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(Un)intended effects of participation in sustainability science: A criteria-guided comparative case study

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ABSTRACT

The impact of collaborative research approaches on science and society has been subject to much debate and speculation. However, empirically grounded analyses of the process-impact link remain the exception. That includes comparing participation planning, intended processes, expectations and implementation. This paper delivers a theoretically informed comparison between different approaches to participation that are practised. It does so by performing a criteria-guided analysis of 31 participatory sustainability studies covering different areas of study and spatial levels. This provides an understanding of how participation is translated from theory into practice, what challenges occur that contradict initial aims, and how these potentially influence expected effects. The results show stark divergences between planning and implementation: persistent normative ideals in the planning phase, echoing deliberative and emancipatory claims, contrast with an emphasis on effectiveness during implementation. This leads to a systematic over-representation of experts and an under-representation of diverse societal actors in the studies. The focus is on producing directly measurable results rather than promoting possible (long-term) societal effects. These findings facilitate a deeper discussion of which conditions and procedures could aid the design and delivery of high-impact collaboration in the future.

1. Introduction

Public participation and cooperation are widely regarded as major preconditions for sustainable development (Meadowcroft, 2004; WBGU, 2011). Within sustainability science, a broad consensus exists that successful sustainability transformation requires participation by scientific and non-scientific actors (Funtowicz and Ravetz, 1993; Miller et al., 2014). This methodological commitment to post-normal science is also referred to as transdisciplinary research (TDR) (e.g. Brandt et al., 2013; Hirsch Hadorn and Jäger, 2008; Jahn et al., 2012) or more generally, transformational or participatory sustainability research (Lang et al., 2012; Wiek et al., 2012). It calls for knowledge co-production incorporating diverse perspectives from academia and practice to find innovative tailored/practice-relevant solutions (Talwar et al., 2011; Wiek et al., 2014) and covers a variety of areas including Natural Resource Management (NRM), Transition Management (TM) or strategic regional planning (Hansson and Polk, 2018). This paper focuses on rationales for participation and how participation is actually implemented in participatory sustainability projects from different areas.

A considerable body of work exists on how participation and the involvement of societal actors in ideal-typical processes should be structured on a conceptual level (e.g. Pohl and Hirsch Hadorn, 2007; Scholz and Steiner, 2015). Three rationales for the positive effects of participation can be identified in this literature (Fiorino, 1990; Newig et al., 2011, 31f): effectiveness (substantive rationale), legitimacy (instrumental rationale) and emancipation (normative rationale).

Firstly, emphasising effectiveness, research teams design participatory processes to make use of the expertise and knowledge from academic and non-academic sources, to effectively develop and implement potential solutions for societal problems (Bergmann et al., 2012; Lang et al., 2012; Wiek et al., 2012). Participation between "forerunners or visionaries" (Loorbach et al., 2009) from different societal backgrounds aims to achieve consensus about a common problem, encourage social learning and trigger systemic thinking leading to innovation and support for sustainability transitions (Chilvers and Kearnes, 2016; van de Kerkhof and Wieczorek, 2005). The expectation is to improve outcomes[1], interpreted as the practice-oriented effectiveness of results (substantive rationale) (Pohl and Hirsch Hadorn, 2007). Secondly,

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[1] In our definition we distinguish outputs which are direct results of participatory processes, like products, action plans or scenarios, and outcomes which comprise effects, like knowledge production or network effects that are less tangible than products, but considered critical effects of participatory sustainability research for long-term societal impact.

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participation is expected to increase legitimacy, as co-produced results are more likely to be accepted in the long term (Jahn and Keil, 2015). This instrumental rationale assumes that involving all relevant perspectives secures acceptance and thus potential societal impact (Miller et al., 2014). And thirdly, including all relevant perspectives represents a democratic ideal, through the realisation of inclusion and deliberative decision-making (normative rationale) (Leventon et al., 2016). The imperative underpinning this normative rationale is that participants can be empowered through a collaborative process (Scholz and Steiner, 2015; Stauffacher et al., 2008). A well-managed, fair deliberative participation process values local and traditional knowledge and improves the quality of decisions for (local) communities (Finewood and Holifield, 2015; Reed, 2008). According to Partzsch (2016), in a substantive body of work in participatory sustainability research, participation presumes the ability of actors with a transformational orientation to act in concert and bring about positive change through mutual learning and cooperation. Different areas of participatory sustainability research only differ slightly in their main aims of participation. All emphasise effectiveness and legitimacy but they (still) share a dominant normative rationale, echoing the Habermasian ideal of deliberative democracy (Habermas, 1982).

However, we argue here that each rationale promotes very different forms of participation regarding process design, actor involvement and decision-making processes, prompting the question of whether participatory processes can fulfil all three rationales equally and simultaneously.

Studies that search for empirical evidence of the right "balance" of rationales (Baker and Chapin, 2018) and to what degree the assumptions regarding the benefits of participatory research on a conceptual level are achieved in practice are still scarce (but see Bergmann et al., 2017; Forrest and Wiek, 2015; Polk, 2014; Wiek et al., 2014). Without more detailed comparative studies, the benefits of participation in sustainability science remain largely unproven (Zscheischler and Rogga, 2015). This issue seems even more pressing when academics are now confronted with mounting pressure from society and funding bodies to produce societally relevant and directly applicable knowledge (Rau et al., 2018). Thus, more empirical evidence is needed to understand the link between the research process and its potential societal impact (Hansson and Polk, 2018). We argue that this implies not only an analysis of implemented processes but also empirical evidence of the link between planning, intended processes and related expectations, as well as realised procedures. Accordingly, better understanding is required of how the balance of instrumental, substantive and normative rationales of participation provide "a mix of benefits and pitfalls" (Baker and Chapin, 2018).

Based on a criteria-guided comparative case study of 31 studies that identify as being within TDR, NRM or TM, this paper explores how participation is understood and organised as it translates to a variable emphasis on actor inclusion, transparency, design of decision-making processes and emancipatory intentions. This provides an understanding of how participation is translated from theory into practice, what challenges occur that contradict initial aims, and how these potentially influence expected effects. Furthermore, it enables deeper discussion of which conditions and procedures could aid the design and delivery of high-impact collaboration in the future.

The remainder of this paper is divided into six sections. In Section 2, drawing on existing empirical studies, we develop criteria to distinguish four key approaches to participation. Section 3 presents the study design and a detailed account of the research methodology for the criteria-guided analysis. Drawing on publicly available documentation of 31 projects, we compare planned and implemented participatory processes, aiming to identify the dominant approaches to participation. The main results are presented in Section 4, followed by a discussion of key findings and implications for participatory processes (Section 5) and some conclusions (Section 6).

2. Empirical studies on participatory processes and development of a typology to characterise approaches to participation

Recently, a growing body of participatory research has focused on the effectiveness of participation, to understand (un-)intended effects and possible barriers to feasibility (Bergmann et al., 2017; Schneider and Buser, 2018; Wiek et al., 2014; for earlier work informing these studies, see Rowe and Frewer, 2000; Walter et al., 2007). This includes critical evaluation of processes (Alcántara et al., 2016; Fritz and Binder, 2018; Polk, 2014) and possible contradictions between ideals and practices (Mielke et al., 2016, 2017). Outside this field, four central studies have largely informed our criteria for distinguishing key approaches to participation.

