

Appendix C-6

UNCERTAINTY AND COMPLEX SYSTEMS: SOME CONSIDERATIONS AND THE TARGETS MODEL

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- Uncertainty and Complex Systems
- Complex Systems Modelling – Basic Principles
- The TARGETS model

COMPLEX SYSTEMS

Systems that comprise a large number of variables and interrelations, most of which are very difficult (or impossible) to quantify and/or identify.

The principle of incompatibility, Zadeh (1973):

“As the complexity of a system increases, our ability to make precise and yet significant statements about its behaviour diminishes until a threshold is reached beyond which precision and significance (or relevance) become almost mutually exclusive characteristics”

- **It is important not to make a fetish of precision, rigor, and mathematical formalism, but instead take advantage, whenever possible, of a methodological framework which should be tolerant of imprecision and partial truths (Zadeh, *ibid.*)**
- **The concept of “Gross Granulation”**

The Uncertainty Question

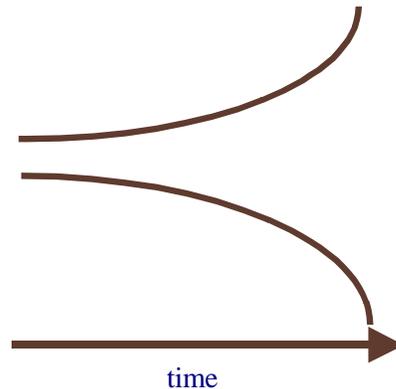
“To know one’s ignorance is the best part of knowledge”, Lao Tsu, *The TAO*.

“A little knowledge can be very dangerous”, cited in *UNCERTAINTY: A Guide to Dealing with Uncertainty in Quantitative Risk and Policy Analysis*, by Morgan & Henrion

RISK: Probabilities distributions of future events are assumed to be known (or that there ways to assess them) \ traditional statistical analysis (time series) \ the future is an extrapolation of the past (i.e., the past is a good witness to the future).

UNCERTAINTY: It is not possible to describe the future in terms of probability distributions
↳ *scenario analysis.*

THE UNCERTAINTY “TRUMPET”



Examples: Microcomputers and the Internet

COMPLEX SYSTEMS - BASIC PRINCIPLES

The iterative refinement of the problem's formulation and analysis:

- **Elaboration** (or addition) of those aspects that have been shown to be important and where greater detail detail may improve the quality of the analysis; and
- **Simplification** (or elimination) of those aspects of the analysis that have been shown to be unimportant to the questions of concern.

THE PRINCIPLE OF PARSIMONY

- ➔ Build the simplest model without being *too simple*

THE TARGETS (TOOL TO ASSESS REGIONAL AND GLOBAL ENVIRONMENTAL AND HEALTH TARGETS FOR SUSTAINABILITY) MODEL

National Institute of Public Health (RIVM) da Holanda

Perspectives on Global Change – The TARGETS Approach, Jan Rotmans e Bert de Vries (eds.), Cambridge University Press, Cambridge, UK.

Objective: Assess the interconnections among socio-economic and biophysical processes, in a global scale.

Characteristics

- **Integrated Assessment Model**

Deals explicitly with the prevailing uncertainties through modelling routes based on different future perspectives.

