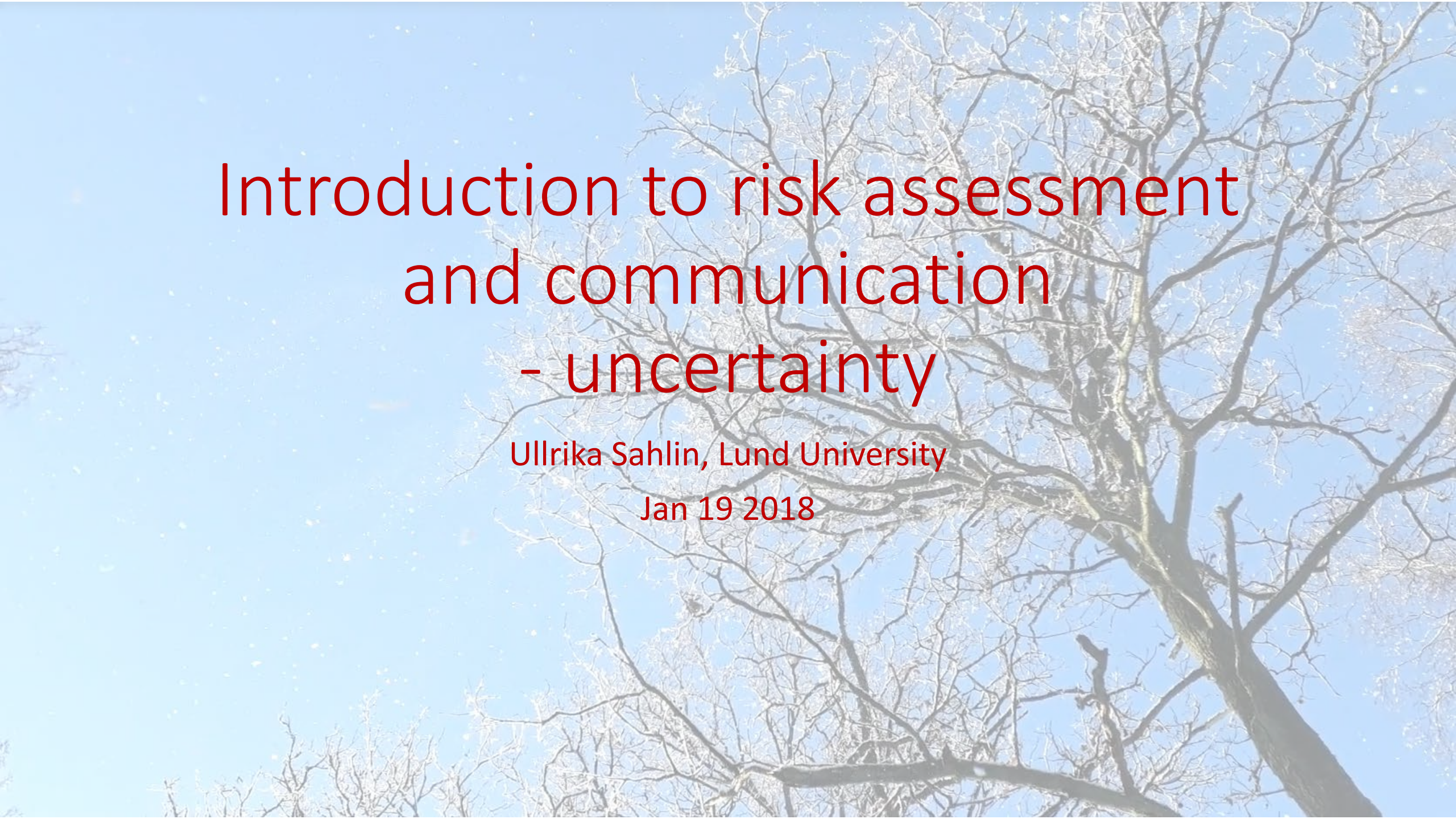


Introduction to risk assessment and communication - uncertainty

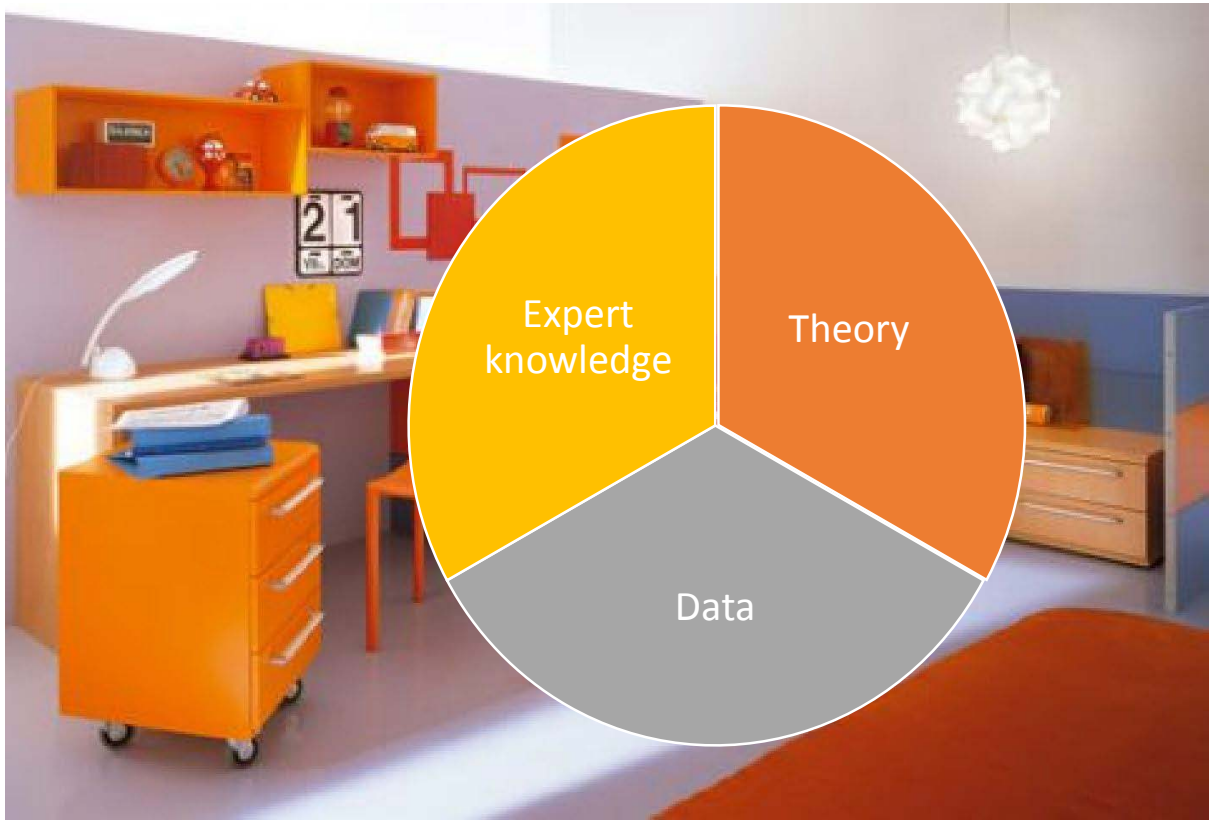
Ullrika Sahlin, Lund University

Jan 19 2018

Things are seldom ideal…

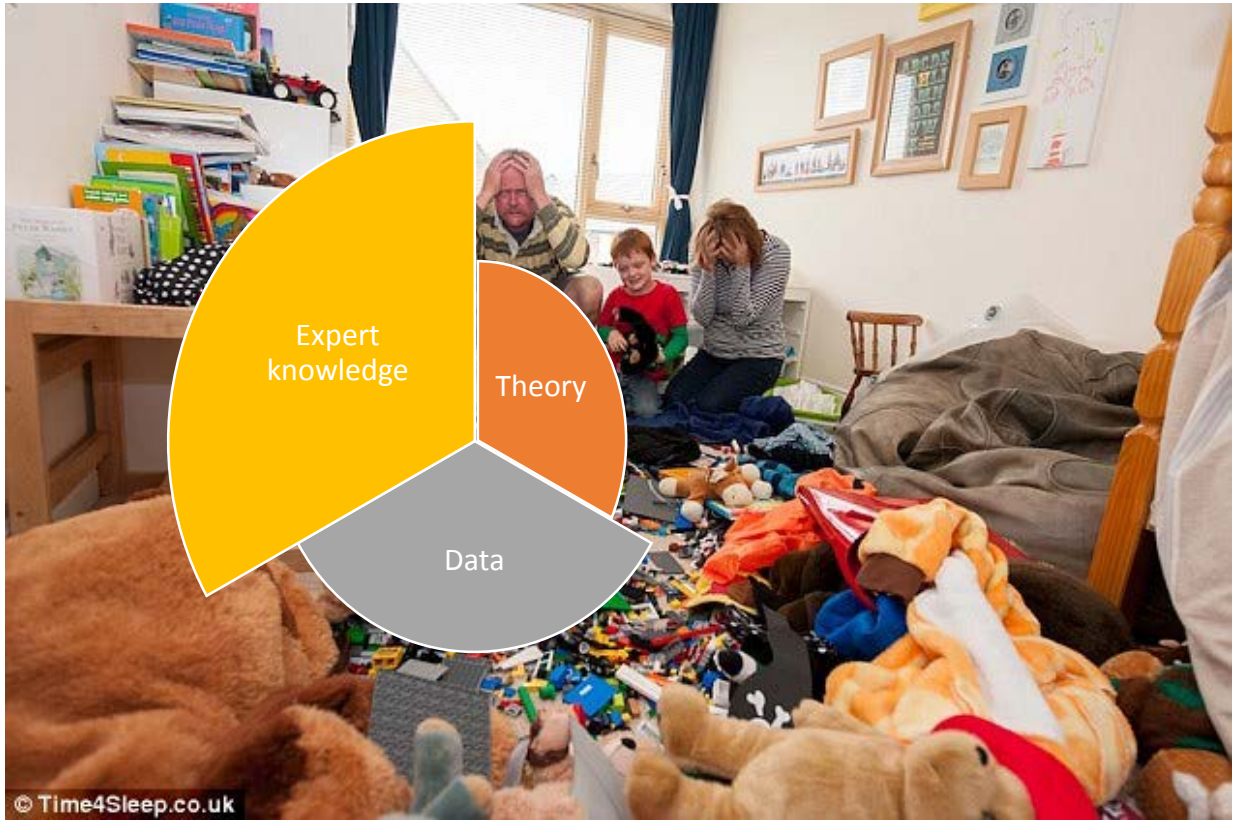
Five-year-old Harry Bateman, won a prize for having the messiest bedroom in the UK. Daily Mail

Things are seldom ideal in risk analysis



Five-year-old Harry Bateman, won a prize for having the messiest bedroom in the UK. Daily Mail

Things are seldom ideal in risk analysis



Five-year-old Harry Bateman, won a prize for having the messiest bedroom in the UK. Daily Mail

Uncertainty

- **Uncertainty** (epistemic uncertainty, lack of knowledge) – REDUCABLE
- **Variability** (aleatory uncertainty, inherent randomness) – NOT REDUCABLE
- ”All uncertainty is epistemic”
- What is variability depend on how we choose to describe the system/processes
- One can be uncertain about a cause-effect relation or about frequencies to describe variability (e.g. rare or extreme events, variation within a population or over space and time)
- Can I be uncertain about my uncertainty?
- Are there other types of uncertainty?

Who's uncertainty?

"Uncertainty is personal and temporal. The task of uncertainty analysis is to express the uncertainty of the assessors, at the time they conduct the assessment: there is no single "true" uncertainty."

