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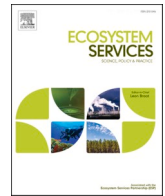
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Guiding the guides: Doing ‘Constructive Innovation Assessment’ as part of innovating forest ecosystem service governance

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ABSTRACT

While participatory methods are not unknown in the ecosystem services community, there is unused potential in co-creating ecosystem service governance innovation. We argue that participatory methods in ecosystem service governance can be further improved and ingrained into the way of working by incorporating insights from innovation studies. In the InnoForEST project, which revolved around innovations in forest ecosystem services, the task of “Constructive Innovation Assessment” (CINA) was to systematically transfer strategic knowledge into six local innovation processes. We outline the core features of this approach and describe the experiences we made in accompanying the implementation of the approach in the six cases. As a core feature of CINA, realistic scenarios were developed in each innovation process, aiming to formulate contextualised innovation options. Because stakeholders are the linchpin of all efforts, they must be able and willing to do something with these options. The innovation work carried out during the project was designed in such a way that the scenarios were developed, stabilised, or modified and sometimes discarded in co-creation with the stakeholders at key points during intensive strategic workshops. Working with the CINA approach benefits from operable boundary objects and strives for achieving the quality of “convergence work”: the challenge of reaching agreement on something that can be collaborated upon, across different interests and with growing shared interest. CINA’s flexibility allowed each of the six processes to be tailored to the forest ecosystem governance of a region. Participation in the InnoForEST project was not limited to a series of workshops but encompassed various forms of communication and interaction between these workshops. For local innovation workers, participation in the InnoForEST project was also a practical challenge: to be self-confident and true to themselves and their own competences, while simultaneously remaining open to trying something new. For them, CINA was not only part of a broader process, but also a ‘method’. This method seemed unwieldy at first but gained momentum and attractiveness while engaging with it. The effort involved in introducing and supporting CINA is substantial. If one does not want to return to a simple, linear illusion of ‘controllable’ innovation, then it is worth investing in the support work with local partners which CINA provides. All sides learn from adopting CINA.

1. Introduction

Adapting the governance of forest ecosystem services to the challenges set by the UN’s Sustainable Development Goals will take time we don’t have, if we limit ourselves to setting unique impulses, hoping for the decisive idea or a lightning bolt from the sky. Currently, the

ambition of European innovation policy is to expedite its success through initiating processes of active innovation work (Lindner et al., 2021). If such innovation is to not be imposed or fizzle out soon after a project, but rather to take root, then partnering up with local actors and actively taking care of the quality and frequency of stakeholder interactions is crucial (Dóci et al., 2021). Although there are many recipes

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and methods for this (Jax et al., 2018), the challenges of *actually* putting participation into practice receive less attention (Dick et al., 2018). The complex interplay of people, institutions, events and other circumstances make the best methods look weak, if they avoid observing deviations from the prescribed course (Fischer and Forrester, 1993; Loeber, 2004; Kuhlmann et al., 2019).

Particularly in ambitious ecosystem services projects aiming to realise governance goals in real-life, there is a risk of being lulled by seemingly magical concepts such as “deliberation”, “participation”, or “co-construction”. As Pollitt and Hupe (2010, p. 654; cf. Voorberg et al., 2015) warn, “[s]uch concepts sometimes fulfil explanatory functions, but only if positioned, specified, operationalized, and applied in systematic ways.” Nevertheless, the rise of multi-stakeholder involvement in the creation of innovations stimulated the development of procedures and formats, allowing involved stakeholders to participate actively and to help shape so-called co-creation (Hahn et al. 2017; Zwick et al. 2008), co-production (Jasanoff, 2004; Ryan, 2012) or co-design (McBride et al., 2017).² This issue has not only been discussed in scholarly literature on science and technology policymaking (Callon, 1999; Gorman, 2002; Jasanoff, 2003; Davenport and Leitch, 2005; Irwin, 2006; Abels, 2007; Chilvers, 2008), but also in public policy practice (Cabinet Office, 1999; Bishop and Davis, 2002; Edelenbos et al. 2010).

Besides, stakeholder inclusion receives increasing attention in ecosystem services as well as ecology and society scholarship (Dick et al., 2018; Paavola and Hubacek, 2013; Sarkki et al., 2019; Secco et al., 2017; Spangenberg et al., 2015; Loft et al., 2015; Secco et al., 2011; Bussola et al., 2021) and more deliberative, participatory, and collaborative framings of governance (Sattler et al., 2018; Primmer et al., 2015). Consequently, integrating discussions about ecosystem services into policy making through participatory approaches has been identified as a core agenda point for the domain (Costanza et al., 2017; Van Oudenhoven et al. 2018). In practice, however, stakeholder inclusion through participatory approaches is often limited to valuing and ranking (Rey-Valette et al., 2017) or mapping (Tusznió et al., 2020) of ecosystem services. Approaches that feature a more elaborate and systematic involvement of stakeholders in the design and implementation of innovative policies fostering ecosystem services provisioning and, thus, allow for actual co-production of knowledge, a comprehensive assessment of socio-cultural-political implementation contexts (Ebner et al., 2022), stakeholder constellations/landscapes and interests (Schröter et al., 2018), and contain tools for addressing and mitigating conflicts in ecosystem services management (Zoderer et al., 2019) are still underdeveloped and/or poorly documented (Langemeyer et al., 2018; Potschin-Young et al., 2018).

Thus, understanding the progress of innovation work, requires looking beyond the mere proclamation of magical concepts. Instead it calls for studying the concrete moments of convergence work in action—“de-emphasizing what is divisive and emphasizing what ... needs to be brought together: actors, issues, institutions and initiatives that deal with concerns so complex that mono-disciplinary treatment seems to be insufficient” (Stegmaier, 2009) - and reflecting critically on the methods applied to instigate that progress by involving stakeholders. Consequently, in this research article, we aim to (a) introduce an integrated, longitudinal multi-stakeholder involvement approach called “Constructive Innovation Assessment” tailored to mid-term development of innovations in forest ecosystem service governance; and (b) identify and highlight where, in recent applications, the tensions between the rules of the method and the idiosyncrasies of local implementation were particularly evident.

We applied the multi-stakeholder involvement method we reflect on

² To be sure and reiterate the point made previously, to avoid these notions becoming container concepts, they require conscious and critical reflection by all those involved.

in the EU H2020 project InnoForEST,³ a three-year “innovation action”,⁴ that featured six forest ecosystem services governance processes, in which innovations should be concretised and developed into first ‘prototypes’ that work in principle (cf. Hopkins et al., 2020). An “innovation action” entails a specific form of scientific work, namely the scientific “accompaniment” of an EU project focused on innovation and governance. In InnoForEST, the innovation accompaniment consisted of initiating, financing, and organising the innovation work in-situ as well as stimulating cross-process learning. Structuring processes were required that wouldn’t straitjacket the innovations. Although some of the reflections on observations made during the innovation action accompaniment may come naturally for adepts in participatory processes, we argue that the real-life vicissitudes of innovation work may bewilder the less-experienced, who lean on textbook participation approaches. The question was how such emphasis on multi-stakeholder involvement and close cooperation in the innovation process can be realised: we arrived at the approach of Constructive Innovation Assessment (CINA). The utility of CINA is both practical and systematic. It is well suited to structure innovation processes in practice and to support the further development of a respective innovation idea.

With its reliance on the concept of “ecosystem services” and jointly developed scenarios of innovative ecosystem services (see section 2), CINA benefits from the strengths of “boundary objects”, which is “a sort of arrangement that allows different groups to work together without consensus” (Star, 2010; cf. Van Oudenhoven et al., 2018; cf. Maczka et al., 2019; cf. Schleyer et al., 2017). Sharing such “boundary objects” has been observed to ease collaboration among stakeholder groups with different, even contrary, positions and roles. Collaboration is not arbitrary, but depends on required information, a sufficient level of both standardisation and case sensitivity, and work requirements. Finally, boundary objects offer interpretive flexibility and work as “means of translation” (Star and Griesemer, 1989: p. 393). We emphasise that such boundary-oriented dialogue should be seen as a bidirectional activity, because equating stakeholder inclusion with a bottom-up process is an over-simplification (e.g., Arnstein, 1969; cf. Edelenbos and Klijn, 2006). Taking the strengths of boundary objects seriously, ecosystem services governance can be organised by investing in what is called “convergence work” (Stegmaier, 2009; Schuurbijs et al. 2013), which occurs when the demarcation of differences—“boundary work” (Gieryn, 1995; Owens et al. 2006)—turns into the collaboration on something valued together.⁵

In the following, we summarise the background and core elements of Constructive Innovation Assessment (section 2), and describe the methodology used for this paper (section 3). In section 4, we relate the experiences of the six cases as six practice puzzles, while section 5 contains the empirical and conceptual implications of the results. We conclude with a summary of how CINA was new and how it can be further developed (section 6).

2. CINA as an operational concept

The CINA approach follows the tradition of Constructive Technology Assessment (CTA; cf. CTA Toolbox Project, 2020a), which is long known

³ <https://innoforest.eu/>.

⁴ The Horizon 2020 online manual defines “innovation actions” as “Activities directly aiming at producing plans and arrangements or designs for new, altered or improved products, processes or services. For this purpose they may include prototyping, testing, demonstrating, piloting, large-scale product validation and market replication” (https://ec.europa.eu/research/participants/docs/h2020-funding-guide/grants/applying-for-funding/find-a-call/what-you-need-to-know_en.htm). Thus, such projects do not aim predominantly at the development of new knowledge, but focus on supporting the introduction of young technologies, or, as in our case, forest ecosystem service governance arrangements.

⁵ As we have shown elsewhere (Loft et al., 2022), it can also serve as an entry point for investigating how innovation processes work, in this case in the field of forest-related governance and management.

from the assessment of emerging technologies (Rip and van den Belt, 1986; Rip and te Kulve, 2008). It emerged as a criticism of general ‘technology assessment’, which was seen as mainly instrumental and a-contextual (cf. Webster, 2007). CTA was then developed to overcome these criticisms by active inclusion of social, historical, political, power and other contexts using heuristics for prior research on the complex dynamics and layers involved in innovation, case sensitive research methods, and interaction formats that allow for inclusion of stakeholders’ and other actors’ perspectives (Rip and van den Belt, 1986; Stegmaier, 2020; cf. García-Nieto et al., 2015; Hauck et al., 2019; Paloniemi et al. 2018; cf. Hack, 1995; Felipe-Lucia et al., 2015). CTA attempts to support the exploration of more socially, technically, commercially, politically, ethically, legally, or otherwise robust and acceptable technological alternatives. A challenge for both CTA and CINA is to avoid becoming an instrument of policymaking and to remain a neutral and (self-)reflexive intermediary between the most diverse actors (cf. Vergragt and Groenewegen, 1989). However, forest ecosystem services and their governance are not a common socio-technical target of CTA. Because the provision and governance of forest ecosystem services goes beyond technology, we endeavoured to reframe the CTA approach. This generalised CTA is Constructive Innovation Assessment (Aukes et al., 2019; Stegmaier, 2020). We were not reinventing CTA but adapting and developing it into a previously untrodden territory: forest ecosystem services governance.

CINA aims at accompanying *investigation* and *reflection* throughout the entire innovation process and fostering it. CINA has, so far, only been used in the context of EU procurement of innovations through so-called Innovation Actions in the Horizon 2020 framework programme (InnoForEST, EU-MACS⁶). CINA lives from, and depends on, the acceptance of the stakeholders involved. For CINA, as for CTA (cf. Parandian, 2012), the promotion of learning potentials for an innovation process is the decisive motivation. It is both about broader societal benefits and the quality of the innovation process. One difference to typical CTA work was that this CINA process did not have to insert into an otherwise completely independent innovation process (cf. Rip and Robinson, 2013), but rather the overall InnoForEST project in most cases provided new impulses to actively continue or even start the respective innovation process for the duration of the project.

