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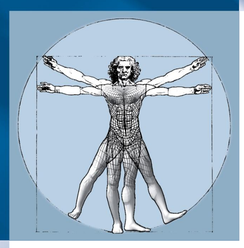

A role for consistent context scenarios in the simulation of future environmental change

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Introduction

Over the last decade, scenarios of global environmental change have been developed by an approach labeled “Story And Simulation” (SAS) [1]. The scenarios resulting from SAS processes have been used for scientific purposes and have become relevant for informing and structuring public and political debates, as. e.g. the so called SRES scenarios published by the IPCC [2]. At the same time, these scenarios have been criticized in terms of usefulness and credibility [3, 4, 5].

The aim of our work is to build on the strengths of SAS and to moderate its weaknesses. We propose to test the combination of the cross-impact balance analysis (CIB) [6] with simulation models. We ask, how CIB could be used within a new approach to SAS and what potential benefits and limits we can expect from CIBAS (i.e. ‘CIB And Simulation’).

Methods

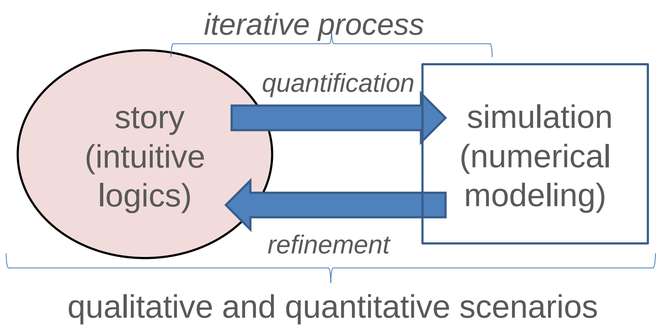
This work is mainly based on literature review of conceptual and empirical work on SAS and on CIB. In addition, several expert interviews have been conducted. We deduce conceptual ideas on ‘CIBAS’ and formulate expectations on potential and limits of its application.

Results

‘Story And Simulation’ (SAS)

The basic idea of SAS is to explore futures of natural systems via numerical simulation models and to combine them with qualitative storylines (narratives) covering socio-economic uncertainty and complexity [1, 7]. The assumption is that this combinations permits to benefit from strengths of ‘qualitative’ *and* ‘quantitative’ scenario approaches at the same time. Examples of empirical prototype studies are the so called SRES, the Millennium Ecosystem Assessment, the World Water Visions and GEO-4.

- Ideal type SAS process, own representation based on [1]



Strengths:

- representation of uncertainty of social contexts
- integration of qualitative information
- inclusion of variety (of knowledge and of participants)

Weaknesses:

- methodological imbalance: formal and systematic modeling is combined with “intuitive logics” [8], a creative-narrative scenario approach
- the ‘promise of consistency’ (mathematical models check the internal consistency of the storylines) [1, 7] seems difficult to hold [4]
- limited reproducibility
- ridden with prerequisites in practice (e.g. transformation of verbal into numerical statements)

Cross-impact balance analysis (CIB)

CIB is a qualitative but systematic form of systems analysis based on expert judgments on direction and strengths of impacts between system elements. It uses a balance algorithm to determine consistent network configurations (i.e. scenarios) [6]. CIB has been applied as a qualitative scenario technique in various fields.

