

Paper Session:

Theoretical and Methodological Advances in Transition Research

Participative Scenario Development for Regional Sustainable Transitions: Opportunities for Combining Systematic Formative Techniques and In-depth Qualitative Analysis

Annika-Kathrin Musch | Anne von Streit | Claudia R. Binder

Chair of Human-Environment-Relations, Department of Geography, LMU Munich

Laboratory for Human Environment Relations in Urban Systems, EPFL Lausanne



INTRODUCTION



Participative scenario construction:

- Method for supporting sustainability transitions of organisational and societal systems (Davies et al. 2012; Miller et al. 2014; Trutnevyte et al. 2011; Wiek et al. 2006).
- Functions of knowledge integration, mutual learning process, legitimation, mobilisation of resources (Bohunovsky et al. 2011; Kerber et al. 2014; Kosow and Léon 2015, Trutnevyte 2014)
- Mixed-method approaches combine qualitative elements such as workshops for the evaluation of future influences with quantitative elements (Hauck and Priess 2011; van Vliet 2011; Wachsmuth 2013; Weimer-Jehle et al. 2016)

The issue:

- Quality criteria for scenario development rather focus on the results than on the construction procedure: neglection of quality criteria for qualitative research



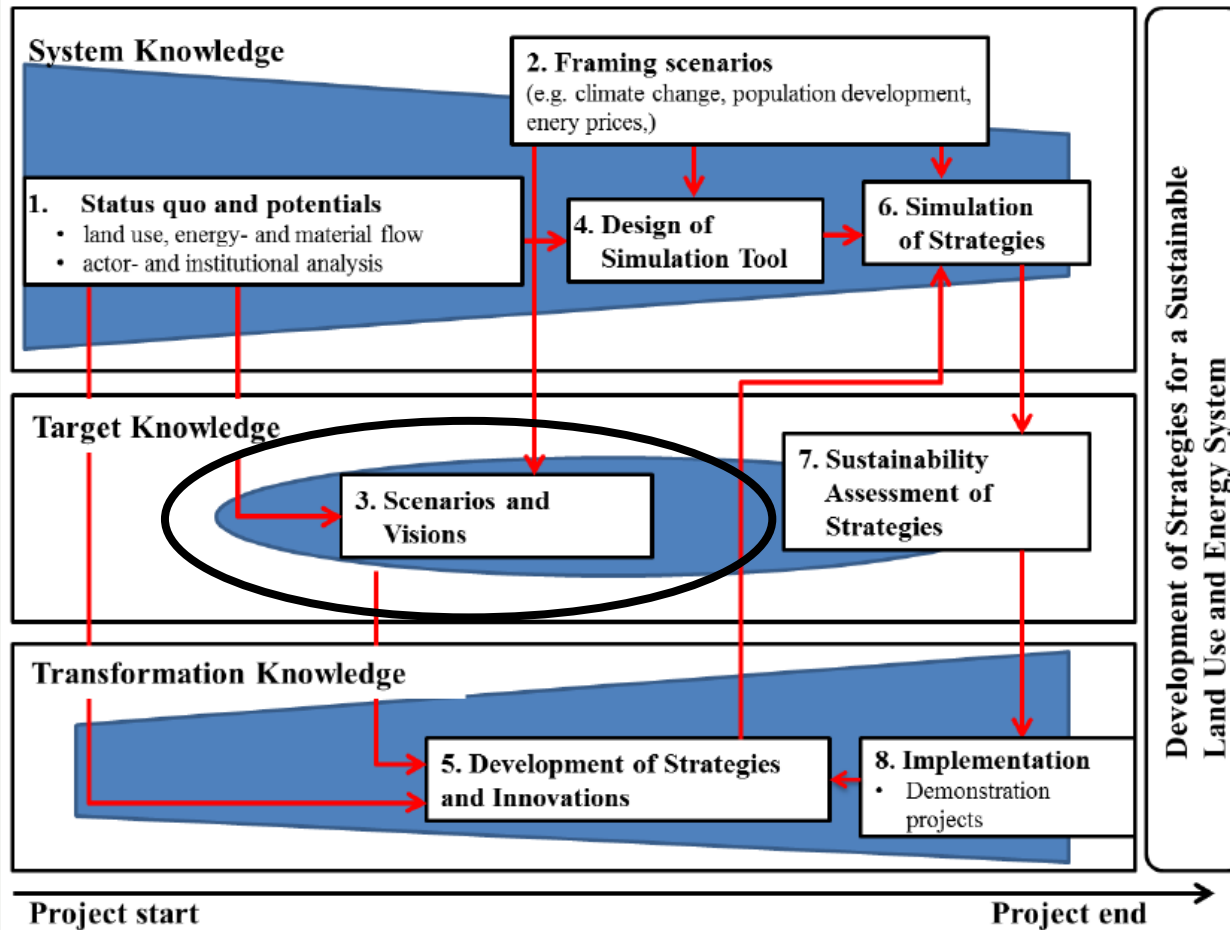
- How to use a cross-impact-balance analysis (CIB) in a participatory process?
- How exactly do system evaluations emerge during group discussion?
- Do the matrix and the consistent scenarios reflect the (integrated) system knowledge of the participants?
- How to improve the quality of the procedure reflecting on quality criteria for qualitative methods? What are relevant quality criteria in this respect?