Similar to CTA, implementing CINA before an innovation and its social embedding stabilises makes it a response to the ‘Collingridge dilemma’. This dilemma postulates that in the early phases of technology development there is a lot of scope for design but comparatively little evidence for evaluating the possible design variants; in later phases, the possibility of evaluation *increases* continuously, while the scope for design *decreases* due to a host of solidification tendencies (Collingridge, 1980; cf. Mann, 2015). There is also a third problem: one often does not know early on how desirable a novelty is, because once developed and used, it could break the boundaries of previous norms and values (Robinson, 2010). All three were present in the InnoForEST project: completely new innovations and well-developed re-innovations, and implications that only after some time became clearer in their consequences-if at all yet. The Collingridge dilemma or Robinson’s trilemma can be taken to describe extreme states with an almost continuous transition from high configurability and low accessibility to increasing consolidation in between. Furthermore, depending on the geographic context, the reversibility and assessability of the innovation in question can vary. Thus, it is not an either-or option, but a continuum along which innovation approaches must be adapted (Kuhlmann et al., 2019). It is largely *not* a matter of deciding for or against a form of

⁶ There still running under the CTA label (cf. Visscher et al., 2020; Stegmaier and Visscher, 2017); see also <https://eu-macs.eu/>. It was resembling CINA, but was still carried out under the CTA name, because it was not yet clear how much explanation would be necessary (and still often not be enough) to show how also non-technological innovations can profit from the CTA approach.

ecosystem service governance at an early stage, but rather of providing continual, indicative contributions for the development of the innovation and its social embedding, and of presumably desirable directions.

2.1. Scenarios as a core tool

Scenarios function as crystallisation points, in which innovation workers’ convergence work materialises.⁷ They figure as the key tool of CINA. Ideally shaped as well-informed, realistic, and thought-provoking narratives, including, for example, conceptual graphs or symbolic images (Parandian and Rip, 2013; Robinson, 2009; Rip and te Kulve, 2013), scenarios are meant to, on the one hand, concretise the innovation alternatives on the table, and, on the other, address the circumstances of choice and realisation.⁹ They are the ‘boundary object’ (Star, 2010) in the narrower sense, the concrete form that the ecosystem services can take. If these scenarios take into account knowledge about stakeholder interests, the governance situation and potential innovation alternatives, as well as the main areas of tension between these (Fig. 1), they can become exciting objects of reference for stakeholders, because they, then, reflect the situation they find themselves in or which they aspire to. Furthermore, scenarios can help to project realistic expectations about how certain context conditions might have affected the feasibility, plausibility, or further development of an innovation alternative (Fig. 1; Aukes et al., 2019). To arrive at scenarios that can be

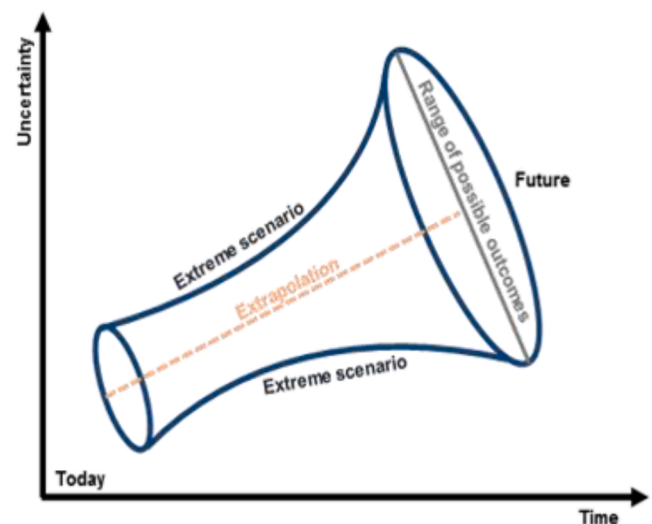


Fig. 1. Basic horizon of CINA scenarios (CTA Toolbox Project, 2020b).

⁷ *Convergence work* (Stegmaier, 2009) describes the challenge of reaching agreement on something that can be collaborated upon, across different interests.

⁸ *Innovation workers* are defined as the in-situ organisers of the governance innovation process. In InnoForEST, they consisted of members of a nearby organisation for the promotion of innovation, an administration, or a project executing agency as well as employees of a nearby university. The former were responsible for managing the project and maintaining relations with the stakeholders while the latter were responsible for data collection in the run-up and documentation of the process. Both reported to the umbrella project. By *CINA agents* we mean people from the umbrella project who accompanied the local innovation workers (assessment of the initial situation, planning and implementation of the workshops, transfer of the lessons learned to the overall project and to the other regions involved). In the case of InnoForEST, these were the authors.

⁹ Much, if not all, of what we state here about scenarios in relation to CINA is also true for CTA.

considered realistic, most regional projects have carried out intensive research, preliminary discussions, and explorations, to already sound out with subgroups of stakeholders what can reasonably be considered and shared as possible future developments and conditions for them. Where this has not been done in detail, it is more appropriate to speak of conceivable options that are the subject of the scenarios.

The construction of scenarios worked best with the early involvement of stakeholders and not as one-sided expressions of what is desirable for innovation workers themselves. Conceptually, the function of scenarios was to “add *substance* to the interactions” (Rip, 2016) and develop a shared conceptual repertoire (Galafassi et al., 2018) during scenario workshops and other encounters, ensuring that these meetings amount to concrete convergence work instead of mere bodily co-presence. The art of scenario making, then, was to formulate them in such a way that they reflect the different interests, knowledge bases and professional approaches to problems of both innovation workers’ and the broader stakeholder circle. Not dissimilar to road-mapping exercises, the CINA scenarios were supposed to think along endogenous futures that can be expected while following the broader paths so far known. They were to be expected as possibilities because existing paths, habits, trials and errors, circumstances, interests, and competences of participants were used in their construction. New options were related to these. Moreover, half of the regional cases intended to find a next generation of an innovation that had already been developed. Thus, for CINA, scenarios needed to find ways to mediate these differences, either by using them complementarily and constructively, or by attempting to dissolve them.

Understanding governance innovations as a process developing over time due to innovation work and external events, it would be counter-productive if scenarios would remain inert over time in CINA’s longitudinal set-up. New knowledge and insights about the innovation prototype and the stakeholder context has to be incorporated for the scenarios to remain as realistic and thought-provoking as possible. Hence, Fig. 2 shows the ‘learning curve’ that is built into CINA (cf. Aukes et al., 2020c). It shows how innovation workers’ preliminary assessments and knowledge about prototype and stakeholder context lead to a set of scenarios—always more than one to enable comparing and contrasting futures. Deliberation of the scenarios during workshops placed strategically along the innovation process leads to a narrowing down of options. This process of refinement leads to an evolving focus of the scenarios from visioning through prototype assessment to roadmapping (section 2.2). Research occurs mainly after a strategic workshop to consolidate results, but also to avoid missing out on contextual developments (Fig. 2).

2.2. Longitudinality manifested in sequential, strategic workshops

CINA stimulates stakeholder-oriented innovation work. This implies that innovation workers collaborate with stakeholders on further developing—i.e., stabilising, modifying, or sometimes discarding – the aforementioned scenarios developed for the governance innovation at key points in time; during ‘strategic workshops’ as opposed to regular work floor interactions (cf. Te Kulve and Konrad, 2017; Te Kulve, 2014). Scenarios as devices holding visions of possible collective futures are the main input of strategic CINA workshops. CINA workshops can be seen as *bridging* events that present an opportunity for *enactors* of a governance innovation, i.e., those who create new innovations (our innovation workers), to discuss their implications with *selectors*, i.e., those who are somehow affected by the innovation, for example, as users (Fig. 3). Innovation workers should invite selectors to a strategic workshop who can bring a relevant perspective to the table; they may be crucial, typical stakeholders or ‘unusual suspects’. Workshops function as a “sharing facility”, where participants can “probe each other’s realities” (Robinson, 2010, Garud and Ahlstrom, 1997) allowing to bridge existing gaps between interests, viewpoints, and worldviews. Although one aim of these workshops is to explore participants’ immediate connections over

scenario content, they should by no means ignore or hurriedly eliminate controversies, but rather strive for understanding the differences, the justified backgrounds others had and where they could still unite. They provide opportunities to move beyond differences towards talking points and possibly even joint action, albeit limited (cf. Carlile, 2004). Here, the scenarios enable collaboration on a charming, jointly developed object without having to agree on everything. In this way, scenarios can mediate between differences and be further balanced out if underlying disagreements remain too strong. Strategic CINA workshops can, thus, be seen as convergence workplaces.¹⁰

Reiterating the importance of accompanying the innovation *as a process*, this must involve more than one workshop including evolving scenarios (section 2.1). With the intention of ensuring that all relevant stakeholders are intensively and extensively involved at strategically important decision-making moments during the innovation process, CINA provides three cumulative, overarching formats of strategic workshops, depending on ‘where’ the governance innovation is in terms of maturity (Fig. 2):

1. Innovation analysis and visioning:
 - a. *Aim*: gaining an understanding of what constitutes a governance innovation and what its actual and/or potential impacts and limitations are.
 - b. *Discussion*: visioning of what governance innovation would be required or useful, and how innovation coordination could proceed or improve based on insights into innovation evolution and its key drivers (in terms of governance, institutions, economic, environmental, or practical issues).
 - c. *Outcome*: several concrete ideas for innovation option(s), resulting in what InnoForESt called innovation ‘prototypes’, i.e., the version of the innovation that innovation workers can proceed with.
2. Prototype assessment:
 - a. *Aim*: assessing (the) innovation prototype(s) selected in previous analysis and visioning workshop(s).
 - b. *Discussion*: critical examination of prototypes by a sufficiently large number of selectors, asking questions such as: (a) what are the chances of success of the innovation, (b) what are the risks/advantages of an improved innovation being scaled up to a wider region, and (c) what are the current and potential economic, social, and ecological impacts and benefits?¹¹
 - c. *Outcome*: narrowing down which prototype to pursue and move to the final stage of a CINA process for the time being.
3. Preparing future conditions:
 - a. *Aim*: discussing the future conditions required for the implementation of the innovation as well as the action plan to get there.
 - b. *Discussion*: reiterating the vision of the innovation, the prototype, and its future application, enactors and selectors must discuss (a) what must be changed, (b) who must be involved, and (c) how this can be achieved.
 - c. *Outcome*: a more or less explicit innovation roadmap matching the developed innovation vision with reality to make it happen.

2.3. Continuous convergence work between strategic workshops

Both scenarios and strategic workshops benefit from new knowledge acquired during the entire innovation process. This requires continuous innovation work, for example in the form of networking with existing or

¹⁰ CINA is thus linked to other activities and innovation policies (Joly et al., 2010; Smits et al., 2010) by creating both explicit negotiation arenas (workshops) and knowledge bases (research, evidence-based).

¹¹ InnoForESt has also developed an experimental role-playing board game exploring forest ecosystem services issues from a more rational-choice- and factor-oriented perspective, which can but must not be used during strategic workshops (Klůváňková et al., 2020).