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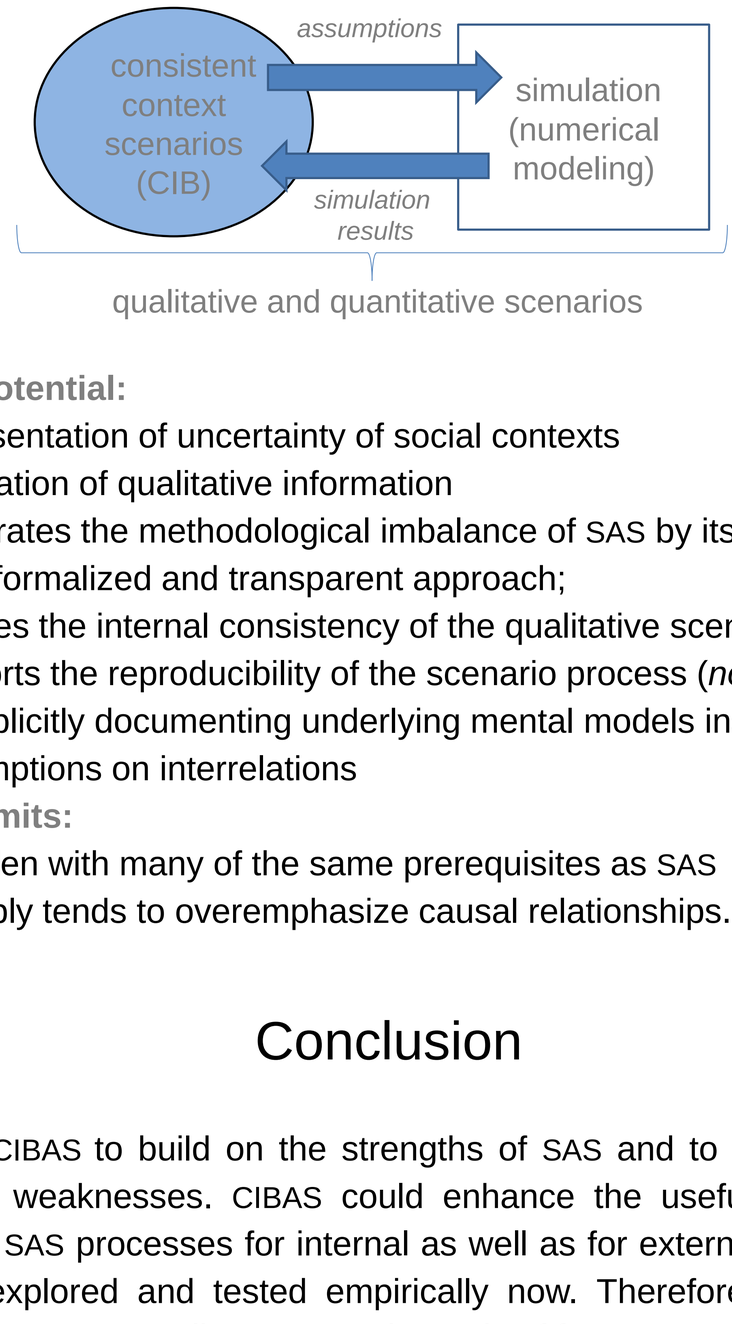
	G			FP			EP			DW		S		
	p	e	s	cp	ri	cf	de	st	dy	ba	co	sp	t	e
government (G)														
-"patriotic" (p)				-2	1	1	0	0	0	0	0	-2	1	
-"economy first" (e)				2	1	-3	-2	-1	3	-2	2	0	0	
-"social" (s)				0	0	0	0	2	-2	3	-3	2	-	
foreign policy (FP)														
-cooperation (cp)	0	0	0				-2	1	1	0	0	0	0	
-rivalry (ri)	0	0	0				0	1	-1	0	0	1	0	
-conflict (cf)	3	-1	-2				3	0	-3	0	0	3	-	
economic performance (EP)														
-decreasing (de)	2	1	-3	0	0	0				-2	2	-3	1	
-stagnant (st)	-1	2	-1	0	0	0				0	0	0	0	
-dynamic (dy)	0	0	0	0	0	0				-2	2	3	-	
distribution of wealth (DW)														
-balanced (ba)	0	0	0	0	0	0	0	0	0			3	-	
-important contrasts (co)	0	-3	3	0	0	0	0	0	0			-3	1	
social cohesion (SC)														
-social peace (sp)	0	0	0	0	0	0	-2	-1	3	0	0			

- Example of a CIB matrix

‘CIB And Simulation’ (CIBAS)

CIBAS builds on the general concept of SAS. In CIBAS, Intuitive Logics is replaced or complemented by CIB. Different CIBAS variants are possible.



Expected potential:

- representation of uncertainty of social contexts
- integration of qualitative information
- moderates the methodological imbalance of SAS by its systematic, semi-formalized and transparent approach;
- assures the internal consistency of the qualitative scenarios via CIB;
- supports the reproducibility of the scenario process (*not* of the result) by explicitly documenting underlying mental models including assumptions on interrelations

Expected limits:

- is ridden with many of the same prerequisites as SAS
- possibly tends to overemphasize causal relationships.

Conclusion

We expect CIBAS to build on the strengths of SAS and to counterbalance some of its weaknesses. CIBAS could enhance the usefulness and the credibility of SAS processes for internal as well as for external users. CIBAS has to be explored and tested empirically now. Therefore, we currently initiate different case studies, e.g. on the topic of future water supply.

References

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