PROCEDURE AND METHOD



Milestones of the transdisciplinary project INOLA (Innovations for a Sustainable Land Use- and Energy Management on a Regional Level)



(Source: own illustration, strongly adapted from Schneider 2011)



(Source: own illustration, adapted from Weimer-Jehle 2014)

	A			B		C			
	a ₁	a ₂	a ₃	b ₁	b ₂	c ₁	c ₂	c ₃	c ₄
A	a ₁								
	a ₂								
	a ₃								
B	b ₁								
	b ₂								
C	c ₁								
	c ₂								
	c ₃								
	c ₄								

Cross-impact evaluations of future possible developments

- Three transdisciplinary workshops (3-4h) with over 60 participants
- Using “tangible” material to facilitate the method
- Discussion minutes, recordings and transcripts

a3: Regional growing population
b1: Increasing regional energy demand

Would a growing population in future

-2: strongly hinder

-1: hinder

0: have no influence on

+1: promote

+2: strongly promote

an increasing energy demand?





- Construction of consistent scenarios: input for modelling
- Involvement of over 60 regional stakeholders and scientific experts
- Formative technique: focused and guided group discussion of influencing factors

“The method helped to focus on single relationships between developments that we have not considered before. Also it was interesting to see who else within the county is working on energy transition and land management”

(Comment of a participant in the workshop evaluation)

- Trace single evaluations that, in the perception of the participants, can or cannot be controlled in the future



- Enhancement of scenario storylines
- **Transparent reconstruction of the procedure**



RESULTS



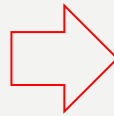
Comparison of group discussions on county level

Discussions	Groups 1 'Economy'			Groups 2 'Land Use'			Groups 3 'Energy'		
County/Group	MB1	BT1	WM1	MB2	BT2	WM2	MB3	BT3	WM3
Total agreement on the direction	68,5%	53,3%	66,7%	70,4%	13,3%	35,0%	61,1%	58,3%	51,7%
Finding a common denominator	25,9%	46,7%	33,3%	29,63%	86,7%	65,0%	38,9%	41,7%	48,3%
Disagreement on the direction	20,4%	30,0%	26,7%	25,93%	73,3%	46,7%	27,8%	28,3%	35,0%
Extreme disagreement from - to +	5,56%	5,0%	1,67%	3,7%	18,3%	10,0%	1,39%	6,7%	0%

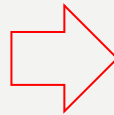


Evaluation/Question	Example for argumentation
<p>If land consumption was to further increase until 2045 within the county – would that either help or hinder the expansion of renewable energies?</p>	<p>Due to the voting, the final result within the cross-impact matrix displays 'no influence'.</p>
	<p><i>Land consumption means new residential areas. Close to wind-mill-power plants the emerging conflicts will hinder the expansion on renewable energies. (-1)</i></p>
	<p>Voting</p> <p>3x hindering, 3x promoting. Final result: No influence (Case WM/T2)</p>
	<p>After this statement the participants discuss:</p> <ul style="list-style-type: none"> - Definition of land consumption - Advantages of wood pellets - A documentation one participant has seen on TV - Cascaded utilisation of wood
	<p>One regional expert dominates the discussion. The moderator interrupts several times, but is not able to steer the discussion back to topic.</p>

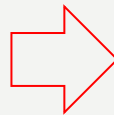
Qualitative in-depth analysis: Identification of intervening factors



Result does not reflect the discussion



Direction of evaluation unclear
Indirect influences considered



Unclear factor definition
Discussion of other factors
Discussions off-topic



Power relations between the participants and the moderator



Procedure-oriented quality criteria

Quality criteria	Conditions to consider	1 = Yes 0 = No	
A	Time	Is there enough time for the discussion?	1/0
B	Moderator	Is the moderator neutral and does not interrupt the discussion?	1/0
C	Power relations	Is the discussion equal without one dominant participant?	1/0
D	Understanding	Can the participants work immediately with the factors and definitions?	1/0
E	Influence	Do the participants evaluate the direct influence?	1/0
F	Context	Do the participants discuss the correct influence?	1/0
G	Focus	Is the discussion on-topic?	1/0
H	Uncertainty	Do the participants have sufficient knowledge on the influence (expert knowledge/experience)?	1/0
I	Response	Do the participants elaborate their voting?	1/0
J	Discussion-Result	Does the discussion reflect the results?	1/0
Maximum			10/0