2.1. Criteria to distinguish approaches to participation

Two studies – one from sustainability science (Mielke et al., 2017) and one from political science (Alcántara et al., 2016) – arrive at very similar concepts of participation procedures. Alcántara et al. (2016, 58ff) offer a nuanced categorisation of public participation procedures practised in political research, reflecting different understandings of democracy which translate into divergent forms of participation. The authors identify four types of participation processes: deliberative, functional, neo-liberal and emancipatory.

In a deliberative process, the basic assumption is that all arguments must be heard and that all affected participants and mediators of civil society groups participate. Ideally, participants agree consensually (Habermas, 1982). In addition to the first type, Alcántara et al. (2016) identify a functional process that is initiated to solve an existing (sustainability) problem with the "best" knowledge available. As the focus is on expertise, only experts and representative stakeholders of society's functional subsystems (e.g. economic, political, legal) are involved. In neo-liberal processes, efficiency of the process outweighs any gain in individual competences or reflection of social values. The aim of the decision-making process is to find a compromise, majority decision or preferential arrangement. All stakeholders holding an argument or interest can participate.

As a fourth type, the authors (Alcántara et al., 2016) additionally categorise processes that aim at empowerment. Notions of empowerment and emancipation frequently appear in participatory sustainability research (Avelino, 2009; Hysing, 2013; Stauffacher et al., 2008), so this approach must be included to cover the whole spectrum of possible approaches. Emancipatory participation concerns the inclusion and empowerment of groups currently excluded from the political system due to limited resources (e.g. time, education, status) (Banducci et al., 2004). The basic assumption is that these excluded groups can be empowered through participation because it helps them to better understand their situation and mobilise their own resources. Ideally, these processes are autonomous or self-managing, as they primarily target participants' ability in the form of knowledge and growth in competence (Barber, 1994).

The study by Mielke et al. (2017) arrives at four similar categories of stakeholder involvement types that researchers practice in sustainability science: democratic, functionalist, technocratic and neo-liberal-rationalist. The first democratic type is comparable to Alcántara et al.'s (2016) categorisation of a deliberative process. Mielke et al. (2017) define such processes as initiated by researchers to extend stakeholder dialogue from experts and scientists to civil society. The dialogue is moderated by scientists, but aims at co-production of knowledge and reflection of societal values. According to the authors, the second, functionalist type tests predefined research findings against the stakeholders' perceptions. Scientists observe from outside, aiming to understand learning processes in science and society. The third, technocratic type consults issue-specific experts in a science-led research process structured according to the scientists' concepts. Knowledge is rather integrated in a technocratic sense. The fourth, neoliberal-rational type aims to discover stakeholders'

interests in a structured, time-limited way, to feed them into the research process. The scientists are also stakeholders and bargain for their (scientific) interests (Mielke et al., 2017).

The results of Mielke et al.'s study (2017) indicate divergences between scientists' ideals and practices when involving participants from outside academia. On a conceptual level, 81 scientists favoured the democratic type. According to the authors (Mielke et al., 2017: 75), terms like "co-design", "co-production" or "open arenas for research and civil society" indicate the intention to design a "democratic" process, as it is usually planned in TDR or TM processes. When asked for their understanding of science and practised stages of involvement in research processes, the 81 respondents in the study contradicted themselves and expressed agreement with other stakeholder involvement types, such as the functionalist, technocratic or neo-liberal type, despite favouring the ideal "democratic" type. These contradictions indicate the need for in-depth analysis of actual participatory processes.

Mielke et al. (2017) and Alcántara et al. (2016) focus on the link between conceptual planning (before) and implementation (during), albeit in very different contexts. Some terms such as "democratic" processes are not nuanced enough for our ends, as all participatory processes are democratic but vary in their emphasis on actor inclusion, design of decision-making processes and emancipatory intentions. To condense and structure the types and make them applicable for science-practice projects in the context of sustainability science, we draw on two central studies that identify the core elements of participatory processes. They offer a good starting point for looking at the link between conducted processes (during) and possible effects (after), using individual case studies as examples.

Wiek et al. (2014) have developed an extensive methodological scheme to test links between conducted participatory processes in sustainability studies and project results. Although the proposed key features are valuable, they are very difficult to apply to studies that researchers did not conduct themselves. The framework is applicable rather to broad long-term processes than to in-depth analysis of individual processes. However, the authors consider the knowledge-generation phase as a core element of the participatory process. Thus, it is included in our categorisation. Polk (2014) analysed five TDR case studies in Sweden to examine the link between participatory process, knowledge production and societal problem-solving. Key elements of the categorisation are: who initiated and organised the project, who set the agenda, how many and which researchers and practitioners participated, and which primary methods were used and how knowledge production was structured. The concise categorisation supports the structure of our differentiation.

2.2. Fourfold typology: main approaches to participation and their core elements

A combination of the aforementioned criteria and understandings of participation is useful to categorise four key approaches to participation that are simple enough to apply to conducted studies on an ex-post level, dealing with limited available data, whilst also significant enough to distinguish the whole spectrum of approaches to participation that reflect key assumptions about different participatory characteristics (see Table 1). We distinguish an emancipatory approach to participation, a deliberative approach, a neo-liberal approach that we call a competitive approach because it focuses on bargaining and competition of arguments, and a functional approach that subsumes expert-driven and technocratic aspects. By assigning the criteria of these approaches to the corresponding core elements of participatory processes, we arrive at the following matrix (Table 1).

In the following, we apply our fourfold typology to published examples of sustainability studies with a participatory process. The aim is to distinguish dominant approaches of participation that are likely to lead to different research results and influence the (lack of) scientific and societal impact.

Table 1
Typology: key approaches to participation with their core elements and criteria.

Approach to participation Core elements of process	Emancipatory	Deliberative	Competitive	Functional
Process design	(E1) Initiated by a research team; process continues to be autonomous or self-managing	(D1) Initiated by a research team, or a deliberative forum exists to reach a fair consensus	(C1) Initiated by a research team to identify preferences	(F1) Initiated by a research team to solve an existing sustainability problem
Participants	(E2) Aim to address unreached groups	(D2) All perspectives, inclusion of all arguments, minority votes and mediator	(C2) All participants with an interest or randomly chosen participants	(F2) Only those with expertise are involved: topic-specific stakeholder or expert analysis
Decision-making	(E3) Focus on social justice, empowerment	(D3) Focus on consensus and exchange of arguments, fair discourse	(C3) Focus on identifying preferences and bargaining interests, competition of arguments, choice between alternatives	(F3) Focus on finding the best solution to a problem. Participants contribute to decision-making; final decisions remain with the research team
Knowledge generation	(E4) Growth of knowledge and competence in formerly excluded participants	(D4) Better decisions = more rational decisions; reflection of societal values	(C4) No focus on knowledge integration; the dominant argument wins	(F4) Knowledge integration (in a technocratic sense)

Table 2
Search terms for the systematic literature review (last update 13/06/2019, see Data in Brief).

