dose estimates by radioecological modelling are part of the safety assessments for nuclear waste repositories. The underlying processes in the biosphere, however, are often difficult to predict over long time periods. Therefore, the results of dose calculations are subject to large uncertainties. To illustrate the effects of parameter uncertainties on dose estimates an interactive web tool was created and evaluated in a transdisciplinary workshop.

## The Interactive Web Tool

- Idea: Illustrate influence of parameter variations on dose estimates
- Underlying model: simplified implementation of biosphere model described in the German regulations (*Calculation basis for dose assessment in the final disposal of high-level radioactive waste*<sup>3</sup>)
- Construction of (fictive) probability distributions (see below)
  - Calculation of "occurrence probabilities" for each parameter combination
- Variable parameters:
  - Residence constant (Se-79) on plants
  - Residence constant (Se-79) in root zone
  - Intake of contaminated food
  - Soil-plant transfer factor (Se-79)
 } converted to mean residence time
- Values of remaining parameters as given in calculation basis



**Tab. 1.** Assumed source term (arbitrarily chosen).

Nuclide	$C_{GW}$ [mBq/l]
Cl-36	10
Se-79	50
Tc-99	5
I-129	30
Cs-135	10



## The Workshop - Overview

- One part of a two-day online workshop
- Topic: *Model calculations and indicators*
  - Geotechnical barriers
  - Transport in geologic media
  - Biosphere**
- 10 participants, 3 moderators, 5 additional observers
- Target group: TRANSENS<sup>1</sup> Citizens' Working Group (CWG)<sup>2</sup> as proxy for an "interested public"

1. Input Presentation on effective dose and radioecological modelling	40 min
2. Web tool testing in small breakout rooms and subsequent joint discussion	20 + 20 min
3. Brainstorming on necessary design decisions and identification of the ones perceived most important by a multiple-choice survey	15 min
4. Silent discussion on advantages and disadvantages of multiple options for addressing the issues identified in part 3	30 min
5. Comparison of three safety-related indicators (effective dose, porosity of the backfill material and radionuclide concentration in groundwater) with respect to a number of desirable features identified in a previous workshop part	30 min

**Tab. 2.** Main parts of the workshop concerning radioecological modelling.

## Key Results

- General aspects
  - Positive perception of web tool
  - Understanding of probabilities very difficult (was mostly ignored in discussion)
  - Uncertainties were of minor importance when comparing different indicators
- Web tool design
  - Need for explanatory info boxes
  - Use of illustrative examples for dose values
  - Unsolved problem:** visualization of probabilities
    - Differing by several orders of magnitude
  - Natural background perceived as much more important than legal limits
  - Careful with colors (e.g. dark color = threatening)
  - Do not mix mSv and  $\mu$ Sv!

Any ideas?  
 We're happy  
 for suggestions!

## References

- TRANSENS: Transdisziplinäre Forschung zur Entsorgung hochradioaktiver Abfälle in Deutschland (Transdisciplinary research on the disposal of high-level radioactive waste in Germany) <https://www.transens.de> (last access: 24. August 2023), 2023
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