Organisational challenges

- Budget time and resources
- Intensive briefing (Moderator)
- Potentially utilise effects

Methodological challenges

- Discussion in advance
- Use of examples

Organisational challenges

- Careful selection of participants
- Intensive briefing (Moderator)
- Iterative process



- We were able to identify intervening factors during transdisciplinary workshops for scenario development
 - Consistent scenarios do not necessarily represent integrated knowledge and system understanding of the participants
- More attention should be paid to quality criteria for participative (scenario) procedures that use systematic-formative techniques and qualitative methods/stakeholder involvement
 - Contribution of our paper to quality criteria for all mixed-method approaches
- Combining systematic-formative approaches and a qualitative in-depth analysis improved the transparency and displayed the individual system understanding of participants
 - Critical reflection within the project team and with the participants

Thank you very much for your attention!

We are grateful to the German Federal Ministry of Education and Research for funding this project.



Power relations occur during social interaction and intergroup actions...

- How to identify dominant participants and occurring power relations?
- How to analyse them?
- How to potentially utilise them for the upcoming ST processes ('frontrunners' or 'change agents')?

Scenarios should challenge conventional wisdom. During some discussion the participants agreed very quickly on the impacts...

- Does not discussing relationships that could be crucial leverages for supporting sustainability transitions rather stabilise the status quo than foster innovative thinking?
- Are the mutual learning processes and the knowledge integration during transdisciplinary processes (that should foster innovative thinking and sustainability transition) too uncritically assumed?



- Bohunovsky, L., Jäger, J. and Omann, I. (2011): Participatory scenario development for integrated sustainability assessment. *Regional Environmental Change* 11 (2), 271–284.
- Davies, A. R., Doyle, R. and Pape, J. (2012): Future visioning for sustainable household practices: Spaces for sustainability learning? *Area* 44 (1), 54–60.
- Jetter, A. and Schweinfurt, W. (2011): Building scenarios with Fuzzy Cognitive Maps: An exploratory study of solar energy. *Futures* 43 (1), 52–66.
- Kerber, H., Schramm, E. and Winker, M. (2014): Partizipative Szenarioverfahren – zur methodischen Ableitung von Zukunftsbildern: Das Projekt SAUBER+ als Beispiel. *Projektbericht SAUBER+*, Frankfurt am Main.
- Kok, K., Bärlund, I., Flörke, M., Holman, I., Gramberger, Marc., Sendzimir, J., Stuch, B. and Zellmer, K. (2015): European participatory scenario development: strengthening the link between stories and models. *Climatic Change* 128 (3-4), 187–200.
- Miller, T. R., Wiek, Arnim, Sarewitz, D., Robinson, J., Olsson, L., Kriebel, D. and Loorbach, D. (2014): The future of sustainability science: a solutions-oriented research agenda. *Sustainability Science* 9 (2), 239–246.
- Schneider, F. (2011): Approaching water stress in the Alps: Transdisciplinary co-production of systems, target and transformation knowledge. In: Borsdorf, A., Stötter, J., Veulliet, E. (Ed.) *Managing Alpine Future II - Inspire and drive sustainable mountain regions*. Proceedings of the Innsbruck Conference November 21-23, 2011 (107-117). Verlag der Österreichischen Akademie der Wissenschaften, Wien.
- Trutnevyte, E. (2014): The allure of energy visions: Are some visions better than others? *Energy Strategy Reviews* 2 (3-4), 211–219.
- Trutnevyte, E., Stauffacher, M. and Scholz, R.W. (2011): Supporting energy initiatives in small communities by linking visions with energy scenarios and multi-criteria assessment. *Energy Policy* 39 (12), 7884–7895.



- van Vliet, M. (2011): *Bridging gaps in the scenario world - linking stakeholders, modellers and decision makers*. Thesis, Wageningen.
- Weimer-Jehle, W. (2014): Einführung in die qualitative System- und Szenarioanalyse mit der Cross-Impact-Bilanzanalyse. *Methodenblätter zur Cross-Impact-Bilanzanalyse, Blatt Nr. 1*. Interdisziplinärer Forschungsschwerpunkt Risiko und Nachhaltige Technikentwicklung, Universität Stuttgart. http://www.cross-impact.de/deutsch/CIB_d_MBI.htm (30.05.2015).
- Weimer-Jehle, W., Buchgeister, J. and Hauser, W. et al. (2016): Context scenarios and their usage for the construction of socio-technical energy scenarios. *Energy* 111, 956–970.
- Wiek, A., Binder, C.R. and Scholz, R. W. (2006): Functions of scenarios in transition processes. *Futures* 38 (7), 740–766.