Search terms	SCOPUS	WOS	Google Scholar
"transitions" AND "sustainability" AND "case study"	831	242	44.100
"transdisciplinary" AND "transitions" AND "sustainability" AND "case study"	17	10	5.810
"case study" AND "transitions" AND "sustainability" AND "participation"	48	26	23.800
"transdisciplinary" AND "sustainability" AND "case study"	147	128	17.900

3. Materials and methods

3.1. Data selection

Data gathering started with collecting potentially relevant publications from scientific journals between 2000 and 2018 in the "SCOPUS" database, the "Web of Science Core Collection" (WOS) and "Google Scholar". We used the search terms presented in Table 2. The searches on SCOPUS and WOS were limited to the field of environmental sciences, energy, social sciences, agricultural and biological sciences. The additional search on Google Scholar was valuable, as results much more reflected the search term combination without focusing too much on citation counts. We did not include studies carried out before 2000, as we were particularly interested in recent developments. This is not to suggest that older examples could not yield valuable insights.

Following data screening and cleaning (Newig and Fritsch, 2009), the search started by selecting the 30 (if available) most relevant publications based on the number of citations for each search term combination (result: 360 publications in total). Overlapping findings were excluded. In a second filtering round, we scanned the abstracts for relevance (result: 207 publications). The highly cited publications in scientific journals with a strong conceptual focus have been considered for the theoretical background, such as Jahn et al. (2012) or Lang et al. (2012). Highly cited publications on detailed case studies have been selected for analysis, such as Larsen and Gunnarsson-Östling (2009); Wiek et al. (2012) and Fraser et al. (2006). The main selection criterion for this study's sample was the completeness of information on conducted participatory processes provided in the case reports. A fair amount of publications describing detailed case studies but with a small number of citations was thus also selected. Many documents we had access to showed insufficient non-transparent reflection on participatory processes. Compared to the importance of the participatory process, reflections on outcomes remained the exception and frequently lacked detail.

Our research design reflects the idea that a comparative case study approach with a small to medium number of cases can provide insights that are more informative and also more stringent than individual case studies (Newig and Fritsch, 2009). For the final [dataset] we selected 31 studies across all search term findings to keep the in-depth analysis manageable[2]. Each project was assigned an ID, consisting of the country, end year of the study and the projects' self-identified areas of sustainability research. Thus, twelve NRM studies appear in the analysis, nine TM studies and ten TDR studies. Twenty-four projects were based in European countries, four in North America, two in Africa and one in Australia.

We included the transdisciplinary project INOLA[3], which is listed as GER2017TD, as a component of the analysis. The authors were involved directly in the project and planned, participated and evaluated central participatory processes such as the transdisciplinary scenario construction. This enables us to elaborate more deeply on the reasons for the changes and discrepancies between planned and implemented processes as well as the effects on the project's outputs and outcomes. In addition to the analysis of the 30 pieces of "second-hand" information included, we can compare and refine broader results with our own experiences.

3.2. Data analysis

Most of the studies answered concrete research questions, presenting project outputs, and placed the participatory process in the method section. Four studies represent evaluation documents that include structured, detailed analysis and comparison for 13 projects. As this provided valuable and transparent information, we conducted a comparative analysis and incorporated these projects in our investigation, keeping in mind that publications already represent interpretations by the authors who published the study.

First, we scanned publications to identify the project goals and the planned participatory process. For example, BOT2002NRM planned to engage a wide range of stakeholders and empower a rural community in Botswana, using local knowledge and western scientific tools such as interviews and focus groups. This project goal reflects emancipatory aspects. In contrast, in EU2009NRM a research team predefined scenarios for different policy options in the European Union for the context of biodiversity management, and asked selected experts to vote for their preferred scenario. This project goal reflects competitive and functional aspects. Secondly, the criteria presented in Table 1 were assigned to the studies to see what was practised. Each criterion in the table has an abbreviation, such as E1 (*an emancipatory process was initiated by the research team and was ideally self-managing after the withdrawal of the researchers*) in contrast to C1 (*a competitive process was initiated by the research team to identify preferences regarding a sustainability issue*). In a [dataset] we assigned the criteria from F1 (…), C1 (…), D1 (…) to E1 (…) to the projects, using a 1 = "yes" and 0 = "no" coding. As each approach consists of four elements (e.g. F1, F2, F3, F4), a project could have applied a single approach, but also partly a functional approach and partly a competitive approach. Distinguishing the individual criteria allowed us to trace differences in planning and implementation and possible emerging contradictions. Each study was coded independently and then compared. Additionally, to learn something about divergences between planning and result, we traced the shortcomings mentioned in the publications and included them in the database, again using coding where 1 = "yes" and 0 = "no".

Depending on the depth and accuracy of the published material, we were able to trace and distinguish some characteristics more clearly than others. Categorisation results from the authors' interpretation. It is important to note here that our analysis is not intended to unearth shortcomings of existing research. Instead, we wish to show their approaches to participation and possible divergences, and to discuss intended and unintended effects.

4. Results

Categorising all projects, we arrive at four main findings: (i) a dominance of functional and competitive approaches and (ii)

[2] Reference list is included in the Appendix, see Table A1. Data in Brief article is provided additionally.

[3] The INOLA project (Innovations for Sustainable Land Use and Energy Management on a Regional Level; http://innovationsgruppen-landmanagement.de/en/innovationsgruppen/inola/) is funded within the Framework Programme FONA (Research for Sustainable Development) by the German Federal Ministry of Education and Research from 2014 to 2019.

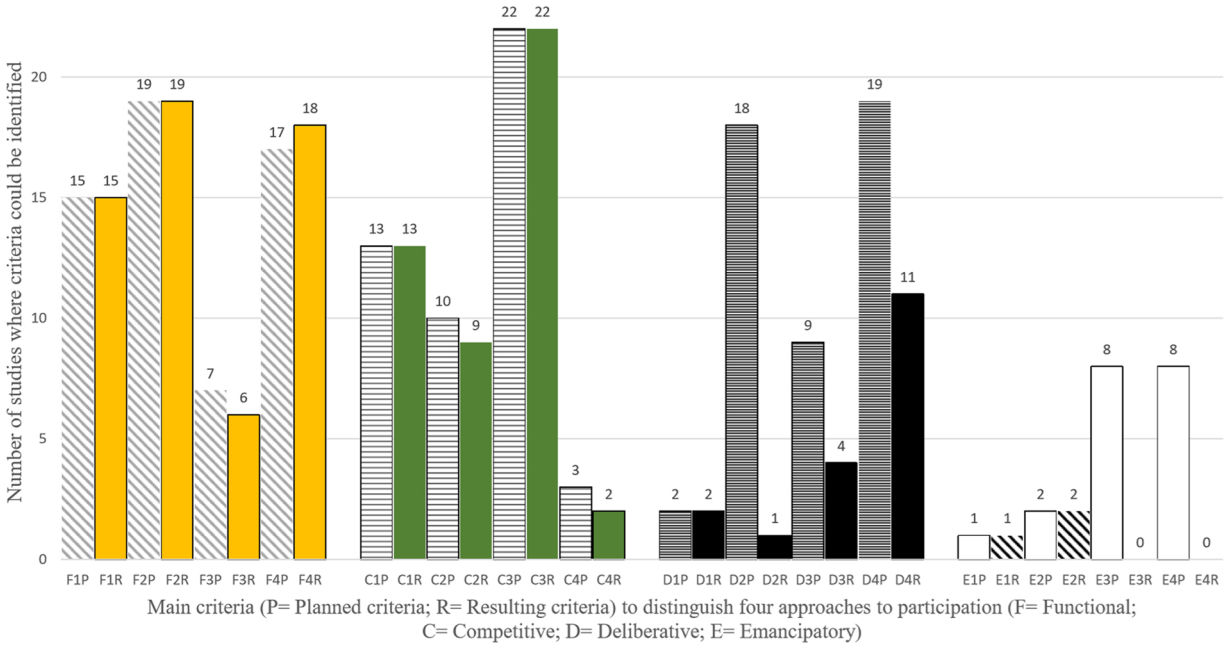

Fig. 1. Distribution and change of criteria reflecting four approaches to participation. Explanation of criteria (F1 to E4) can be found in Table 3. (Data: comparative case study, N = 31).

divergences between planning and implementation. (iii) Most studies mixed criteria from different approaches. And (iv), these three findings apply to all studies alike, regardless of whether they define themselves as being in the field of TDR, NRM or TM.