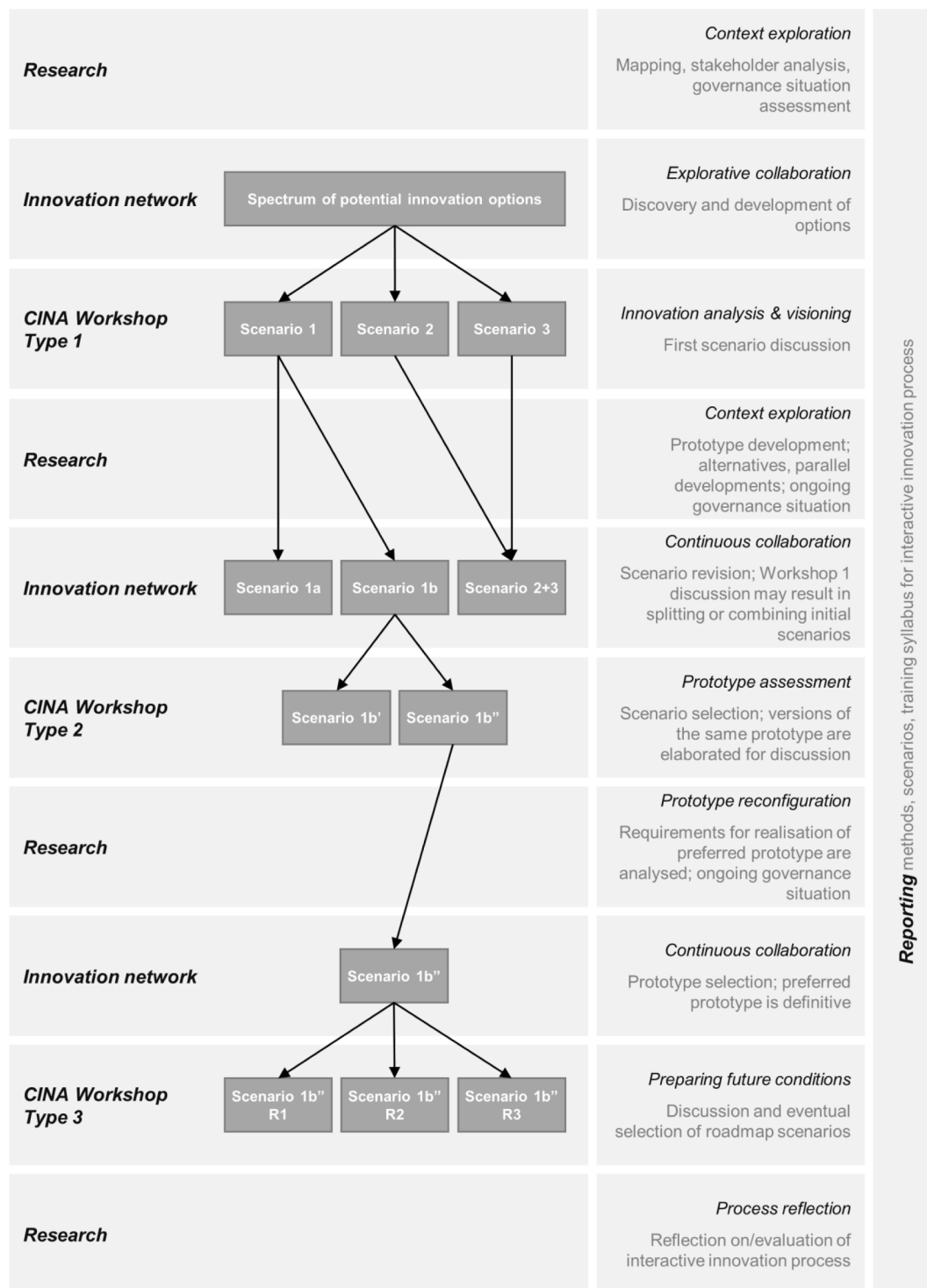


Fig. 2. Exemplary evolution of scenarios during a CINA process (Aukes et al., 2020c; cf. CTA Toolbox Project 2020a; cf. Schwerdtner et al. 2015).

potential new stakeholders or monitoring regime and landscape changes closely, between workshops. First, in the preparation of CINA workshops, the situation regarding the innovation and the stakeholder networks must be examined in detail (section 4.3). It may turn out that evolving scenarios and prototypes require the focal stakeholders to change in subsequent workshops. Thus, not all participants in visioning workshops must become active participants during the ensuing innovation process as marked by the strategic workshops with evolving focus (section 2.2). Similarly, it is not paramount that the stakeholder configuration remains the same during the whole innovation process.

Second, to enable ongoing innovation modulation between workshops, innovation workers must observe what happens in terms of scenario content development and stakeholder dynamics during workshops. This is ensured by closely following and documenting the factual discussion during a workshop.¹² Third, a detailed analysis of the workshop documentation results in accurate comprehension of the new knowledge

¹² In InnoForEST, strategic workshops were supported with the presence of at least one CINA agent.

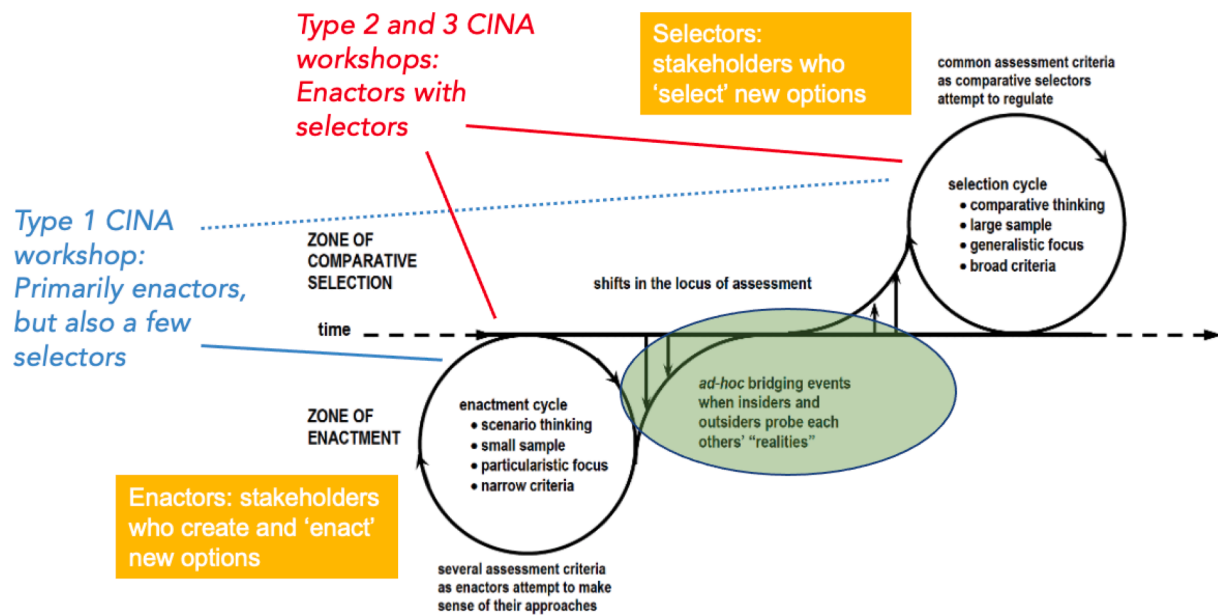


Fig. 3. CINA workshops as bridging events (adapted from Robinson, 2010, and Garud and Ahlstrom, 1997).

gained from the interaction. This can also be described as a continuous realignment of the research on the innovation topic and its context, i.e. interests, possibilities, and limitations regarding the innovation. This cannot be done by innovation workers alone behind closed doors, but requires permanent feedback with stakeholders, and also to engage and keep them on board. Doing so ensures not only that knowledge of strategic importance for the innovation is up to date, but also that stakeholders perceive the innovation process as legitimate.

Such a continuous exchange between stakeholders and innovation workers simultaneously fulfils two tasks: on the one hand, findings and innovation progress were continuously coordinated with the stakeholders and thus included in the innovation process; and, on the other, the innovation process remained socially, politically, and economically embedded through the accompanying research and communication with the stakeholders.

In sum, CINA has similar ambition as CTA, which is to modulate innovation where possible and do so continuously. Scenarios, embodying the different possible future directions of an innovation, are central to both approaches. They have to be discussed during workshops positioned strategically in time. There is arguably a sequence of conceivable workshop topics to be discussed using the scenarios. However, scenarios and workshops are not the only thing, there is a lot of accompaniment, engagement, and assessment necessary between the strategic workshops. CINA is, thus, a natural expansion of CTA in topical and temporal scope.

3. Material and methods

Although we present our research methods in linear fashion, the three-year project context from which we report makes for a continuous back-and-forth between defining what cases we are dealing with (cf. Ragin and Becker, 1992), as well as generating and analysing data (Schwartz-Shea and Yanow, 2012). The results presented below are not only based on ex-post analysis, but also on immersion in the cases during the project. Central to this paper are not the concrete results of the project, but the circumstances of the practical implementation of the

CINA approach in cooperation with the various regional partners. We found that the generally formulated approach, called CINA, underwent particular transformations on the ground and describe these here.

3.1. Cases and field access

In this analysis of the introduction and real-life vicissitudes of CINA, we rely on the data generated in six cases of forest ecosystem service governance innovation targeting different kinds of ecosystem services (Table 1). All cases were part of the InnoForEST project (section 1). They are cases of implementing the CINA approach through local teams of innovation workers, coordinated by the authors (as “CINA agents”), by organising an ongoing learning process from the introduction of the method to accompaniment relating to documentation and practical issues. As CINA is a recent further development of the CTA approach, to our knowledge these are the only cases using this approach. Given that in all cases the targeted ecosystem services as well as governance contexts are different, this presents the opportunity to see how CINA fares in these divergent contexts.

Table 1 shows that the cases varied substantially. For example, four cases were positioned to develop a new forest ecosystem services governance arrangement, which did not yet exist or was in its infancy (Austria, Finland, Italy, Czech Republic). In Germany and Sweden, an existing programme was supposed to be further developed. We argue that CINA can be adapted to both new and existing innovation processes. Furthermore, the goal of each innovation targeted different (sets of) forest ecosystem services. The flexibility of scenario thinking allows for different kinds of contents. There were also different types of stakeholders involved as innovation workers in each case. While this set of cases arguably follows a ‘most different’ systems logic (cf. Seawright and Gerring, 2008), which might be seen as common for the kind of cases developed for EU innovation-action-type projects (see introduction), their variation is relevant for the implementation of CINA inasmuch as it shows its translatability to considerably different contexts, be they cultural, political, scientific, and ecosystemic.

Table 1
General aspects of the cases in which CINA was applied.

Aspect	Eisenwurzen, Austria	South-East of Finland	Mecklenburg-Western Pomerania, Germany	Fiera di Primiero, Italy	Gothenburg region, Sweden	Liberec region, Czech Republic
Starting point Innovation goal	Experimentation Developing a forest ecosystem service value chain in a fragmented stakeholder landscape	Experimentation Further developing a national biodiversity protection system as a market for biodiversity rights called 'Habitat Bank of Finland'	Evaluation and redevelopment Evaluating and adapting a payments for forest ecosystem services scheme called 'Forest Share'	Experimentation Developing a close-to-nature forest-pasture management structure in a mid-elevation mountainous area	Evaluation and redevelopment Evaluating and adapting an educational competition about forest ecosystem services called 'Ålska Skog'	Experimentation Further developing collective management of forests for Čmelák
Innovation worker	STUDIA	Finnish Environment Institute SYKE	Akademie für Nachhaltige Entwicklung Mecklenburg-Vorpommern	Servizio Foreste e Servizio Faunistico, Provincia Autonoma di Trento	Universetum	Čmelák – 'New Virgin Forest'
Actor network characteristics	Emerging network	Small stable network; large spectrum of satellites	Small stable network; one large, relatively permanent purchaser and many other satellite purchasers	Stable network; some private forest managers dropped out	Small network; some supporting companies dropped out; difficult to increase	Stable network
Core issues	What will the innovation be precisely? How do niche ideas fit into current practices, laws and regulations? Can the niche link up with forest-ecosystem-service-unrelated sectors?	What kind of actor should broker the transactions? How to assess which areas to use and appraise their value?	How to expand the theme given limited amounts of space? Should other elements such as carbon storage be included? How to ensure continuous governmental support?	What should the forest-pasture management entail? How to deal with a fragmented ownership situation of private forest areas?	How to resonate important societal topics for education while maintaining a suitable investment base? How to ensure stronger embedding in school curricula?	How to establish fair and inclusive processes of change? How to adapt the current management system to a changing social and ecological environment? How to position the management system vis-à-vis national environmental protection rules and regulations?

3.2. Data generation and analysis

To study the impact of CINA on each innovation context and distinguish the practical issues that emerged during the process, we relied on three kinds of data all generated within the context of the InnoForEST project. First, in terms of what could be called primary data, we trailed all six teams of innovation workers throughout the project through frequent online meetings and CINA workshop visits. We also discussed observations and feedback notes from field visits as well as the documentation of the CINA workshops in detail with the innovation workers. Thus, by talking with them and reconstructing their views, assessments, and interests, we involved local stakeholders in the analysis of the evolving situation. Second, we consulted a series of individual dossiers produced by the innovation workers in the various regions (Aukes et al., 2020a). These dossiers detailed the processes and outcomes of each CINA workshop in each case, including a case overview, the overall innovation strategy in the case, scenarios used, setting, participant composition, key findings, detailed findings, process reflections, stakeholder interactions, and lessons learnt. Thirdly, we analysed each case's detailed elaboration, discussion, validation, and verification of the innovation journeys, including a systematic comparison (Loft et al., 2020; Aukes et al., 2020b; cf. Van de Ven et al., 2008). Finally, here we are only interested in the details of the specific cases insofar as they reflect the circumstances under which CINA helped to structure the overall innovation processes. Thus, we do not present a detailed analysis of each case's scenarios but show selected illustrations of the CINA processes.