"Uncertainty analysis should begin early in the assessment process and not be left to end."

EFSA's uncertainty guidance (draft 2016)

A structured approach to manage uncertainty?

- Adapt to the
  - Type of decision problem
  - Type of system (incl. processes to model variability and cause-effects)
  - Knowledge-bases (incl. strength in knowledge)
- Fulfill requirements for quality assurance
  - Guidance documents (top-down)
  - Guidance for best practice (bottom-up)
  - Specific requirements
- ?

U=P

U = ?

Uncertainty

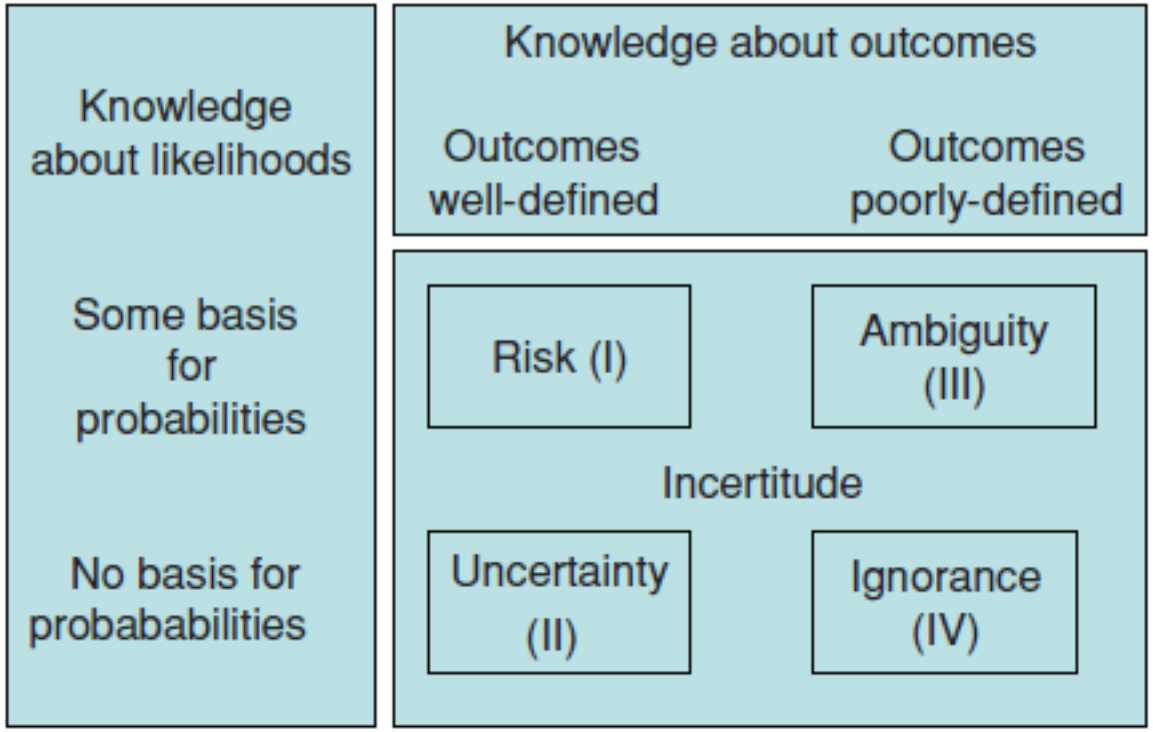


Fig. 1. A classification system for incertitude (Stirling and Gee[16]).