(i) Dominance of functional and competitive criteria

First, we looked at the individual criteria and compared planning and implementation (Fig. 1). In the participatory process that was implemented, functional and competitive approaches clearly dominate (compare Table 3 for the criteria). The most decisive factors are criteria of participant involvement and knowledge-generation process. Nineteen studies involved only those with expertise – as defined by the project team – such as selected stakeholders, experts and representatives of the public. This was assigned to the criterion F2, an element of a functional approach.

In 18 studies, the participants expressed their opinions and expert knowledge by statements or voting, and the project team summarised and "integrated" the opinions and results. We assigned this to criterion F4, knowledge integration in a technocratic sense, and also criterion C3 for decision-making. Twenty-two studies let participants choose between predefined alternatives, bargain interests or vote for preferred options. This could be linked to the choice of methods (not shown in the Figure). Twenty-one projects conducted scenario constructions, and 13 projects included a sustainability assessment, some additionally to the scenario process, where expressing preferences and voting is often practised. Scenarios and indicators were largely predefined or integrated by research teams. The projects did not concentrate on the reflection of social values, different perspectives or engagement in wider argumentation processes. Eleven projects conducted additional interviews or focus groups.

(ii) Divergences between planning and implementation

A somewhat surprising outcome of the analysis is that many projects failed to achieve their expectations of a participatory-deliberative process (see Fig. 1 and compare with initial project goals listed in Appendix A in Table A1). We find divergences between deliberative and emancipatory ideals that are apparent in the intentions of project goals, and the implementation that is much more focused on effectiveness,

Table 3
Criteria that distinguish the four approaches to participation.

F1	Initiated by the research team to solve an existing problem	D1	Initiated by the research team, or a deliberative forum exists to reach a fair consensus
F2	Only those who have expertise can be involved: topic-specific stakeholder analysis	D2	All affected perspectives, inclusion of all arguments, minority voices included
F3	Participants contribute to decision-making; final decisions remain with decision-makers	D3	Consensus, focus on arguing, fair discourse
F4	Knowledge integration (in a technocratic sense)	D4	Reflection of societal values leads to new knowledge
C1	Initiated by the research team to identify preferences	E1	Initiated; ideally the process is autonomous or self-managing
C2	All participants with interest or randomly chosen participants	E2	Aim is to address the unreached groups; all participants are actively involved
C3	Identify preferences and bargain interests, competition of arguments, choice between alternatives	E3	Redistribution of power, social justice
C4	No focus on knowledge integration; the dominant argument wins	E4	Growth of knowledge and competence in previously excluded participants

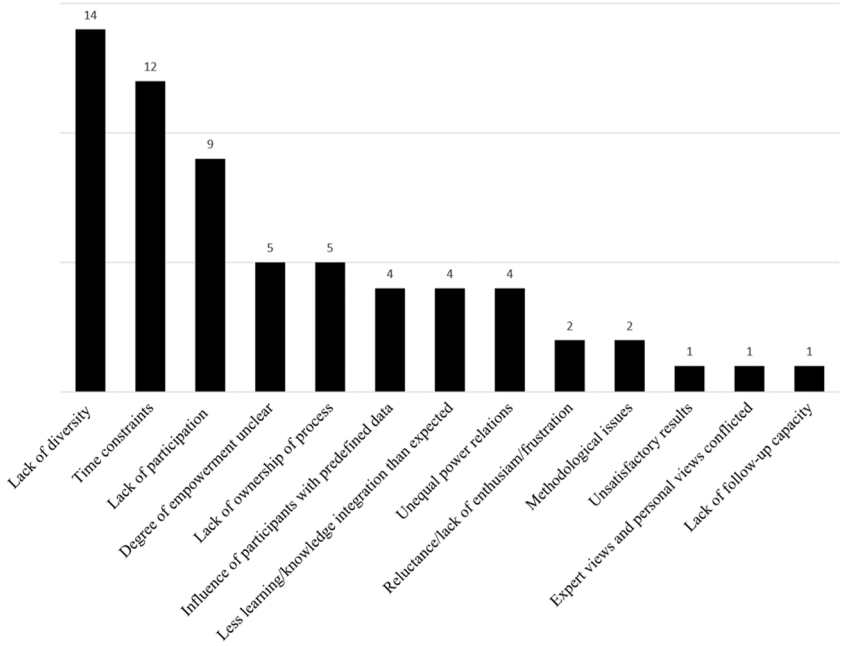

Fig. 2. Absolute numbers of shortcomings mentioned across all projects included in the comparative case study (N = 31, possibility of multiple shortcomings per study).

involvement of experts and generation of (tangible) outputs. Eighteen studies claimed to involve all affected perspectives and arguments, which we assigned to the criterion D2, representing a deliberative approach. Nineteen studies expected that the reflection of societal values leads to co-creation of new knowledge, criterion D4 of the deliberative approach. Eight studies initially planned to address unreached groups and actively involve new participants, thus representing a criterion of an emancipatory approach (E2), and to foster knowledge and growth in competence growth in previously participants (E4).

For example, CH2007TD strove for fair, open discourse, to reflect social values and find consensus (initial deliberative approach). However, in the process as conducted, only experts could participate, and they were selected through topic-specific stakeholder analysis (functional approach). The project mentioned methodological issues and less knowledge integration than expected as an unintended effect.

GER2017TD offers an example of a change in approach during the process. The main objective of the participatory scenario process in the project was the collaborative knowledge-production phase aimed at involving all relevant stakeholders and the broad public to enhance perspectives, foster deliberative discussion, leading to new knowledge and mutual learning. Despite involving more than 100 participants, and aiming at a deliberative process, the processes actually conducted are closer to a competitive approach with functional elements. As scenario construction is time-consuming, the methods were formalised, limiting the time for deliberation and knowledge integration. Participants had to agree on one common denominator by voting, reflecting a competitive approach to participation.

Tracing actual participation across all projects, we found far more processes working with existing stakeholder groups, selected experts and decision-makers in a limited time and with limited stakeholder access instead of broad deliberation processes. The studies struggled with implementing initial deliberative goals, as projects often had access to only some sort of pre-existing participant groups. In particular, planned process steps of functional and competitive approaches such as F1 or C1 (initiation of processes by a research team to solve existing problems or to identify preferences) changed to a lesser extent, as these process steps are at the beginning of projects, less emergent and more controllable.

