Uncertainty reduction in consequential LCA models

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Bo Weidema

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Uncertainty reduction in consequential LCA models

- The sources of uncertainty
- Measurement or estimation in the ecoinvent database
- Uncertainty reduction

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Sources of uncertainty in consequential LCA models

- Data
- Completeness
- Aggregation level
- Geography
- Modelling
- Forecasting

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Data uncertainty

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- Basic data uncertainty is reported for each data point
- Defaults applied when measured data are insufficient
- Additional uncertainty related to data quality is estimated with the pedigree matrix approach – including uncertainty from extrapolating or interpolating

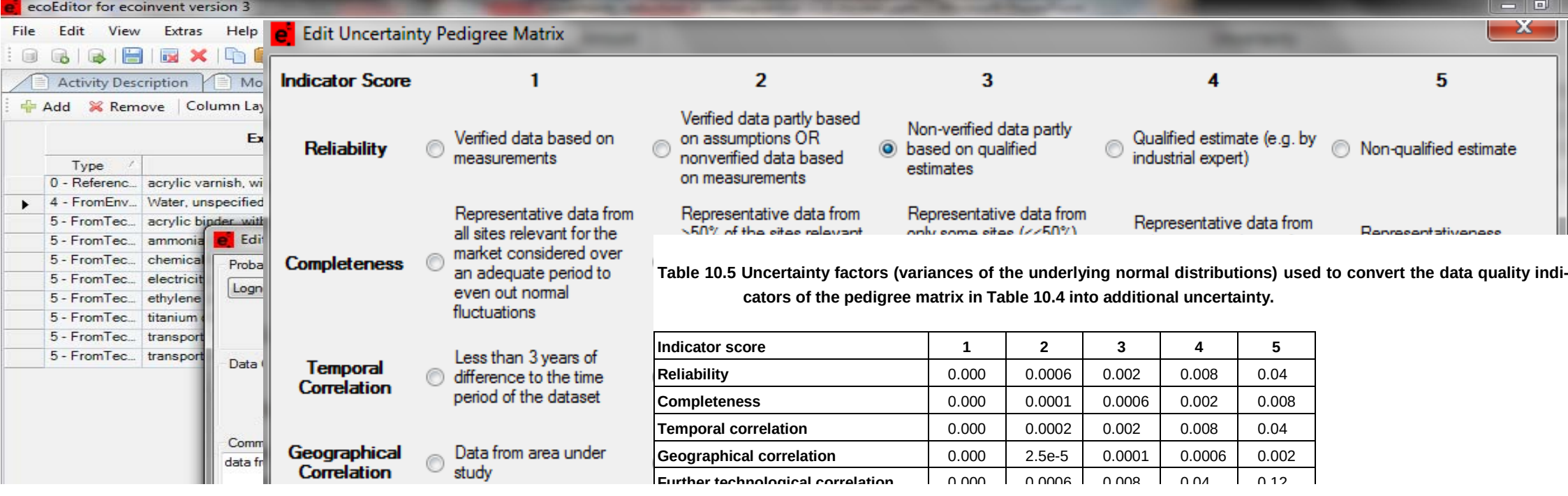

Table 10.5 Uncertainty factors (variances of the underlying normal distributions) used to convert the data quality indicators of the pedigree matrix in Table 10.4 into additional uncertainty.

Indicator score	1	2	3	4	5
Reliability	0.000	0.0006	0.002	0.008	0.04
Completeness	0.000	0.0001	0.0006	0.002	0.008
Temporal correlation	0.000	0.0002	0.002	0.008	0.04
Geographical correlation	0.000	2.5e-5	0.0001	0.0006	0.002
Further technological correlation	0.000	0.0006	0.008	0.04	0.12

Uncertainty related to completeness

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- Completeness of data behind a specific datapoint → DQI
- Missing data points → Replace by extrapolated data with a higher uncertainty
- Example: 5 kWh +/- [BU+DQI] purchased from Quebec ; missing data from Quebec
  - ➢ use data fro[illegible]CAN instead?
  - ➢ extrapolate (interpolate) Quebec data, e.g from CAN, adding higher pedigree scores
- Data and completeness uncertainties are thereby treated in the same way and can be handled via normal simulation with e.g. Latin hypercube sampling.

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Uncertainty related to the model assumptions

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- Some related to specific data points (production volumes, market trends) → can be treated in line with the afore
- Some related to fixed model parameters:
  - market delimitations
  - capital replacement rate
  - technology levels
  - market constraints or elasticities

  which can only be assessed by sensitivity analyses with manual modifications for each model run (although parametarisation may be used to facilitate this).

Uncertainty related to forecasting

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- The outlined approach can also be applied to forecasted data (data for years into the future)
  - ➢ increasing the temporal pedigree score for each data point
  - ➢ using a wider range of settings for the fixed model parameters in the sensitivity analyses

Uncertainty reduction

- Reducing the largest uncertainties first
- Differentiating between reducible and irreducible uncertainty