4. Adapting CINA for practice: Puzzling with the approach, approaching its puzzles

This section describes our practical, methodological findings from development, application, and accompaniment of the approach in the six case contexts. Although some of these findings may ring familiar for scholars comfortable in the use of participatory methods or even CTA, we contend they are by no means common or routine knowledge for practitioners on the ground. We encountered that intensive training efforts and process accompaniment were necessary to ensure the constructive and productive application of the approach by local innovation teams (Section 4.2). Furthermore, when executing assessment methods, such as CINA, following its central methodological literature like a recipe is preferable and would simplify its working in practice, practical circumstances often, if not always, render ideal execution impossible. The translation of textbook assessment methods must deal with practical questions such as what is the context in which the method will be applied, what is the context about, what is already happening there and what that means for how the method can be made productive. In other words, translating a method from a textbook (i.e., as summarised in section 2) into practice entails what we call *practical puzzles*, of which we will describe seven in the following (Fig. 4).

4.1. Practice puzzle 1: Strategic workshop sequences

The CINA approach calls for context-dependent adaptation and figuring as the backbone of the entire InnoForEST process, strategic workshop sequences were tailored to the circumstances of each of the six cases. Looking at Table 2, the variation in sequences stands out. One type of workshop – the visioning format – was executed more than once in the Eisenwurzen and Mecklenburg-Western Pomerania cases. For both cases, this reflects the difficulty of establishing with what the innovation should be. In the Eisenwurzen, the intention of developing a completely new forest value chain presented the difficulty of deciding where to focus. While for a prolonged period in the Mecklenburg-Western Pomerania case, it remained unclear how the existing payments for ecosystem services scheme could be developed to revive it (see Table 1 “Core issues”). Table 2 also reveals that the Liberec and

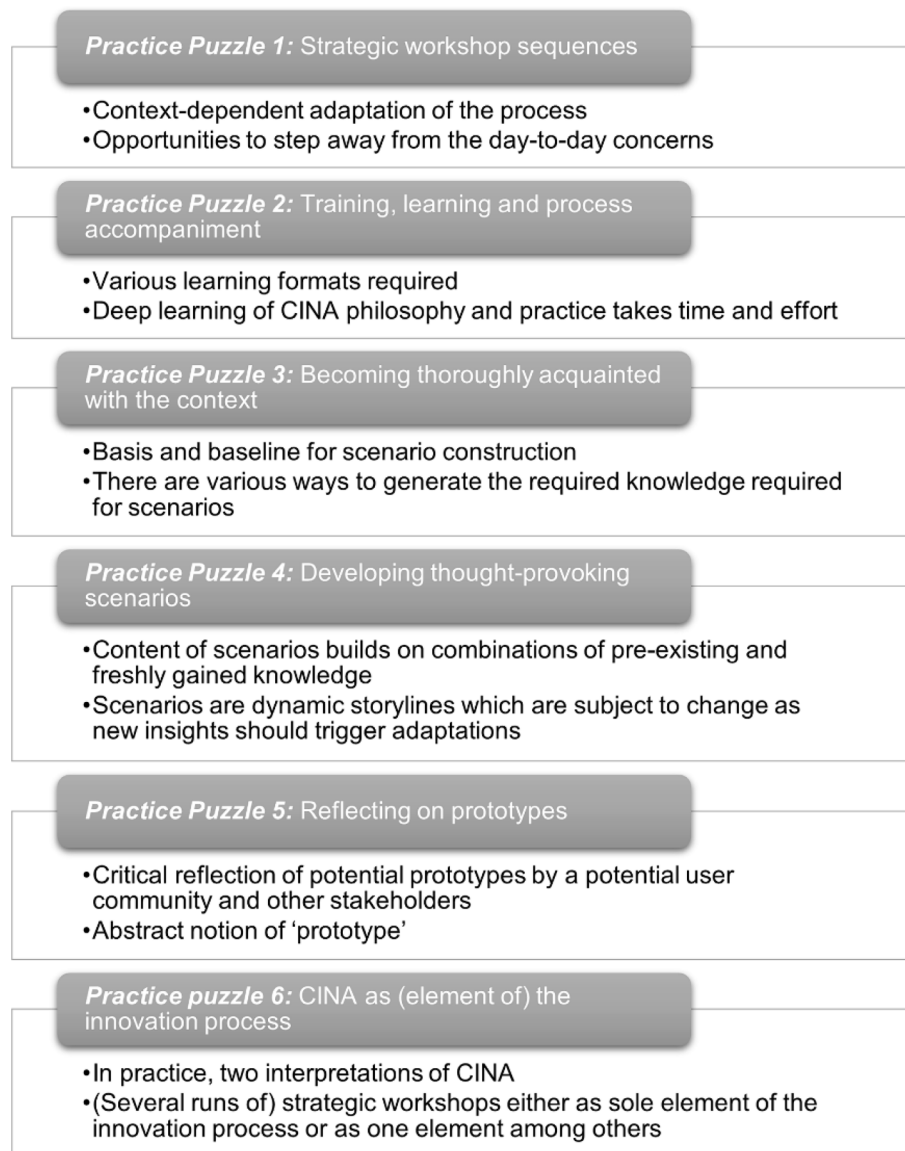


Fig. 4. Six practice puzzles.

Mecklenburg-Western Pomerania cases never got around to organising a future conditions workshop (Type 3). For the former, the COVID-19 pandemic meant it was not possible to bring the required stakeholders together in a strategic workshop. For the latter, this was because the process simply did not get to a stage where the stakeholder network could begin thinking about how to implement a prototype.¹³ There are also three cases-Liberec, Finland, and Fiera di Primiero-in which a follow-up strategic workshop was planned, but not executed. This was partly because of the COVID-19 pandemic, but also due to other local circumstances. These circumstances included landscape developments, such as government elections (Finland) or natural disasters (Fiera di Primiero). While both can be windows of opportunity to propel an innovation forward, they also stall an innovation due to waiting games

¹³ NB: While it is possible to have mixed format workshops, where, for example, visioning and a bit of prototype assessment is done, it is virtually impossible to hold strategic workshops of different formats within very short timespans. This is, because the results of one strategic workshop have to be processed and fed into the next. Thus, the total number of workshops also represents a longer time span of months per workshop, thereby reflecting a long-term innovation process.

or redirecting focus to everyday work. Additionally, such circumstances indicate that there is no external necessity to organise a strategic CINA workshop at a given time, but that they can be positioned as well-argued punctuations of innovation processes over time. Innovation workers in Eisenwurzen, Liberec, and Gothenburg also each organised one additional workshop that did not follow a CINA format to discuss matters differently. For example, the Gothenburg innovation, dealing with the redevelopment of an educational programme targeting cultural forest ecosystem services, had a dedicated meeting exclusively with pedagogic staff members to develop the didactical approach of the programme, without relying on scenarios to do so. In Eisenwurzen, an additional workshop was held on the initiative of a few stakeholders, with the function of providing space to probe a side branch of the scenarios and prototypes proposed by the innovation workers. While the innovation workers intended to focus on bringing together stakeholders in a tighter forest value chain, some stakeholders wanted to explore if they could collaborate specifically on pyrolysis and exploiting this economically. In all cases, the CINA workshops were opportunities to step away from the day-to-day informal meetings and occasional talks that already happen in more or less tight-knit stakeholder networks, where one sees each other for different reasons (section 2.3). Nonetheless, it is important to

Table 2

CINA workshop types as carried out in practice per Innovation Region. Numbers between brackets indicate planned, but not executed workshops.

Case	CINA Workshop types			Extra workshops, on local initiative	Informal meetings, occasional talks, etc.
	Type 1: Innovation analysis and visioning	Type 2: Prototype assessment	Type 3: Preparing future conditions		
Eisenwurzen, Austria	2	1	1	1	x
Liberec region, Czech Republic	1, (1)	(1)	n/a	1	x
South-East of Finland	1	1	(1)	n/a	x
Mecklenburg-Western Pomerania, Germany	3	1	n/a	n/a	x
Fiera di Primiero, Italy	1	1	(1)	n/a	x
Gothenburg region, Sweden	1	1	1	1	x

mention the intense work in-between strategic workshops, which involves figuring out where the innovation process stands and building stakeholder networks. This innovation work creates the knowledge and relational base on which strategic CINA workshops can happen. The workshop sequences in the six cases show that there is no guarantee from the start that a full innovation process will be carried out within a given time. Due to unforeseeable circumstances, innovation processes can get stuck, take less a linear shape, or require more care (and, thus, time) by innovation workers.

4.2. Practice puzzle 2: Training, learning and process accompaniment

As hardly any of the innovation workers were familiar with CTA or the envisioned CINA process, training activities were required from our side (Table 3). As initial activities, we organised a webinar and provided background literature to get the process of thinking about scenarios underway. Shortly after, we discussed all scenario ideas and characteristics across cases with all innovation workers to propel scenario development. Once the innovation processes gained momentum, we moved from a teaching role to a coaching and accompanying role. We met with the innovation workers before each of their strategic workshops to discuss the planned scenarios and anticipated discussions, and, after each workshop, to map the way forward. Finally, we also tried to participate in as many workshops as possible to support and observe the CINA processes in action.

During this teaching and accompanying process, we discovered that it was challenging to involve all innovation workers in the level of deep learning about the CINA philosophy and process that we had in mind. First, some of the innovation workers had insufficient time to engage with the provided literature and other resources. CINA/CTA has peculiarities distinguishing it from general participatory methods. For example, external inputs in the form of presentations are common elsewhere, but we encouraged the innovation workers to minimise these

in favour of open, plenary scenario discussions. In the end, several of the strategic workshops were organised in a rather top-down way as a lecture with relatively low involvement of the present, carefully curated stakeholder group, for example in Liberec and the Finnish case. Despite our efforts, it turned out to be difficult to change existing participatory routines or add to one's repertoire other parallel ways of organising participation. This obstructed the lasting investment of efforts required for ongoing scenario development over the course of the whole innovation processes.

4.3. Practice puzzle 3: Becoming thoroughly acquainted with the context

Gaining a deep, initial understanding of the local context at the beginning of an innovation process serves as a basis and baseline for scenario construction (section 2.1). At the start of InnoForEST, all six cases carried out an assessment of the state of play regarding the governance situation, the stakeholders, general factors of influence and the forest ecosystem services in the region (Table 4). While the former three relied mainly on qualitative methods, because direct interaction and understanding with stakeholders needed to be established, the institutional dimension of forest ecosystem services in each region was mapped with quantitative methods.

In compiling these assessments, innovation workers were invited to consider prior knowledge and existing expertise in their network (Adolphi, 2020; Pekkonen et al., 2020). Additionally, if new insights were needed, suitable data generation methods were chosen, including qualitative interviews or focus groups. In Liberec, this involved the collaborative identification of the main barriers for innovation and reconstruction of the history of the innovation by stakeholders and innovation workers (cf. Špaček et al., 2020). Qualitative interviews with primary-level pupils and teachers were carried out in the Gothenburg case to better understand the forest educational program to be innovated (Brogaard et al., 2020). What had to be researched at the beginning of

Table 3

Overview of learning activities offered to innovation workers, including a description.

Teaching or Accompaniment activity	Description
Webinar	In the start-up phase of the innovation processes, when no strategic workshops had yet occurred, we organised a 4-hour webinar to introduce the CINA process. This was an interactive session, in which we discussed the underlying rationale, scenario development, workshop formats, workshop preparation, and documentation of results. There was also the opportunity for the innovation workers to begin to develop their scenarios and ask questions.
Background literature	We provided seminal literature on CTA and scenario-building for the innovation workers to consult and prepare for the webinar (see row above). This literature is largely congruent with what is discussed in section 2.
Cross-case scenario development session	During one of the first general assemblies of the InnoForEST project, about a month or two after the webinar, we organised a session to compare the state of the scenarios in each case and discuss them further. To make the discussion more coherent, we provided a table for every innovation worker to fill out, detailing the actor configuration, governance arrangement, organisational embedding, business model, role of citizens, role of technology and science, discourse context, key trends, uncertainties, and future prospects.
Pre- and post-workshop accompaniment	To make sure the most was made of each strategic workshop in terms of the CINA ambitions, we met with each innovation worker before and after a workshop. In the pre-meetings, we discussed the scenarios to be presented and possible peculiarities, e.g. pertaining to stakeholder constellations. In the post-meetings we mapped the further direction of the innovation process and the scenarios based on the preliminary results of the workshop.
CINA agent workshop participation	As much as possible, we attempted to have one of the authors present in each strategic workshop to support the discussions, consult with the innovation workers in-action, and observe interactions. This happened in approximately half of all workshops.