Although the studies mention shortcomings (see Fig. 2), they do not elaborate on the reasons. Nine projects mentioned lack of participation, fourteen a lack of diversity in participants' status and gender. Other projects that experienced changes from deliberative planning to functional implementation mentioned lack of ownership of the process and less knowledge integration than expected (CH2011TD), lack of participation and diversity of stakeholders (EU2011NRM), time constraints, lack of enthusiasm and frustration of the project team (GER2016). Furthermore, some reported power issues because participants had knowledge advantages and more resources, or expert views and personal views conflicted (EU2009ATM).

(iii) Mixed approaches

The analysis of approaches conducted (see Fig. 3) shows that in our categorisation, only six projects implemented a consistent approach to participation, i.e. all criteria could be assigned to one approach. For example, US2015NRM implemented an ideal-typical competitive approach. In this project, a research team predefined normative statements about future water governance. Interested stakeholders rated

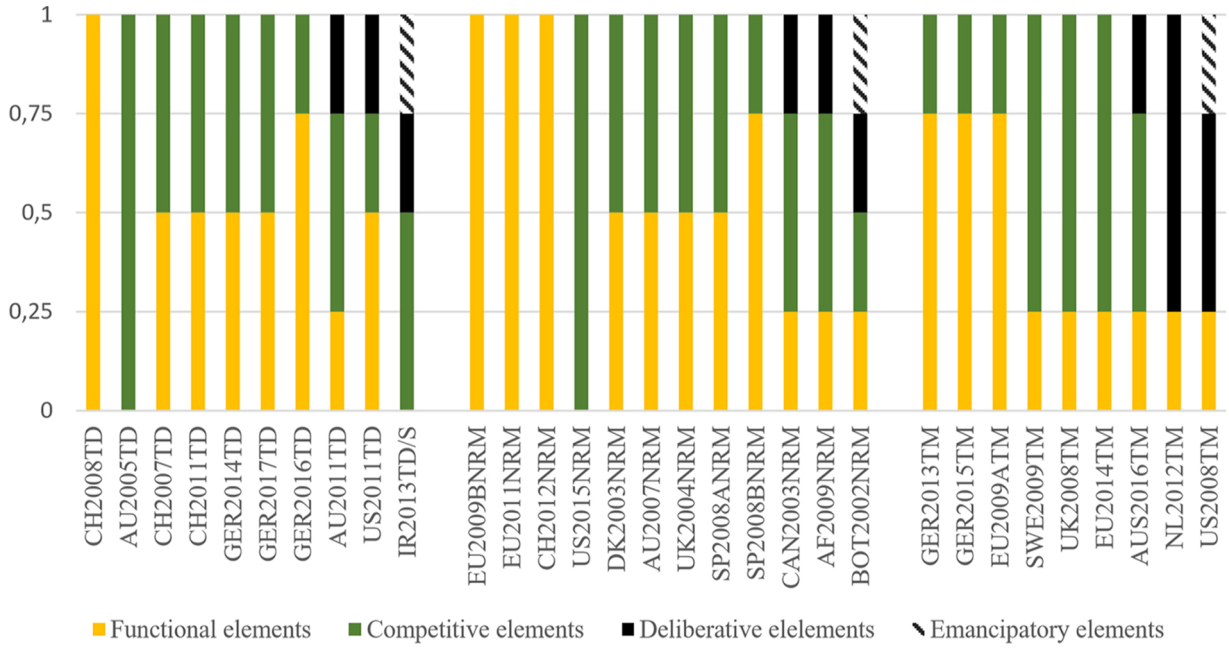

Fig. 3. Studies under consideration and their realised approaches to participation. As each approach consists of four elements (e.g. F1, F2, F3, F4) a project could have applied a single approach, but also partly a functional approach and partly a competitive approach (Data: comparative case study, N = 31).

statements according to their desirability.

Most other projects, irrespective of the assigned area of research (TDR, NRM, TM), mixed criteria from different approaches to participation. The following examples show that reasons for mixed approaches can be diverse, either connected to methodical or organisational struggles, or conceptually intended from the beginning. For example, BOT2002NRM was initiated to solve an existing land-use problem in Botswana (F1, functional criterion). The research team aimed to empower rural farmer groups at risk of poverty and reflect societal values and local knowledge (D4 and E3, deliberative and emancipatory criteria). Conducting the participatory process, they experienced translation issues, resulting in competitive decision-making (C3, identify preferences/voting) on predefined sustainable land-use indicators. UK2004NRM planned an integrated sustainability assessment as part of the participatory process towards sustainability of a rural community for coastal management (C1, project initiated to identify preferences and C2, all participants with an interest invited to participate). The project faced reluctance and lack of enthusiasm from the local community, and thus switched to one workshop with the national administration rather than with locals. The project team then defined the sustainability indicators themselves (F4, knowledge integration in a technocratic sense).

IR2013TD/S researched social practices of energy consumption using participatory visioning and backcasting workshops to facilitate collaboration amongst actors (C1, initiated by a research team to investigate preferences while also D4, reflecting societal values and practices) representing different disciplinary backgrounds and heeding democratic arguments for their inclusion (E2, including socially deprived households). This project is the only project in the sample adopting a social practice perspective (S).

Some examples indicate that the mixture of different elements could lead to contradictions and unintended effects. SWE2009TM planned to consider different future scenarios to achieve legitimate, effective and sustainable climate-change adaptation scenarios for a Swedish urban area. Local politicians were invited to discuss future scenarios the researchers had identified beforehand. In subsequent workshops, selected citizens evaluated the scenarios. The experts who calculated the energy reductions could not accept the results from the workshops: the knowledge input from the workshops was insufficient to achieve the climate mitigation goals defined in the project objective. Results from broader participation contradicted the generation of expected or desired outcomes as defined by the research team. This example shows emerging tensions between content-related outputs and process, originating from mixed approaches to participation, in this case planned deliberative elements vs. implemented competitive and functional, expert-based participation.

5. Discussion

Our main aim is to contribute to a better understanding of the process-impact link in participation in sustainability science. In considering both intended processes, expectations and realised procedures in the context of normative, substantive and instrumental rationales, we have identified potential pitfalls of participation. Our typology provides a useful heuristic for a structured in-depth analysis of the implemented processes. By applying the criteria and comparing how 31 projects translated their planned approach to participation into practice, we obtain three key results.

Firstly, we expected to find mainly deliberative approaches to participation, echoing the dominant normative rationale of planned participation. In contrast, the analysis shows a dominance of functional and competitive criteria across all areas of sustainability research from which our 31 selected studies were drawn. This can be attributed to a focus on effectiveness-oriented rationales of participation and leads to a clear over-representation of selected 'relevant' experts, focus on time-efficient processes, and an under-representation of diverse societal actors or 'normal' citizens.

Secondly, we identify discrepancies between planned and implemented approaches to participation across all studies. Deliberative and emancipatory goals in the planning phase changed to functional or competitive implementation. These changes – such as involving a smaller selected group instead of the broader public, choice of predefined data instead of extensive deliberation – are systematic and similar. Overall, the impression was that mostly, researchers implicitly trusted their participatory method – regardless of its characteristics.

Thirdly, a majority of projects combine elements of all approaches to participation. Most projects show mixed approaches to participation. Given the importance of participation and coproduction in sustainability science, and its influence on results, effects and impacts, more detailed information on participatory processes is vital. A lack of conceptual clarity of the rationales pursued within the studies, resulting in mixed approaches, creates possible tensions between high expectations that cannot be met when implementing participatory processes.