Uncertainty

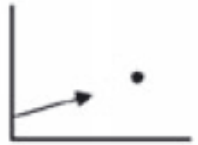
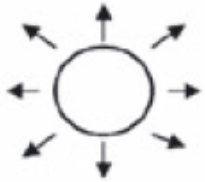
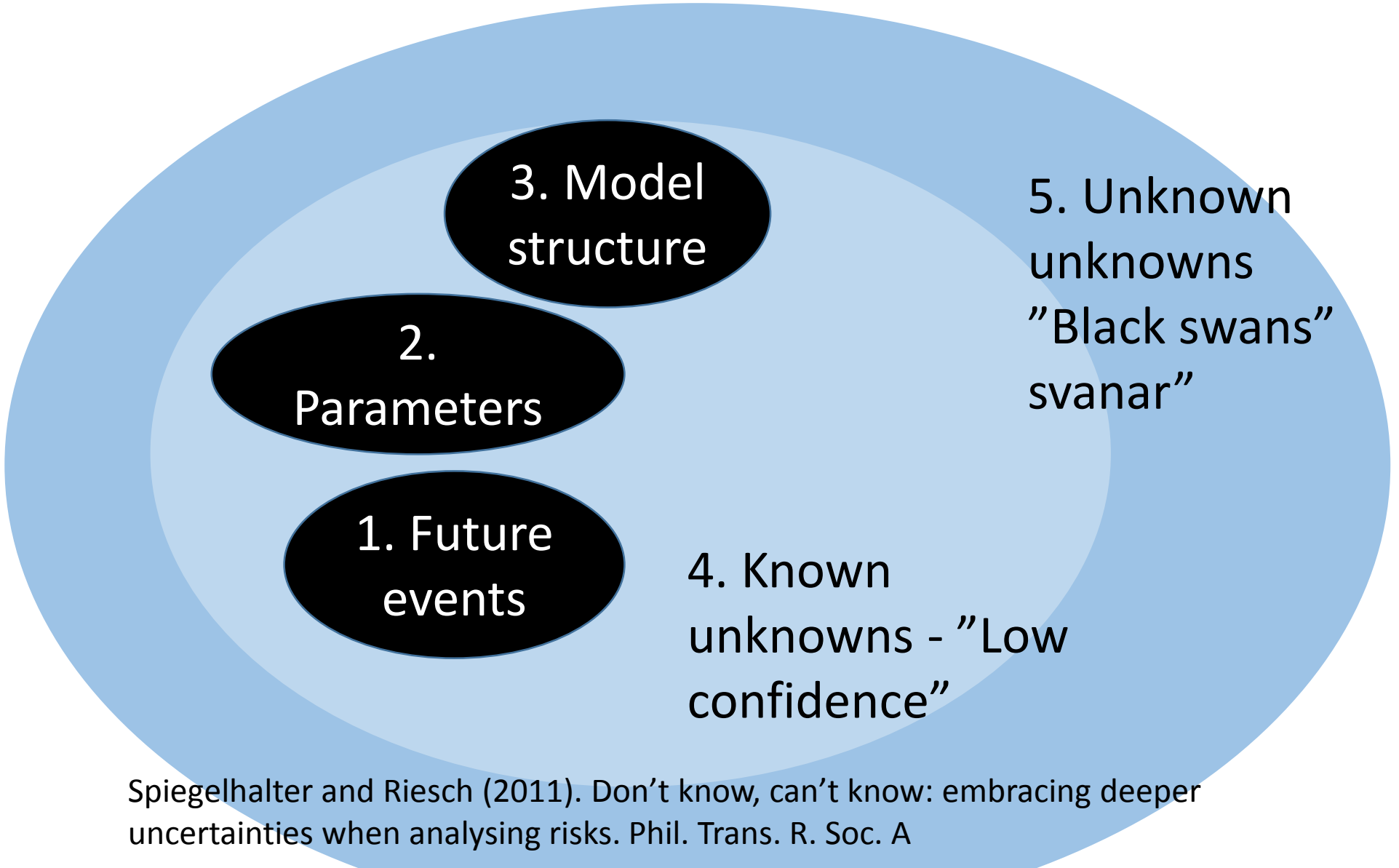
Determinism		Level 1	Level 2	Level 3	Level 4	Total ignorance
				Deep Uncertainty		
	Context	A clear enough future 	Alternate futures (with probabilities) 	A multiplicity of plausible futures 	Unknown future 	
	System model	A single system model	A single system model with a probabilistic parameterization	Several system models, with different structures	Unknown system model; know we don't know	
	System outcomes	A point estimate and confidence interval for each outcome	Several sets of point estimates and confidence intervals for the outcomes, with a probability attached to each set	A known range of outcomes	Unknown outcomes; know we don't know	
	Weights on outcomes	A single estimate of the weights	Several sets of weights, with a probability attached to each set	A known range of weights	Unknown weights; know we don't know	