Table 4
Supplementary assessments at the basis of scenario development and innovation processes in general.

Aspect	Governance Situation Assessment	Stakeholder Analysis	Socio-ecological-technical factor analysis	Mapping of forest-related institutional conditions in EU
Focus	Chronology of governance development, current governance problem structures (cf. Hoppe, 2010)	Range, interests, types, and networks of stakeholders (cf. Raum, 2018)	Social, ecological, and technical system dimensions influencing sustainable provision of forest ecosystem services	EU and national policy strategies on forests and forest-related policy domains
Methods	Qualitative	Qualitative	Qualitative	Quantitative
Peer-reviewed and grey publications	Aukes et al., 2019	Schleyer et al., 2019	Sorge et al., 2022; Kluvánková et al. 2020	Primmer et al., 2021; Primmer et al., 2019

each case's innovation process also depended on its maturation: when the envisioned innovation started from scratch this required other kinds and sources of knowledge than in the more developed ones. However, CINA agents encouraged innovation workers in all six cases to remain vigilant to developments in their socio-political, economic, or ecological surroundings-such as the formulation of new policies at various governmental levels (Finland), significant changes in market prices (Liberec, Eisenwurzen Fiera di Primiero), extreme weather events (Liberec, Fiera di Primiero), or the departure and appearance of stakeholders (Gothenburg, Mecklenburg Western-Pomerania, Eisenwurzen)-throughout the process to adapt their innovation work to the new circumstances and maintain the plausibility and realism of their scenarios. For example, this happened in the Fiera di Primiero case where additional stakeholder-analysis-type surveys were administered to new or unknown stakeholders towards the end or directly after a CINA workshop (Bussola et al., 2021). For CINA, this means there is no single way to generate the knowledge required for the innovation to thrive. What can be said is that innovation workers cannot recede into back rooms to plan an innovation but need to remain actively engaged with stakeholders and reflect on new insights continuously.

4.4. Practice puzzle 4: Developing thought-provoking scenarios

The centrality of scenarios in the CINA approach warrants closer inspection of how they were developed and shaped under the specific circumstances of the six cases. Of importance are the content and format of scenarios, how the scenarios and supplementary materials were presented, and how and under what circumstances scenarios were

developed further between sequential CINA workshops.

The content of scenarios builds on combinations of pre-existing and freshly gained knowledge (section 2.1). We advised the innovation workers to contrast multiple complementary scenarios during a CINA workshop that may differ, for example, in terms of products or services to be developed, such as in the Eisenwurzen case, where the first scenarios comprised furniture or tiny houses as potential prototypes (Schleyer et al., 2022; cf. Kister et al., 2020); or governance modes underlying a payment for ecosystem services scheme, such as in Mecklenburg-Western Pomerania; or Finland where an existing scheme had to be redeveloped or a new one devised, respectively (Adolphi, 2020; Pekkonen et al., 2020). In terms of format, scenarios were tailored to the prototype in question and the expected workshop participants, including the envisioned governance arrangement and actors involved. The innovation workers turned out to be creative in designing appealing scenarios (Fig. 5). Formats we encountered include Q&A, bullet-point descriptions, overarching topics, summarising figures with accompanying text, multi-paragraph narratives, or a table with potential scenario aspects, depending on what seemed the best structure. Such a table can be considered a useful starting point and an effective connection between the preparatory research and first storylines for scenarios (Fig. 6).

It is central to the CINA approach that scenarios are dynamic storylines which are subject to change as new insights should trigger adaptations in them. First, the time between workshops is rarely uneventful. Either on the landscape or regime level, events happen that might trigger a shift in priorities and change the circumstances under which the planned innovation can and will flourish, for example, in Finland, where newly elected politicians pushed for favourable policy

1

WILD KIDS

Welcome to participate in a school competition project for pupils in grade 4 and 5!

It's free for all teachers and schools in the region to register, it's free of charge and of course with a content that can be linked to the curriculum.

The students' assignments are designing a day trip in the forest - for a specific target group.

The excursion should contribute to an extensive experience of the forest's width and positive properties. The specific target groups are defined together with our partners and are real "cases", i.e. target groups that do not have the same conditions for getting out into the forest.

Suggestions for target groups: The Young Deaf Association, Young people with visual impairment, Autism and Asperger Society and Children with disabilities.

The work of designing a holistic forest excursion is carried out with the support of coaches / mentors from the different target groups and partners with special competences (partners, the scouts, Swedish outdoor association etc.). The forest excursion must meet the different needs of the target groups and at the same time offer a holistic forest experience.

The winners are appointed by a jury consisting of Special Education Authority and the project partners. The contribution that in the best way has been able to show understanding for the target group and then designed a relevant content that both enriches and challenges, wins.

The win is a real Wild Kids overnight stay in the forest for the whole class, or money for the class cash.



2

CERTIFIED OUTDOOR GUIDE

Are you in year 7 or 8? Do you want to become a certified outdoor guide in your local forest area? Ask your teacher to sign your class up to Universeum's new school project!

The mission is to plan and carry out an outdoor activity for newly arrived Swedes.

The classes work in groups and are each awarded an outdoorcoach from the project partners, the scouts, Swedish outdoor association or similar. During the work-period (march-june) you should visit the places and stick out a path, decide on stops and what you should talk about at the various stops. By guiding each other, and your coaches, you train on how to capture interest, spread knowledge and exercise leadership.

The groups should work on a number of support issues in order for all guided tours to hold similar arrangements and be able to be assessed in a similar way:

1. What is interesting about the place from a biological perspective?
2. What activities can be carried out there?
3. What happens to the place if one violates the right of public access?
4. What will the site look like in 20 years?

The final assignment, the actual guidance of the new-Swedes, is carried out for a maximum of 1 hour. After completed tour the guided groups will evaluate their experience and assess your approach, the content and how well you have completed the tour as a whole.

After taking part of the evaluation you will be named certified outdoor guide, which is announced in the form of neat diploma and nice prizes.



3

CLIMATE CHALLENGE

These are proposals for a classical school project for pupils in year 7-8 with student inspiration, teacher training, own work and assignment reporting with award ceremony.

The assignment is to identify, investigate and propose a solution to a climate problem in its neighborhood.

Student inspiration: Think about your world without trees - what is affected if all trees are gone? Study visit: in forests that have been affected in various ways, after fire, after storm or after major environmental impact, and then compare it with unaffected forest.

Students must first understand and identify a climate problem that affects them. Then come up with concrete facts about the problem - how does it look, why has it become like this? The classes can, for example, measure the air quality in their school area and then compare it to a forest area. Does it differ, what role does the forest play?

The classes will then meet with experts (researchers, partners) in order to get help coming up with different solutions to their problems. Together, they find out who they need to influence to get the problem and their solution noticed.

The final work consists of creating a product that shows the solution and shaping it so that the person (s) who could do something about the problem (politicians, organizations, authorities) pay attention to the issue.

The class that has managed to create the most effect or been extra creative with its solution collects the prize: climate compensations and tree planting in the schoolyard.



Fig. 5. Example of CINA scenarios for prototype assessment workshop in the Gothenburg case (Brogaard et al. 2020).

Aspect	Scenario 1: Authority-driven mechanism	Scenario 2: Voluntary contracting	Scenario 3: Nature values bank
Actor configuration	<ul style="list-style-type: none"> • Landowners offer sites for restoration • Added (nature) value assessed by the authority or an assigned expert • Authority chooses suitable offset sites • (Moderate) monitoring responsibility with the authority 	<ul style="list-style-type: none"> • Landowners offer sites for restoration • Assessment carried out by an accredited consultant • Compensating actor receives a certificate • Landowner restores and possibly manages the site • Consultant will monitor impact of offset • Authority sets principles for contract and oversees legality of contracts 	<ul style="list-style-type: none"> • Landowners offer sites for restoration • Bank monitors sites and development of nature values • Authority oversees only the bank
Governance arrangement	<ul style="list-style-type: none"> • Authority sets the conditions 	<ul style="list-style-type: none"> • Terms negotiated between the actor needing the compensation and the landowners offering the offsets 	<ul style="list-style-type: none"> • Bank sets conditions for offsetting, following legal and possible strategic guidance principles
Organisational embedding	<ul style="list-style-type: none"> • Ministry of the Environment • Ministry of Agriculture and Forestry 	<ul style="list-style-type: none"> • Landowners' Union • Ministries • Companies needing compensations • Consultants 	<ul style="list-style-type: none"> • Nature values bank, which is a foundation like actor and an intermediary
Business model	<ul style="list-style-type: none"> • Government-driven, can include competitive supply 	<ul style="list-style-type: none"> • Supply and demand develops in a network like market 	<ul style="list-style-type: none"> • Landowner sells or leases the sites to the bank as nature capital • Bank sells added nature values to actors needed compensations • Supply and demand meet through bank
Role of citizenry	<ul style="list-style-type: none"> • Legal hearings? 	<ul style="list-style-type: none"> • Expressing social demand for compensation? 	<ul style="list-style-type: none"> • Small / no role? • Expressing social demand for compensation?
Role of technology & science	<ul style="list-style-type: none"> • Moderate, organized & predictable demand for impact assessment & monitoring • Selection & pairing of sites can benefit from new technologies & algorithms 	<ul style="list-style-type: none"> • Impact assessment & monitoring can benefit from innovative knowledge processing • Selection & pairing of sites can benefit from new technologies & algorithms • Possibly new virtual market space 	<ul style="list-style-type: none"> • Impact assessment & monitoring can benefit from innovative knowledge processing • Selection & pairing of sites can benefit from new technologies & algorithms • Possibly new virtual market space

Fig. 6. Example of tabular scenarios from Finnish case (Aukes et al., 2020b).

change (Pekkonen et al., 2020) or when in Fiera di Primiero, Eisenwurzen, Liberec and Gothenburg natural disasters related to forests occurred (Brogaard et al., 2020; Bussola et al., 2021; cf. Špaček et al., 2020; Schleyer et al., 2022; cf. Kister et al., 2020). Second, supplementary material was presented alongside the actual scenarios to make them more vivid and imaginable, involving, for example, general descriptions of ecological compensation as in Finland (Pekkonen et al., 2020) or more detailed versions of the scenarios, which happened in Gothenburg, Fiera di Primiero, and Eisenwurzen (Brogaard et al., 2020; Bussola et al., 2021; Schleyer et al., 2022; cf. Kister et al., 2020). Neither of the scenarios presented in the cases has turned out in the way the literature would suggest. The extensively empirically prepared, intensively thought-out and detailed scenario narratives that we proposed as

benchmarks were not realised for various reasons: workshop opportunities arose before they could have been finalised; innovation workers' insistence on simple tabular overviews (even though it had been explained that elaborated texts make the links between individual bullet points and the contextual conditions explicit); and understandability for mostly non-academic stakeholders.

Specific examples of learning from what transpired during CINA workshops occurred in the Eisenwurzen and Finnish cases. In Eisenwurzen, a more or less clear-cut new, platform-oriented scenario emerged during the first visioning workshop alongside the initial three product- and service-oriented scenarios (Schleyer et al., 2022; cf. Kister et al., 2020). During that workshop, stakeholders declared their urgent interest in more cooperation that could be facilitated through an

institutionalised stakeholder network or platform. It even transpired to be important enough to dedicate a prototype development workshop to that scenario, in which three organisational forms were brought up for discussion. Learning also illustratively occurred in a strategic workshop in Finland, where stakeholders terminated two scenarios due to their overall thrust. There, the stakeholders suggested incorporating elements from the dismissed scenarios into the remaining one (Pekkonen et al., 2020).