Lastly, the dominance of mixed approaches could be due to non-transparent representation of the participatory process in the publications, complicating the authors' interpretation. This hints at a possible limitation of our study and the methods applied: since participation was not the core issue in some studies, important information on actor involvement might not have been addressed. Methodologically, a larger comparative case study that could examine in-depth evaluations of participatory procedures would certainly be desirable, but is unavailable. Nevertheless, this study shows clear tendencies and trends.

In the following discussion, we address reasons for our four core findings and discuss possible unintended effects.

5.1. Conflicting normative ideal types vs. pursued effectiveness-oriented rationales

Newig et al. (2011, 31f) argue that more recently, the focus in discourses on participation and sustainability shifted away from a normative rationale echoing deliberative democratic instances towards an instrumental, effectiveness-oriented perspective on participation.

Our findings show that the normative rationales – echoing ideal-types of participation with strong deliberative and emancipatory motives – are still persistent in the conceptual planning (phase) of participatory processes, but an effectiveness-oriented perspective seems more important when conducting participation.

We see three main reasons why, in our categorisation, many resulting processes echo competitive and functional approaches: methods used, limited access to stakeholders and time constraints. Frequently used methods such as Sustainable Indicator Assessment, Multi-Criteria-Decision-Analysis or scenario development are formalised and contact with stakeholders is limited to few workshops. The aim is to define sustainability indicators, vote for predefined scenarios and get the necessary data for scientific results. Access to unreached stakeholder groups beyond existing networks is difficult. Time constraints lead to the involvement of known stakeholders or the administration, as practices in UK2004NRM demonstrate.

Deliberative or emancipatory approaches are difficult and time-consuming to implement throughout an entire research project. Thus, some authors suggest alternating phases: a few phases of deliberation and empowerment alternate with phases of expert discussions (Scholz and Steiner, 2015; Stauffacher et al., 2008). This means that substantive and normative rationales are merged within one participation process, which might be problematic. We argue that it is highly unlikely that limited involvement of selected stakeholders from the public during a workshop empowers participants. Projects like US2008TM and IR2013TD/S, which showed emancipatory elements, could draw on ongoing grassroots initiatives, pre-existing deliberative platforms (citizen groups) or the researchers' actively involving formerly unreached groups. A more consistent choice of approaches to participation (either emancipatory or functional) and methods depending on the available resources and existing platforms would keep expectations more realistic for science and practice.

Our findings support Newig et al.'s (2011) argument that broad participation, cooperation and effectiveness might actually contradict each other and, at worst, lead to unsustainable development or stagnation, as two examples show; as we saw in project SWE2009TM, knowledge input and suggestions from a broad citizen workshop did not match the climate mitigation goals defined by experts in the project. On the one hand, the results from deliberative exercises might not be "sustainable" enough for effective outcomes; on the other hand, the knowledge input or preferences of citizens have been ignored. In GER2017TD, participants of a scenario process perceived the gap between the preferred sustainable vision and the expected future as insurmountable, something outside their scope of action and agency. The assumption in the literature is that actors with a transformational orientation and 'good intentions' integrate knowledge to bring about change and produce better outcomes (Jahn and Keil, 2015; Partzsch, 2016; van de Kerkhof and Wieczorek, 2005). Despite good intentions, the collaborative process sometimes led to feelings of inefficacy amongst actors, which might hinder the realisation of sustainability measures.

5.2. Between instrumental and normative rationales: inclusion of all "relevant" participants vs. inclusion of all participants/paying heed to democratic arguments

Our findings clearly demonstrate divergences between conceptual planning and practical implementation of participation, mirroring evidence of discrepancies between researchers' ideals and participatory practices in sustainability science projects reported by Mielke et al. (2017). Their data reveal that researchers mostly agree with the democratic or deliberative type, and strongly disagree with the technocratic and functionalist type. However, the reality looks rather different, with many researchers adopting forms of participation reflecting the latter approach. Hysing (2013) found that "[…] *the actors most directly involved in environmental governing argue more strongly for increased expert governing than for giving power to the people. This is in contrast to the discrepancy between normative green political theory and the "deliberative" visions of green professionals."*

Kenis et al. (2016) also point to possible contradictions between

conceptual planning and implementation. They criticise TM advocates for pretending to involve a broad range of perspectives/having emancipatory intentions while being highly selective when involving participants such as selected visionaries, frontrunners or pioneers (Loorbach et al., 2009), consequently creating new elitist cliques which often lack diversity.

Ten projects mentioned a lack of stakeholder diversity regarding gender, thematic perspectives and available resources (e.g. time, education, status, knowledge). This poses questions about 'valuable' knowledge and expertise, what defines an expert, who is thought to be innovative, and legitimation. Decisions by expert panels may not be accepted by the general public, and the growing diversity of public values may not be adequately represented, with potential negative long-term effects on the acceptance of developed solutions. Involving homogenous participants could also miss opportunities for new perspectives, effects that are desired for participatory sustainability science. In fact, we argue that in male-dominated research areas such as energy, land-use and environmental management, we must devise specific engagement strategies to reach different groups and enhance participant diversity, most notably women (Ryan, 2014). For further research it would be interesting to explore whether a lack of stakeholder diversity can also be attributed to researchers' mistrust of normative fundamentals as a reason to resort to more familiar mechanisms that are easier to control, such as using known groups.

5.3. The "dark side" of effectiveness-focused participation: pressure to generate results and reach consensus in limited time periods

As we could see, projects are result-oriented and less process-oriented. The focus on effectiveness raises an additional issue. There is a trend that funding agencies increasingly favour transdisciplinary projects focusing on directly applicable outputs. Most impact assessments focus on immediate outputs rather than long-term outcomes (Rau et al., 2018). Every project phase is expected to produce outputs and results. There is no time and space for 'failures', e.g. that no consensus was reached and no direct outputs generated. Nine projects in our analysis mentioned time constraints. Projects that experienced such drawbacks (UK2004NRM; SP2008BNRM; GER2016TD) continued with participation processes, choosing different participants from the administration or creating the results as a research team, although this surely led to very different outcomes.

At the same time the claim for broad, collaborative participation with multiple actors frequently appears in policy papers, funding calls and research proposals, disregarding limited space, human resources and time for deliberation. As a consequence, deliberation to reach (faster) consensus happens – but often with mainly selected stakeholders and predefined experts from different thematic fields but similar societal backgrounds. For further research, it would be important to explore the different reasons why this happens, such as that researchers only pay lip service to some of the fundamentals of participation or to funding calls. According to Chilvers (2009, p. 304), researchers' determination to forge consensus can hide intractable differences and reinforce hegemonic power relations by excluding certain voices, framings and forms of expression. Furthermore, the emphasis on consensus has been criticised for being overly optimistic and naïve about win-win solutions, while neglecting possible conflicts (Cooke and Kothari, 2007). Thus, more radical alternatives to deliberative democracy advance approaches to participation that appreciate conflict, tensions and disruptions, deconstruction and challenges to existing power structures, which in turn could lead to radical system change and transformation (Laclau and Mouffe, 2001).