Selection of one preferred scenario (Bad Tölz-Wolfratshausen)





Example for collected cross-impact-evaluations within a discussion minutes

								CONSENSUS			
Evaluation	Strongly Hinderig	Hinderig	No influence	Promoting	Strongly promoting	Finding a common denominator after one discussion round/ Final result	Participants /Group	Total agreement on the direction?	Finding a common denominator ?	Disagreement on the direction?	Extreme disagreement from - to +?
1	0	0	1	3	0	1	4		X	X	

Bad Tölz Teil 1

		Wohlstandsentwicklung im Landkreis	Entwicklung des Arbeitsmarktes	Finanzkraft der Kommunen	Bevölkerungsentwicklung	Entwicklung der Siedlungs- und Verkehrsfläche	Struktur der Landwirtschaft	Energieverbrauch	Akzeptanz der Energiewende in der Bevölkerung	Entwicklung der E-Mobilität	Ausbau erneuerbarer Energien
BEWERTUNG DER EINFLUSSSTÄRKE WEIß: Kein Einfluss/kein Zusammenhang (0) 1x GRÜN: fördert (+1) 2x GRÜN: fördert stark (+2) 1x ROT: hemmt (-1) 2x ROT: hemmt stark (-2) SCHWARZES FELD: keine Bewertung möglich GRAUES FELD: Halbzeit											
		Steigend	Zunehmende Beschäftigtenquote	Zunehmende Finanzkraft	Wachsende Bevölkerung	Zunehmender Flächenverbrauch	Zunehmende Intensivierung	Zunehmender Energieverbrauch	Zunehmende Akzeptanz	Zunehmend (gleichbleibende) Nutzung fossiler Antriebe	Zunehmender Ausbau
Wohlstandsentwicklung im Landkreis	Steigend		●	●	●	●	●	●	●	●	●
	Sinkend	●		●	●	●	●	●	●	●	●
Entwicklung des Arbeitsmarktes	Steigende Beschäftigtenquote	●		●	●	●	●	●	●	●	●
	Sinkende Beschäftigtenquote	●●		●	●	●	●	●	●	●	●
Finanzkraft der Kommunen	Zunehmende Finanzkraft	●	●		●	●●	●	●	●	●	●●
	Abnehmende Finanzkraft	●	●		●	●	●	●	●	●	●
Ausbau erneuerbarer Energien	Zunehmender Ausbau	●	●	●							
	Abnehmender Ausbau (Stagnation)	●●	●	●							
Diese Bewertungen werden von Gruppe 2 und 3 übernommen											



Example for consistent scenarios on county level (Bad Tölz-Wolfratshausen)

Szenario Nr. 2	Szenario Nr. 3	Szenario Nr. 1
A Wohlstandsentwicklung: A2 Abnehmender Wohlstand		A Wohlstandsentwicklung: A1 Steigender Wohlstand
B Entwicklung des Arbeitsmarktes: B2 Sinkende Beschäftigtenquote		B Entwicklung des Arbeitsmarktes: B1 Steigende Beschäftigtenquote
C Finanzkraft der Kommunen: C2 Abnehmende Finanzkraft		C Finanzkraft der Kommunen: C1 Zunehmende Finanzkraft
D Bevölkerungsentwicklung: D2 Schrumpfende Bevölkerung		D Bevölkerungsentwicklung: D1 Wachsende Bevölkerung
E Entwicklung der Siedlungs- und Verkehrsfläche: E2 Verringerung der Flächeninanspruchnahme		E Entwicklung der Siedlungs- und Verkehrsfläche: E1 Zunehmende Flächeninanspruchnahmen
F Struktur der Landwirtschaft: F1 Zunehmende Intensivierung		
G Energieverbrauch: G2 Abnehmender Energieverbrauch		G Energieverbrauch: G1 Zunehmender Energieverbrauch
H Akzeptanz der Energiewende in der Bevölkerung: H2 Abnehmende Akzeptanz		H Akzeptanz der Energiewende in der Bevölkerung: H1 Zunehmende Akzeptanz
I Entwicklung der E-Mobilität: I1 Gleichbleibende Nutzung fossiler Antriebe		I Entwicklung der E-Mobilität: I2 Zunehmende Elektromobilität
J Ausbau regenerativer Energiequellen: J2 Abnehmender Ausbau (Stagnation)		J Ausbau regenerativer Energiequellen: J1 Zunehmender Ausbau