4.5. Practice puzzle 5: Reflecting on prototypes

Stipulated as a core focus for EU Innovation Action projects, the notion of ‘prototypes’ conjures up images of technological machinery, which, at first, was difficult to adjust to the topic of governance innovation.¹⁴ The idea is that the innovations developed in their own individual contexts can also be abstracted to a general or ideal type. Before drawing conclusions and spending large sums on an innovation idea that is not yet experimented with or tested, variations of the innovation idea should undergo critical reflection by a potential user community and other stakeholders. Hence, developing a prototype precedes its testing in a piloting stage. Nevertheless, we argue that it can be adequately integrated with CINA’s scenario thinking. In practice, the terms ‘scenario’ and ‘prototype’ may overlap but are not synonymous. A set of scenarios may describe an equal number of *distinct* prototypes, but it is also possible that a set of scenarios describes *versions* of one and the same prototype. Thus, the InnoForEST cases had to develop, assess and ideally-implement an innovation prototype.¹⁵

Over InnoForEST’s three years, various prototyping results have seen the light. Owing to the varying starting situations and different levels of success in the development process, the prototypes range from incremental to more paradigmatic changes. In Eisenwurzen, the discussions during CINA workshops have led to the broadly supported request to develop a tighter collaboration between stakeholders in the value chain for forests and wood. Compared to the original ideas, which revolved around Tiny Houses, furniture and design, and nature education, this represented a considerable extension and change of focus. A redirection that has taken place from a pure forest/wood-product and -service orientation to the development of stronger networking of stakeholders through the establishment of a cooperation platform. Although this process was ongoing at the time of writing, some local stakeholders had already revealed their willingness to commit to carrying this idea further (Schleyer et al., 2022; cf. Kister et al., 2020). In other cases, such as Liberec and Finland, the prototype was much more concerned with the legal relationships between stakeholders because, and perhaps unsurprisingly so, in both cases the innovation related to compensation schemes that rely on some kind of contractual security (Pekkonen et al., 2020; cf. Špaček et al., 2020). Nevertheless, whereas it became clear quite early in the Finnish case that voluntary compensation was the way to go, there were still quite some options on the table in Liberec. There, the local innovation workers were discussing the possibility of (a) national-level, top-down regulation of their forest ecosystem services, (b) whether a market including an external certification authority can be organised, or (c) whether the ‘payments for ecosystem services’ scheme should predominantly remain in the hands of the local community. Finally, in the German case of Mecklenburg-Western Pomerania, two further developed variants of the current payment scheme are on the table (Adolph, 2020). One variant would attempt to further specify the

¹⁴ Although ‘prototyping’ as a design activity has already found a broader meaning in innovation policy, where it can support the development of citizen experiences, policies, public offer experiences, organisational structures, systems, processes, and spaces (Kershaw et al., 2021), it is still relatively uncommon in the domain of governance innovation.

¹⁵ The CINA approach with its scenario thinking was but one element of InnoForEST’s “interactive prototype development” (e.g. Practice Puzzle 3).

current forest share, particularly with respect to how realistic the compensation algorithm is. Another variant envisions the combination of the current forest share with other similar regional payment schemes that concern swamps and meadow orchards respectively. For CINA, this involvement in prototype assessment illustrates the additional complication of coming to terms with other notions introduced by other relevant stakeholders, in this case the EU. Discussions with innovation workers about what a ‘prototype’ means in general, as well as what it could mean in their case context added an additional layer of complexity to the CINA processes.

4.6. Practice puzzle 6: CINA as (element of) the innovation process

When the CINA approach was introduced as foundation for the innovation processes at the start of InnoForEST, two different interpretations of its role emerged:

1. One variant emphasised the strategic workshops and reduced the innovation work to the implementation of the three workshop types or to several runs of each workshop type (cf. Section 2.2).
2. The other variant understood the innovation process as more diverse, including: thorough exploration of the situation, outreach and continued discussion with stakeholders, working meetings as ongoing activities and the strategic CINA workshops as occasional highlights punctuating the innovation process.

Both interpretations can be useful, depending on the circumstances. When stakeholders were unwilling to budge, innovation workers appreciated getting at least some attention and outreach by means of the strategic workshops. When it was easier to mobilise stakeholders and come up with attractive ideas for innovation, the innovation work could naturally happen on a broader basis and the workshops had more of a function of focusing and channelling the innovation work already underway at certain points.

The CINA process was often complemented by bilateral and smaller group meetings. This occurred at earlier stages when ideas were collected and stakeholders mobilised in several cases, but also in Eisenwurzen in the form of ‘task force’ meetings when a prototype had been found and more focused interactions took place to follow it up. There were also additional events that were only loosely connected to InnoForEST and CINA, such as a follow-up workshop of Čmelák (in the Liberec region) and a meeting on pyrolysis in Eisenwurzen as a side project to InnoForEST that connected to the regional stakeholder network, used the platform, and then left (see Loft et al., 2020).

Innovation workers did not include as broad a spectrum of actors as possible in all cases. Thus, in Mecklenburg-Western Pomerania, during politically tense phases, expansion was postponed until the innovation idea had more strongly crystallised and the political tensions had eased. In Eisenwurzen, a large region that touches three Austrian provinces, the change of workshop location enabled the involvement of other actors who would not have travelled the long distance. However, this change led to at least the temporary loss of some stakeholders who partook before but now found the journey too far. Nevertheless, this location changes also became a test of who was sufficiently interested in the innovation to go the extra mile. In the Gothenburg and Finland cases, the composition of stakeholders changed due to evolving interests. As such, previously prepared scenarios did not always match the interest of the stakeholders participating at a workshop. Consequently, scenarios either had to be dropped or changed to accommodate the ‘new’ participants, or, if not, those participants could not relate to the developed scenarios (and did not return).

4.7. Zooming out: Puzzles and boundary objects that work

Boundary objects played an integrating role in all six puzzles, and between them (Table 5). First, they represented the holding device for

Table 5
Types of boundary objects, their value for achieving convergence and between whom.

Boundary object	Convergence value	Convergence opportunity for
Scenarios	Thematic focus Innovation concretisation Collaboration cause	Innovation workers – CINA agents Innovation workers – Stakeholders
Documentation	Comparative information Inspiration	Innovation workers – CINA agents Innovation workers – Innovation workers Innovation workers – Project administration
Deliverables	Public information Making FES approaches & contexts visible Justification for funding received	Innovation workers – CINA agents Innovation workers – Innovation workers Innovation workers – Project administration – EU Commission

the evolving innovation ideas over time and across the sequence of CINA workshop types. Second, in the training and coordination efforts towards concerted innovation work in all regions, they served as a training and content delivery tool, through which people could discuss and often concretise exchanges about FES alternatives and approaches. Third, they manifested the results of situation and context recognition and could be made accessible across regions. Fourth, they presented the intellectual challenge of building exciting and viable alternatives. When these were available in raw form, they fulfilled the aforementioned functions and became boundary objects themselves as prototypes (in scenarios or concrete plans). Fifth, all innovation efforts running parallel to this could more easily engage with the tangible convergence products that the boundary objects were developing into, make concrete reference to them, contribute to them or refrain from them again if they did not fit. Boundary object can be anything, abstract or concrete, not only artefacts such as documents, a device, things, but also a goal, a forest, a law, an economic model-whatever is suitable for working together on the matter across divergences of perspective (Bowker and Star, 1999; Akkerman and Bakker, 2011). A scenario as a boundary object may indeed be both, an artefact and an idea, written down in a document and exist in thinking as a concept of something crucial.

Boundary objects were used on two levels: scenarios as boundary objects both in the exchanges between the innovation workers and agents, on the one hand, and the stakeholders, on the other, and between the innovation workers and the CINA agents. In addition, there was documentation¹⁶ of meetings with stakeholders (CINA workshop and others), which the regional partners could use to keep internally aware of their own state of affairs and to keep the CINA agents who were not always on site and the project up to date for administrative and research purposes. Finally, the third type of boundary objects, the deliverables, served to provide public visibility and information about FES approaches and their working conditions, as well as to justify the use of EU funds in accordance with the contract. Both the communication of results and the justification were means to involve the EU Commission level. The scenarios were primarily of a content-related and relationship-building function, the documentations served content-related and analytical coordinating purposes, and finally the deliverables served content-related and project-administrative purposes.

5. Discussion

Having introduced CINA as a dynamic, multi-faceted, longitudinal approach allows us to discover new sides to the matter related to workshop engagement, boundary objects, combining CINA with other approaches, the negotiation of scenarios, and CINA under pandemic circumstances. First, we have seen the importance of engaging with stakeholders *between CINA workshops*. This is precisely where the

sustainability of innovation work becomes apparent: when it develops its own dynamic that only uses the CINA impulses strategically, but no longer fully relies on them. Thus, we conceptualised and introduced CINA workshops as ‘strategic workshops’. This should not be confused with the fact that the workshops are also used to design and specify strategies in addition to demand articulation (Te Kulve and Konrad, 2017; Te Kulve et al., 2018). Besides the socialising role of workshops, it was important to stay in close contact during time in-between the workshops. Here, the goals, measures and strategies agreed upon at the workshops had to be implemented, and the commitment had to be carried over into everyday life. After all, the project should have given visible impulses after three years. It was therefore not irrelevant whether and when something from the workshops would be taken up. The results of the workshops had to be implemented. The continuous, structural accompanying of innovation efforts in the field (instead of only setting individual workshop impulses) is a methodological innovation that we hereby claim for CINA compared to conventional TA/CTA.

The approach has an “insertion method” (Rip and Robinson, 2013), as there are existing routines and habits in a regional setting, whether there are CINA efforts or not. To repeatedly initiate a special quality of innovation work here only succeeded by repeated involvement beyond the workshops and thereby irritating ingrained routines in a somewhat subtle and tolerable way (cf. Fisher et al., 2006; Fisher, 2007). Nevertheless, CINA also provides a framework ensuring continual innovation work impulses that pick up on the dynamics on the ground. This helps to build something more substantial within the EU project framework. Therefore, the approach is best summarised as structure-offering “flow heater” mediating between the EU project and local dynamics.

Second, there is an infra-level structuration that is closely linked to specific *boundary objects* and *convergence work* efforts. Boundary objects helped people to join around a shared task. The tasks and objects were motivating to develop shared focus to some extent, though never completely. When the divisive aspects recede into the background and what unites takes centre stage in the form of an accepted and living boundary object, we speak of “convergence work”. Key convergences we observed and fostered were, related to the views, interests, and forest governance foci of the participants. After all, the notion of convergence work originally had a socio-cognitive focus (Stegmaier, 2009). Yet there was also this work-floor level of convergence that was tackling tensions between novelty and incumbency, various (partially diverging) tasks, process starting points, and efforts. These new findings emphasise the dimensions of ambition and collaboration in convergence work as well.

The boundary objects played an integrating role within and between puzzles 1–6. On the one hand, their own puzzle was to develop in such a way that they would be inviting enough to look at and struggle with constructively. On the other, it was a matter of further developing them from the function of marking differences that can be discussed together to a function of convergence that makes commonalities and differences manageable. The extent to which this succeeds in a project can be a yardstick for the degree of integration or better: rapprochement. When this happens, not only does the definition or attribution of “boundary” change to “convergence”, but a sense of togetherness or cooperation goal is formed. This means that on a meta-level, not only the object of

¹⁶ The documentation referred to should not be confused with reports, which were only given as administrative duties to coordinate the multi-site project. The latter, however, could also contribute a smaller dose of communication between different project levels and parts.

interest, but the identification of shared interest and its orientation become tangible.

Not everything converged, of course. Contents, processes, and personal groupings sometimes drifted apart and were no longer treated as a common cause. In [Loft et al. \(2020\)](#) we referred to such moments for all regions involved and traced developments as innovation journeys. We distinguished docking/undocking,¹⁷ forking/coupling,¹⁸ and shifts.¹⁹ It is important to note that we have always conceived of these moments in pairs, not only unilaterally as a movement of convergence, but always also as a movement of divergence. Convergence is a goal, but there is no guarantee, and not everything can or must converge. Some issues will remain subject to boundary work.

Third, the *InnoForEST* project with its overlapping methodological approaches has shown that CINA can also be *combined* with several other (intervention) methods (cf. [Rip and te Kulve, 2008](#); [Rip, 2018](#); [Stegmaier, 2020](#); [Douma et al. 2007](#)). There were workshop formats that divided the time for scenario work and other exercises. However, it was also found that when we started working with scenarios in depth, there was hardly any time left to do anything else. As such, we advocated when combined with other various methods-not as a matter of principle, but because the time and effort associated with using this technique should not be underestimated. The other methods also had to be coordinated with the scenario approach so that participants would not experience the workshops as inherently inconsistent. Ideally, the elements would build on and complement each other-which usually meant that the other methods served in some form to deepen, outline, prepare or follow up the actual scenario work.