From this position, it is essential for high-impact participation to open up participatory processes that value difference, otherness and indeterminacy (Chilvers, 2009). According to our experience, different groups with different perspectives and practices, not just similar stakeholder groups with different thematic backgrounds, must be actively involved, especially when dealing with supposedly technical subjects like energy transitions or land use that affect society as a whole. This is surely a challenging claim that can hardly be achieved under current funding conditions.

6. Conclusions

Although participatory processes are to some extent emerging, our paper shows that certain trends and changes in approaches to participation are systematic and similar, and result from a mismatch between conceptual expectations and practical feasibility. Those who plan, co-design and facilitate participation in sustainability science need to a) be aware of possible opportunities and challenges concerning the conflicting rationales of participation, such as normative ideals dominating the conceptual background vs. effectiveness-oriented rationales while implementing participation, b) value possible tensions and conflicts, by involving 'experts' and 'lay people' or actors with fundamentally different experiences, but at the expense of immediately deliverable outputs, and c) be honest and realistic about project effects with scarce available time and human resources. Further research is required on the questions of how participation could be designed between immediate scientific output-orientation and societal impact. Furthermore, comparative in-depth analyses of context and power relations would be useful, such as examining how more powerful actors influence the design or participation practices. By enhancing the transparency of participatory processes, a more realistic feedback culture regarding the feasibility of complex, socially relevant participation processes in a limited amount of time and adequate impact assessment measures might emerge in the future.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A

Table A1
Overview of the studies used for the criteria-guided comparative analysis.

Country/ Year/ Authors	Topic	Research approach	Aim of the participatory process	Planned approach to participation
BOT2002	Land use	NRM	To engage a wide range of stakeholders and empower a rural community in Botswana using local knowledge and western scientific tools such as interviews and focus groups.	Deliberative-emancipatory
In: Fraser, E.D.G., Dougill, A.J., Mabee, W.E., Reed, M., McAlpine, P., 2006. Bottom up and top down: analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable environmental management. Journal of Environmental Management 78 (2), 114–127.				
DK2003	Land use	NRM	The discussion of predefined land-use scenarios and the identification of interests with all interested experts and lay people in a Danish region.	Competitive
In: Tress, B., Tress, G., 2003. Scenario visualisation for participatory landscape planning—a study from Denmark. Landscape and Urban Planning 64 (3), 161–178.				
CAN2003	Coastal m.	NRM	To engage a wide range of stakeholders in community workshops, with the aim of a two-way learning experience and to broaden perspectives resulting in sustainability guides for coastal management in a Canadian region.	Mainly deliberative
In: Fraser, E.D.G., Dougill, A.J., Mabee, W.E., Reed, M., McAlpine, P., 2006. Bottom up and top down: analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable environmental management. Journal of Environmental Management 78 (2), 114–127.				
UK2004	Land use	NRM	Development of sustainability indicators with a local community and co-creation of knowledge for more sustainable land use in an English region.	Emancipatory
In: Fraser, E.D.G., Dougill, A.J., Mabee, W.E., Reed, M., McAlpine, P., 2006. Bottom up and top down: analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable environmental management. Journal of Environmental Management 78 (2), 114–127.				
AU2005	Energy	TD	Selected relevant actors from science and practice developed scenarios for a future energy system and citizens evaluated the developed scenarios in an Austrian region.	Deliberative – competitive
In: Garmendia, E., Stagl, S., 2010. Public participation for sustainability and social learning: Concepts and lessons from three case studies in Europe. Ecological Economics 69 (8), 1712–1722.				
CH2007	Land use	TD	The co-creation of knowledge to define and discuss land-use scenarios for a Swiss regional long-term development with all relevant stakeholders from organisations and the public.	Mainly deliberative
In: Walz, A., Lardelli, C., Behrendt, H., Grêt-Regamey, A., Lundström, C., Kytzia, S., Bebi, P., 2007. Participatory scenario analysis for integrated regional modelling. Landscape and Urban Planning 81 (1-2), 114–131.				
AU2007	Energy	NRM	To find consensus on a future sustainable energy system and foster social learning, mostly with lay people in an Austrian region.	Deliberative
In: Bohunovsky, L., Jäger, J., Omann, I., 2011. Participatory scenario development for integrated sustainability assessment. Regional Environmental Change 11 (2), 271–284.				
CH2008	Land use	TD	Different techniques and methods such as scenario development for information, consultation, cooperation, collaboration and empowerment of the public and stakeholders for a sustainable land-use strategy in a Swiss region.	Deliberative-emancipatory
In: Stauffacher, M., Flüeler, T., Krütli, P., Scholz, R.W., 2008. Analytic and Dynamic Approach to Collaboration: A Transdisciplinary Case Study on Sustainable Landscape Development in a Swiss Prealpine Region. Systemic Practice and Action Research 21 (6), 409–422.				
US2008	Energy	TM	Bound socio-technical experiment. Assembling of a heterogeneous team representing a range of interpretative frames and belief systems, thus setting in motion an interactive, vibrant creative discourse for a zero-energy residential building.	Deliberative
In: Brown, H.S., Vergragt, P.J., 2008. Bounded socio-technical experiments as agents of systemic change: The case of a zero-energy residential building. Technological Forecasting and Social Change 75 (1), 107–130.				
UK2008	Energy	TM	Exploration and discussion of sustainability scenarios and indicators for a rural energy transition with all relevant stakeholders in England.	Deliberative
In: Garmendia, E., Stagl, S., 2010. Public participation for sustainability and social learning: Concepts and lessons from three case studies in Europe. Ecological Economics 69 (8), 1712–1722.				
SP2008A	Land use	NRM	Exploration and discussion of sustainability indicators for environmental management of a biosphere reserve in Spain with all relevant stakeholders to increase mutual understanding.	Deliberative
In: Garmendia, E., Stagl, S., 2010. Public participation for sustainability and social learning: Concepts and lessons from three case studies in Europe. Ecological Economics 69 (8), 1712–1722.				
SP2008B	Water mgmt.	NRM	The integrated sustainability assessment is part of the participatory process towards sustainability and empowerment for regional water management in a Spanish region.	Emancipatory
In: Wiek, A., Ness, B., Schweizer-Ries, P., Brand, F.S., Farioli, F., 2012. From complex systems analysis to transformational change: A comparative appraisal of sustainability science projects. Sustainability Science 7 (S1), 5–24.				
SWE2009	Urban pl.	TM	A deliberative scenario process with experts and lay people aims to achieve legitimate, effective and sustainable climate change adaption scenarios for a Swedish urban area.	Deliberative
In: Larsen, K., Gunnarsson-Östling, U., 2009. Climate change scenarios and citizen-participation: Mitigation and adaptation perspectives in constructing sustainable futures. Habitat International 33 (3), 260–266.				
EU2009A (Whitmarsh et al., 2009)	Mobility	TM	To deliberate and elicit knowledge and preferences of European stakeholders (experts and citizens) in focus groups in respect of sustainable mobility.	Deliberative
In: Whitmarsh, L., Swartling, Å.G., Jäger, J., 2009. Participation of experts and non-experts in a sustainability assessment of mobility. Environmental Policy and Governance 19 (4), 232–250.				
EU2009B	Biodiversity	NRM	Development of scenarios for different policy options in the European Union for the context of biodiversity management with selected experts.	Functional
In: Bohunovsky, L., Jäger, J., Omann, I., 2011. Participatory scenario development for integrated sustainability assessment. Regional Environmental Change 11 (2), 271–284.				
AF2009	Energy/land use	NRM	Participatory research settings were applied at different stages of the project in order to ensure the incorporation of traditional knowledge on land-use practices and deliberation among all stakeholder perspectives in different African countries.	Mainly deliberative
In: Wiek, A., Ness, B., Schweizer-Ries, P., Brand, F.S., Farioli, F., 2012. From complex systems analysis to transformational change: A comparative appraisal of sustainability science projects. Sustainability Science 7 (S1), 5–24.				
CH2011 (Trutnevyte et al., 2011)	Energy	TD	Develop holistic, qualitative visions for a future energy system with relevant actors from practice and academia in a Swiss region. Participatory assessment of consequences.	Deliberative