Fig. 1. A suggested taxonomy of uncertainties.[83]

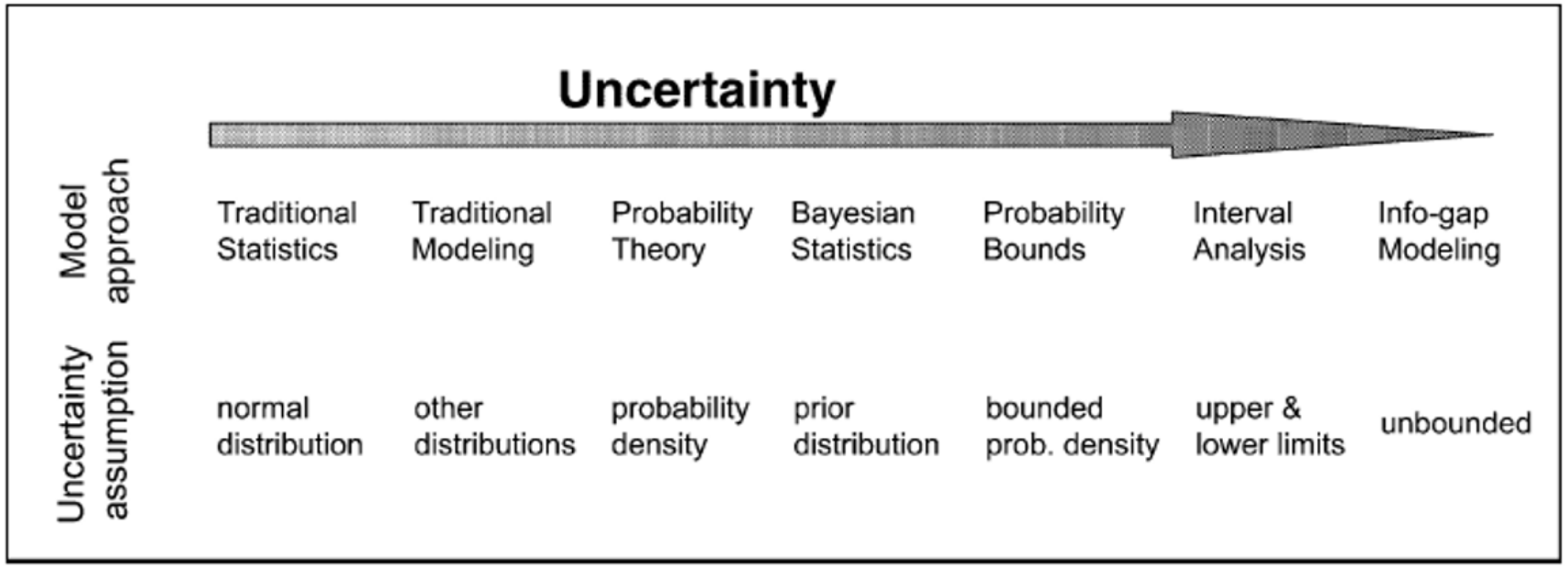
Cox, L. A., Jr. (2012). Confronting deep uncertainties in risk analysis. Risk Anal, 32(10), 1607-1629.

Uncertainty



Spiegelhalter and Riesch (2011). Don’t know, can’t know: embracing deeper uncertainties when analysing risks. Phil. Trans. R. Soc. A

Uncertainty



Halpern, B. S., Regan, H. M., Possingham, H. P., & McCarthy, M. A. (2006). Accounting for uncertainty in marine reserve design. Ecology Letters, 9, 2-11.