Fourth, related to the way we presented CINA, it was important to work with the stakeholders on what *their* scenarios should or must look like, how one wants to change them or which (aspects) one wants to put aside. After we had experimented selectively with CINA-style interaction in an earlier project ([Visscher et al., 2020](#); [Stegmaier and Visscher, 2017](#); [Hamaker-Taylor et al., 2018](#); [Stegmaier, 2020](#)), we were now able to test this project's approach as the central approach that all those involved had to address while we kept the implementation flexible, i.e., case-sensitive.

Nevertheless, some innovation workers in the regions reported that they felt insecure with the unfamiliar CINA approach and the deliberative work with the stakeholders as they felt they had not communicated the process as confidently to the stakeholders as necessary. As CINA agents, through a lot of communication during the preparation and participation in the workshops, we continuously encouraged the innovation workers to lower these inhibitions and to strengthen them in their work.

The pragmatic omission of scenarios during a strategic workshop by the local innovation workers, for example because important stakeholders were missing for a scenario, was rather inappropriate from this perspective. However, the teams of innovation workers in regions that have occasionally done this did not fail because of it. It is not possible to say with certainty what would have happened if they had negotiated the omission directly with the stakeholders-for example, what impulses of any kind might have resulted from it.

This is a tremendously important point. Participatory processes, stakeholder work and the use of scenarios are no longer completely new-although some people still need to learn how to do it themselves. Dealing with this over a longer time and consistently aligning the entire

¹⁷ "External events/projects/activities in relation to a given innovation effort temporarily join the innovation project for the time being, then either integrate or go separate ways again" ([Loft et al. 2020](#)).

¹⁸ "Development of two or more ideas for scenarios out of a more general idea Conjunction of scenario ideas (potentially scenario selection)" ([Loft et al. 2020](#)).

¹⁹ "Change of focus regarding criteria, problem framing, participating personnel, aims and objectives, etc. (not per se a change of maturation level)" ([Loft et al. 2020](#)).

relationship work with the stakeholders with it was not-and perhaps never is-trivial. It changed those who carried out this work. They had to change, adapt to changing situations and engage in sometimes arduous learning processes and make their own mistakes before they saw success (if at all). Innovation agents came from different practices and routines,²⁰ and had motives and objectives that differed from initiating change processes with the other stakeholders, first accompanying them to some extent, and then making them the sole owners of the process. This is not often found in the textbooks and praises of the 'participatory world' (but for some enduring dilemmas, see: [Loeber, 2004](#)).

Fifth, although we are introducing an integrated, longitudinal multi-stakeholder involvement approach as a method with core elements, i.e., a series of strategic workshops with specific, evolving focus, and thought-provoking scenarios, we want to stress that this can by no means be taken as a recipe to simply be copied into any real-life governance innovation situation. Ideal textbook methods require translation and adaptation to the situation at hand and practical factors will impede the implementation of the ideal form. Thus, the impact of practical vicissitudes is not only indicated by varying workshop sequences across our cases stemming from their concrete innovation journeys. We argue that such *translation effects* need to be taken into consideration for other similar methods as well.

Despite what is commonly called the "replication crisis", the above examples in the implementation of our 'textbook' method illustrate that we need to reframe our understanding of the knowledge claims attached to qualitative, empirical social science methods ([Pratt et al., 2020](#)). In other words, the trustworthiness of this kind of qualitative research does not increase as the similarity of method application increases. Rather, the better a method can adapt to the real-life circumstances and change with them, the more robust the qualitative knowledge claims that can be derive from their results ([Yanow, 2014](#)).²¹ As [Yanow \(2014\)](#) eloquently asserts, even notions of 'comparison', 'comparability', and 'generalizability' take on different meanings that are beyond the scope of this article (see also [Adcock, 2014](#)). For CINA, it remains to be said that from this perspective, its flexibility and adaptability in real-life contexts is a strength.

Finally, a comment on the *controllability of innovation processes* and COVID-19. More than any other unforeseeable event, the pandemic has shown us how innovation processes can be planned and how little can go according to plan. Not only can participants change their views or motivations, or weather events occur in the affected forest areas with consequences for the participants working in and with the forest (storm Vaia in Trentino), but crises can happen-namely, a global pandemic. At other times and in other fields, a financial crisis would also have had significant effects. All the innovation work and, by extension, CINA were designed to include face-to-face meetings and exchanges. COVID-19 caused delays, with the immediate meetings having to be cancelled or postponed. In some cases, it was possible to hold hybrid events at low-risk times, such as the final roadmapping (CINA type 3) in the Eisenwurzen. If the pandemic had happened at an earlier stage, there would have been pressure to develop methods for working on the innovations that are feasible under pandemic conditions-such as online-based or with social distance and mask-wearing in the field.

After all the experiences of how differently the Innovation Action and CINA work was interpreted in the regions, we have no doubt that it is possible to develop formats that work interface-to-interface or masked-face-to-masked-face. We think that exploring this direction

²⁰ For the CINA approach, it was a risk, when workshops involved considerable time of frontal lecturing instead of early and active stakeholder involvement. The discussion could have started right away, because (i) participants had something to say, (ii) they had their thoughts ready, or (iii) because of pressing open questions in the room that required talking and arguing about.

²¹ For an extensive discussion of quality criteria in this kind of qualitative research, see [Schwartz-Shea \(2014\)](#).

further also creates opportunities to implement transregional and more spontaneous meetings in fruitful and personal relationship-building ways.

6. Conclusions and outlook: Developing CINA further, possible directions

We conceive of CINA as an integrated approach allowing for tailor-made stakeholder interactions, that consider specific innovation contexts including their social, political, economic, and ecological circumstances. CINA inspires and stimulates the assessment and development of tangible, plausible innovation options as a collaboration between enactors, for example, individuals or organisations who want to innovate, and other stakeholders. By creating plausible scenarios as ‘boundary objects’ built around prototypes and discussing them with stakeholders, tensions between stakeholders’ views of the past, present, and future can be made productive, and positions eventually converge. Thus, CINA is an approach for *reflecting* on prototypes in the broadest sense, *assessing* their value and future potential, and *fostering* their further development.

Unlike often in CTA, we have chosen a phase approach to carry out the CINA workshops. CINA thus not only concentrates on an early point in time when lots is still open and changeable, nor on a middle point in time when one can already recognize a direction and at the same time influence or fine-tune it, and equally as little on one late point in time at which one can only determine the further way. Rather, as we have practised in InnoForEST, CINA extends over the entire course of the innovation project. We combine different workshop formats that are important for innovation work at the respective times with different functions (innovation visioning/selection, prototype assessment, road-mapping). This means that we strive to *turn the Collingridge dilemma into an opportunity*: to use the possibilities of early multi-optionality to build up a broad range of alternatives, to get to know the conditions, feasibility and limits of their realisation in the further course and, in the later course, to learn from this and recognise better options for shaping the already advanced, no longer so open spaces.

Finally, in the light of what has been said before, we want to discuss and suggest a few directions in which the further development of the CINA approach could go. It would only be logical to *diversify* both the number and the type of workshops even more broadly, because in areas other than forest ecosystem services with a regional focus, other perspectives may become important. Even in the InnoForEST project we sometimes had two to three visioning / selection workshops (CINA type 1) before we could continue working on a prototype. One could say that InnoForEST has shown that CINA can, no matter how often, be expanded as required (“CINA on demand”, if you like). For this, of course, the resources (e.g., time, personnel, expertise) must be available (which was ideally the case in this project) and the task of the communication with the regional partners changes. This not only means adapting an existing scheme of workshop types to suit the case, but also inventing new types and making them suitable for a CINA process. For example, the current COVID-19 pandemic circumstances suggest innovations that make stakeholder interaction possible online or at a safe distance without losing the intimacy necessary for a lively exchange.

We will have to provide an *extended toolbox*, which can be fed from other existing CTA / CINA experiences, but also get new CINA inserts, where one can specifically try out more. This is accompanied by an evolving need for research. So far, it was enough to research the initial situation thoroughly before the first CINA workshops and then pragmatically evaluate the interactions. We have the impression that the current situation should have been thoroughly updated before each workshop in order to get even more out of the workshops. This needs to be done in such a way that stakeholder fatigue through repeated interviewing can be avoided—for instance, through carefully reconstructing changes in stakeholder views during workshops or being present at talks with stakeholders that have a more pragmatic character dealing with

practical issues of innovation work. If there are even more formats and workshop moments, one probably needs a thorough update of the strategic intelligence that clearly outlines changes—even where they are superficially and not easily seen from the pure action perspective of direct innovation work. That is, one must have the opportunity to look systematically and more deeply instead of always assessing the situation under the pressure of action. Otherwise, there is the danger of getting overwhelmed.

One of the strengths of the CINA approach in InnoForEST, inherited from CTA, was that we researched the situation very thoroughly at the beginning, including the “tracking of expectations, agenda setting and emerging networks” (Van Merkerk and Robinson, 2006). To do this, we used two research perspectives that have proven to be very helpful: the Stakeholder Analysis (Schleyer et al., 2019) and the Governance Situation Assessment²² (Aukes et al., 2019, 2020c). The first was already planned in the project application. The second developed ad hoc, due to emerging needs of completing the picture of the situation. In it, we *combined perspectives from innovation and governance research* in a context in which innovation studies is not overly common way. If lots of accompanying research is conducted and feedback options are offered, as is the case in InnoForEST—instead of simply letting a few innovation attempts run unconnected—, then it would be only logical to also reconstruct the learning curve that the individual innovation projects go through and to provide information with targeted reflection (Loft et al., 2020, section 7.7).

What has been broadly missing so far because it is only considered implicitly, is the systematic observation of how the individual initiatives learn during the innovation phase accompanied by CINA work (for examples in this direction, cf. Parandian, 2012; Marris et al. 2008). We assume that learning that can also question and revise previous approaches—*second order learning* (Hall, 1993; Argyris and Schön, 1978)—cannot do so without empirical foundations and interaction formats that go beyond mutual reporting, as is often the case at meetings of consortia. This would include an interactive and empirically-informed working level of reflection in such projects, which must be well-equipped—above all, there must be time and leeway. Perhaps general research on purely scientific publication should mostly take a back seat—although one could also imagine that this collective reflection work, which is empirically founded, can first be well reconstructed and would also be worth reporting in specialist publications. This would not be limited to mere evaluation.

It will also be important to prepare a set of appropriate practical perspectives for use—a *CINA toolbox*—so that they can be chosen and used in combination and that it becomes clear what is fundamentally needed and what can be added or omitted as required.²³ A more detailed concept for training colleagues in the various regions and institutes who come from different professions and disciplines could be developed. We ‘taught’ the CINA approach in part by directly accompanying the individual regional innovation processes. As a result, we were able to adapt to the demands of our colleagues very individually, but we also noticed that the means for training and manoeuvre criticism are reaching their limits. To do this, one could create demand-based joint learning opportunities and an overarching training concept as standard feature for EU Innovation Actions and other project frameworks (cf. Schleyer et al., 2020). It will also be important to prepare a set of appropriate perspectives from the two research traditions mentioned for users so that

²² Governance Situation Assessment (GSA) was a research task that we introduced in addition to the original plans in the project agreement when we realised that the analysis of stakeholder perspectives and interests would not be sufficient to adequately capture the respective regional contexts. The GSA combines a heuristic on the past, present and discernible trends of the FES situation in the respective region with an analysis of the problem structure according to Hoppe (2010).

²³ Cf. the CTA toolbox (<https://cta-toolbox.nl/>).

they can be chosen and used in combination and that it becomes clear what is fundamentally needed and what can be added or omitted as required.

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.

Data availability

The data for this article are available through EU H2020 project documentation on innoforest.eu.