(*continued on next page*)

Table A1 (*continued*)

Country/ Year/ Authors	Topic	Research approach	Aim of the participatory process	Planned approach to participation
In: Trutnevyte, E., Stauffacher, M., 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.				
AU2011	Energy	TD	Eliciting stakeholders' (influential people with respect to energy and citizens) preferences on alternative renewable energy scenarios for an Austrian region.	Competitive
In: Schaffer, M., 2011. iENERGY Weiz-Gleisdorf – Citizens supported by a stakeholder process implement intelligence to upgrade their smart urban region. Smart Energy Demo, 100 pp.				
EU2011	Biodiversity	NRM	Involve stakeholders in the definition of the research scope, elaborate scenarios for possible regional development pathways for different European regions and discuss implications.	Deliberative
In: Bohunovsky, L., Jäger, J., Omann, I., 2011. Participatory scenario development for integrated sustainability assessment. Regional Environmental Change 11 (2), 271–284.				
US2011	Urban pl.	TD	Aimed to engage relevant stakeholders and the public in a deliberative interactive participatory setting for potential future urban development in a US American city, visions and action-oriented guidelines.	Deliberative
In: Wiek, A., Ness, B., Schweizer-Ries, P., Brand, F.S., Farioli, F., 2012. From complex systems analysis to transformational change: A comparative appraisal of sustainability science projects. Sustainability Science 7 (S1), 5–24.				
CH2012	Land use	NRM	Engage stakeholders in a collaborative modelling process to initiate strategic knowledge on how to effectively adapt to expected climate change in a Swiss region; different stages of collaboration.	Deliberative-functional
In: Wiek, A., Ness, B., Schweizer-Ries, P., Brand, F.S., Farioli, F., 2012. From complex systems analysis to transformational change: A comparative appraisal of sustainability science projects. Sustainability Science 7 (S1), 5–24.				
NL2012	Land use	TM	Start up a new learning network in the Netherlands, in which societal actors, students and supervisors can learn, innovate, share, transform and co-create knowledge in an open and exploratory way by creating sustainable relationships in equality.	Deliberative - emancipatory
In: Sol, J., Beers, P.J., Wals, A.E.J., 2013. Social learning in regional innovation networks: Trust, commitment and reframing as emergent properties of interaction. Journal of Cleaner Production 49, 35–43.				
GER2013	Energy	TM	To develop integrated roadmaps of change for climate adaptation (scenarios) for an urban region in Germany with relevant stakeholders. from economy, administration and civil society.	Functional
In: Wachsmuth, J., 2013. Rahmenszenarien: Entwicklung dreier Szenarien für mögliche Rahmenbedingungen in der Metropolregion Bremen-Oldenburg im Nordwesten im Jahr 2050. Nordwest2050-Werkstattbericht 50, Bremen, 19 pp.				
IR2013	Energy	TD/S	The aim of the participatory visioning and backcasting workshops in Ireland is collaboration amongst stakeholders representing different disciplinary backgrounds, paying heed to democratic arguments for their inclusion.	Deliberative-emancipatory
In: Doyle, R., Davies, A.R., 2013. Towards sustainable household consumption: Exploring a practice oriented, participatory backcasting approach for sustainable home heating practices in Ireland. Journal of Cleaner Production 48, 260–271.				
EU2014	Energy	TM	By engaging different stakeholders and citizens from across Finland, participatory backcasting aims to bring about higher-order learning, implementing potential results for society. Empower stakeholders that are significant in the formation of sustainable futures.	Deliberative - emancipatory
In: Neuvonen, A., Kaskinen, T., Leppänen, J., Lähteenoja, S., Mokka, R., Ritola, M., 2014. Low-carbon futures and sustainable lifestyles: A backcasting scenario approach. Futures 58, 66–76.				
GER2014	Land use	TD	Development of future land-use scenarios for central Germany with stakeholders to integrate the perspectives. Scenarios provide the common basis to discuss concerns and arrive at a shared understanding of challenges and support regional decision-making.	Deliberative
In: Priess, J.A., Hauck, J., 2014. Integrative Scenario Development. Ecology and Society 19 (1).				
GER2015	Energy	TM	The construction and discussion of low-carbon mitigation scenarios in Germany with selected relevant stakeholder groups from civil society and industry.	Functional
In: Lechtenböhmer, S., Schneider, C., Yetano Roche, M., Höller, S., 2015. Re-Industrialisation and Low-Carbon Economy—Can They Go Together? Results from Stakeholder-Based Scenarios for Energy-Intensive Industries in the German State of North Rhine Westphalia. Energies 8 (12), 11,404–11,429.				
US2015	Water mgmt.	NRM	The research team developed normative statements about future water governance in an US American region. Selected decision-makers rated the statements according to their desirability.	Competitive
In: Withycombe Keeler, L., Wiek, A., White, D. D., Sampson, D. A., 2015. Linking stakeholder survey, scenario analysis, and simulation modeling to explore the long-term impacts of regional water governance regimes. Environmental Science & Policy 48, 237–249.				
AUS2016	Energy	TM	Construction of energy scenarios for an Australian region by a research team followed by a discussion and deliberation with stakeholders.	Deliberative
In: Foran, T., Fleming, D., Spandonide, B., Williams, R., Race, D., 2016. Understanding energy-related regimes: A participatory approach from central Australia. Energy Policy 91, 315–324.				
GER2016	Land use	TD	Development of scenarios for a sustainable regional land-use system in a German region. Inter- and transdisciplinary collaboration to describe and evaluate scenario factors; coproduction of knowledge.	Deliberative
In: Schwand, I., Steinhardt, U., 2016. Landnutzungsszenarien - ein Gestaltungsprozess: Die Entwicklung von Szenarien als ein Prozess mit Unsicherheiten, Expertenwissen und Zukunftsideen auf dem Weg zu einer nachhaltigen Landnutzung. ELaN discussion paper. Leibniz-Zentrum für Agrarlandschaftsforschung (ZALF) e.V., Institut für Landschaftswasserhaushalt, Müncheberg, 1 Online-Ressource (36, XXXI Seiten).				
GER2017	Energy/Land Use	TD	Scenario development aimed at involving all relevant stakeholders and the broad public to enhance perspectives, foster deliberative discussion, leading to new knowledge and mutual learning, capacity building, trust and network effects.	Functional-Deliberative
In: Musch, A.-K., Streit, A. von, 2017. Szenarien, Zukunftswünsche, Visionen: Ergebnisse der partizipativen Szenarienkonstruktion in der Modellregion Oberland. INOLA Working Paper 7. Ludwig-Maximilians-Universität, München				

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