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References

Various mentions of Anonymous in the text refer to details omitted for double-anonymized reviewing

- Abels, G., 2007. Citizen Involvement in Public Policy-making: Does it Improve Democratic Legitimacy and Accountability? The Case of pTA. *Interdiscip. Inf. Sci.* 13, 103–116. <https://doi.org/10.4036/iis.2007.103>.
- Adcock, R., 2014. Generalization in Comparative and Historical Social Science: The Difference Interpretivism makes. In: Yanow, D., Schwartz-Shea, P. (Eds.), *Interpretation and Method: Empirical Research Methods and the Interpretive Turn*, 2nd ed. M.E. Sharpe, New York, pp. 80–96.
- Adolphi, P., 2020. Documentation of Constructive Innovation Assessment (CINA) workshops: InnoForEST Innovation Region Waldaktie Mecklenburg-Vorpommern, Germany. D4.2 subreport, InnoForEST, Eberswalde. <https://innoforest.eu/enabling-innovation/#fusion-tab-deliverables> (accessed 27 May 2021).
- Akkerman, S.F., Bakker, A., 2011. Boundary Crossing and Boundary Objects. *Rev. Educ. Res.* 81 (2), 132–169. <https://doi.org/10.3102/0034654311404435>.
- Argyris, C., Schön, D.A., 1978. *Organizational Learning: A Theory of Action Perspective*. Addison-Wesley, Reading, MA.
- Arnstein, S.R., 1969. A ladder of citizen participation. *J. Am. Inst. Plan.* 35, 216–224. <https://doi.org/10.1080/01944366908977225>.
- Aukes, E., Stegmaier, P., Hernández-Morcillo, M., 2019. Deliverable 5.1: Interim Ecosystems Service Governance Navigator & Manual for its Use, InnoForEST, Eberswalde. <https://innoforest.eu/enabling-innovation/#fusion-tab-deliverables> (accessed 30 November 2020).
- Aukes, E., Stegmaier, P., Schleyer, C., 2020a. Deliverable 4.2: Set of reports on CINA workshop findings in case study regions, compiled for ongoing co-design and knowledge exchange, InnoForEST, Eberswalde. <https://innoforest.eu/enabling-innovation/#fusion-tab-deliverables> (accessed 30 November 2020).
- Aukes, E., Stegmaier, P., & Schleyer, C., 2020b. Deliverable 5.3: Final report on CINA workshops for ecosystem service governance innovations: Lessons learned, InnoForEST, Eberswalde. https://innoforest.eu/wp-content/uploads/innoforest-deliverable-5_3.pdf (accessed 26 May 2021).
- Aukes, E., Stegmaier, P., Hernández-Morcillo, M., 2020c. Deliverable 5.5: Ecosystems Service Governance Navigator & Manual for its Use, InnoForEST, Eberswalde. <https://innoforest.eu/repository/d5-5-overview/> (accessed 11 March 2022).
- Bishop, P., Davis, G., 2002. Mapping public participation in policy choices. *Aust. J. Publ. Admin.* 61 (1), 14–29.
- Bowker, G., Star, S.L., 1999. *Sorting Things Out: Classification and Its Consequences*. MIT Press, Cambridge, MA.
- Brogaard, S., Törn-Lindhe, C., Krause, T., Maria Hertog, I., 2020. Documentation of Constructive Innovation Assessment (CINA) workshops: InnoForEST Innovation Region Ålska Skog/Love the Forest (Gothenburg, Sweden). D4.2 subreport, InnoForEST, Eberswalde. <https://innoforest.eu/enabling-innovation/#fusion-tab-deliverables> (accessed 27 May 2021).
- Bussola, F., Falco, E., Aukes, E., Stegmaier, P., Sorge, S., Ciolli, M., Gagliano, C., Geneletti, D., 2021. Piloting a more inclusive governance innovation strategy for forest ecosystem services management in Primiero, Italy. *Ecosyst. Serv.* 52, 101380. <https://doi.org/10.1016/j.ecoser.2021.101380>.
- Cabinet Office 1999. Modernising Government, <https://webarchive.nationalarchives.gov.uk/20131205101137/http://www.archive.official-documents.co.uk/document/cm43/4310/4310.htm> (accessed 26 May 2021).
- Callon, M., 1999. The Role of Lay People in the Production and Dissemination of Scientific Knowledge. *Sci., Technol., & Hum. Values* 4, 81–94. doi:10.1177/02709172189900400106.
- Carlile, P.R., 2004. Transferring, Translating, and Transforming: An Integrative Framework for Managing Knowledge Across Boundaries. *Organ. Sci.* 15, 555–568.
- Chivers, J., 2008. Deliberating Competence. Theoretical and Practitioner Perspectives on Effective Participatory Appraisal Practice. *Sci., Technol., & Hum. Values* 33, 421–451.
- Collingridge, D., 1980. *The Social Control of Technology*. Pinter, London.
- Costanza, R., de Groot, R., Braat, L., Kubiszewski, I., Fioramonti, L., Sutton, P., Farber, S., Grasso, M., 2017. Twenty years of ecosystem services: How far have we come and how far do we still need to go? *Ecosyst. Serv.* 28, 1–16. <https://doi.org/10.1016/j.ecoser.2017.09.008>.
- CTA Toolbox Project, 2020a. 'Toolbox' for researchers, technology developers and engineers. <https://cta-toolbox.nl/> (accessed 27 May 2021).
- CTA Toolbox Project, 2020b. Scenarios. <https://cta-toolbox.nl/tools/scenarios/> (accessed 1 February 2021).
- Davenport, S., Leitch, S., 2005. Public participation: Agoras, ancient and modern, and a framework for science–society debate. *Sci. Publ. Policy* 32, 137–153. <https://doi.org/10.3152/147154305781779605>.
- Dick, J., Turkelboom, F., Woods, H., Iniesta-Arandia, I., Primmer, E., Saarela, S.-R., Bezák, P., Mederly, P., Leone, M., Verheyden, W., Kelemen, E., Hauck, J., Andrews, C., Antunes, P., Aszalós, R., Baró, F., Barton, D.N., Berry, P., Bugter, R., Carvalho, L., Czúcz, B., Dunford, R., García Blanco, G., Geamăna, N., Giucă, R., Grizzetti, B., Izakovičová, Z., Kertész, M., Kopperoinen, L., Langemeyer, J., Montenegro Lapola, D., Liqueste, C., Luque, S., Martínez Pastur, G., Martín-López, B., Mukhopadhyay, R., Niemela, J., Odee, D., Peri, P.L., Pinho, P., Bürger Patrício Roberto, G., Preda, E., Priess, J., Röckmann, C., Santos, R., Silaghi, D., Smith, R., Vădineanu, A., van der Wal, J.T., Arany, I., Badea, O., Bela, G., Boros, E., Bucur, M., Blumentrath, S., Calvache, M., Carmen, E., Clemente, P., Fernandes, J., Ferraz, D., Fongar, C., García-Llorente, M., Gómez-Baggethun, E., Gundersen, V., Haavardsholm, O., Kalóczkai, Á., Khalalwe, T., Kiss, G., Köhler, B., Lazányi, O., Lellei-Kovács, E., Lichungu, R., Lindhjem, H., Magare, C., Mustajoki, J., Ndege, C., Nowell, M., Nuss Girona, S., Ochieng, J., Often, A., Palomo, I., Pataki, G., Reinvang, R., Rusch, G., Saarikoski, H., Smith, A., Soy Massoni, E., Stange, E., Vågnes Traaholt, N., Vári, A., Verweij, P., Vikström, S., Yli-Pelkonen, V., Zuilian, G., 2018. Stakeholders' perspectives on the operationalisation of the ecosystem service concept: Results from 27 case studies. *Ecosyst. Serv.* 29, 552–565. <https://doi.org/10.1016/j.ecoser.2017.09.015>.
- Dóci, G., Rohrer, H., Kordas, O., 2021. Knowledge management in transition management: the ripples of learning. *Sustain. Cities Soc.* 79, 103621. <https://doi.org/10.1016/j.scs.2021.103621>.
- Ebner, M., Fontana, V., Schirpke, U., Tappeiner, U., 2022. Stakeholder perspectives on ecosystem services of mountain lakes in the European Alps. *Ecosyst. Serv.* 53, 101386. <https://doi.org/10.1016/j.ecoser.2021.101386>.
- Edelenbos, J., Klijn, E.-H., 2006. Managing Stakeholder Involvement in Decision Making: A Comparative Analysis of Six Interactive Processes in the Netherlands. *J. Publ. Admin. Res. Theory* 16 (3), 417–446. <https://doi.org/10.1093/jopart/mui049>.
- Edelenbos, J., Steijn, B., Klijn, E.-H., 2010. Does Democratic Anchorage Matter?: An Inquiry Into the Relation Between Democratic Anchorage and Outcome of Dutch Environmental Projects. *Am. Rev. Publ. Admin.* 40 (1), 46–63. <https://doi.org/10.1177/0275074009332064>.
- Felipe-Lucia, M.R., Martín-López, B., Lavorel, S., Berraquero-Díaz, L., Escalera-Reyes, J., Comin, F.A., 2015. Ecosystem Services Flows: Why Stakeholders' Power Relationships Matter. *PLoS ONE* 10, e0132232.
- Fischer, F., Forrester, J. (Eds.), 1993. *The Argumentative Turn in Policy Analysis and Planning*. Duke UP, Durham/London.
- Fisher, E., 2007. *Ethnographic Invention: Probing the Capacity of Laboratory Decisions*. *NanoEthics* 1, 155–165.
- Fisher, E., Mahajan, R.L., Mitcham, C., 2006. Midstream Modulation of Technology: Governance From Within. *Bull. Sci. Technol. Soc.* 26 (6), 485–496. <https://doi.org/10.1177/0270467606295402>.
- Galafassi, D., Daw, T.M., Thyresson, M., Rosendo, S., Chaigneau, T., Bandeira, S., Munyi, L., Gabriëlsson, I., Brown, K., 2018. Stories in social-ecological knowledge cocreation. *Ecol. Soc.* 23, 23. <https://doi.org/10.5751/ES-09932-230123>.
- García-Nieto, A.P., Quintas-Soriano, C., García-Llorente, M., Palomo, I., Montes, C., Martín-López, B., 2015. Collaborative mapping of ecosystem services: The role of stakeholders' profiles. *Ecosyst. Serv.* 13, 141–152. <https://doi.org/10.1016/j.ecoser.2014.11.006>.
- Garud, R., Ahlstrom, D., 1997. Technology Assessment: A Socio-Cognitive Perspective. *J. Eng. Technol. Manag.* 14, 25–48. [https://doi.org/10.1016/S0923-4748\(97\)00005-2](https://doi.org/10.1016/S0923-4748(97)00005-2).
- Gieryn, T.F., 1995. Boundaries of Science, in: Jasanoff, S., Markle, G.E., Peterson, J.C., Pinch, T. (Eds.), *Handbook of Science and Technology Studies*, second ed. Sage, Thousand Oaks, 393–443. doi:10.4135/9781412990127.
- Gorman, M.E., 2002. Levels of Expertise and Trading Zones: A Framework for Multidisciplinary Collaboration. *Soc. Stud. Sci.* 32, 933–938. doi:10.1177/027030631270203200511.
- Hack, L., 1995. Gutachten zum Thema TA als theoriegeleitete Interventionsstrategie. Der Ansatz des 'Constructive Technology Assessment/CTA' in der sozialwissenschaftlichen Technikdebatte. *Wissenschaftliche Berichte, FZKA-5641*. doi:10.5445/IR/270038316.

- Hahn, K., Kuhlmann, S., Konrad, K., Visscher, K., 2017. Co-creation: embedding companies' innovation practices in innovation ecosystem dynamics, *Science, Technology & Policy Studies – STEPS Working Paper Series 01/17*. <https://research.utwente.nl/en/publications/co-creation-embedding-companiesinnovation-practice-s-in-innovation>.
- Hall, P.A., 1993. Policy Paradigms, Social Learning and the State. The Case of Economic Policymaking in Britain. *Comp. Politics* 25, 275–296. <https://doi.org/10.2307/422246>.
- Hamaker-Taylor, R., Perrels, A., Canevari, L., Nurmi, V., Rautio, T., Rycerz, A., Larosa, F., 2018. Results of explorations of the CS market for the financial sector, EU-MACS deliverable 2.1. http://eu-macs.eu/wp-content/uploads/2019/02/EUMACS_D21_FINAL.pdf (accessed 30 November 2020).
- Hauck, J., Schleyer, C., Priess, J.A., Veerkamp, C.J., Dunford, R., Alkemade, R., Berry, P., Primmer, E., Kok, M., Young, J., Haines-Young, R., Dick, J., Harrison, P.A., Bela, G., Vadineanu, A., Görg, C., 2019. Combining policy analyses, exploratory scenarios, and integrated modelling to assess land use policy options. *Environ. Sci. Policy* 94, 202–210. <https://doi.org/10.1016/j.envsci.2018.12.009>.
- Hopkins, A., Breckon, J., Lawrence, J., 2020. The Experimenter's Inventory. A catalogue of experiments for decision-makers and professionals, NESTA, London. https://media.nesta.org.uk/documents/Experimenters_Inventory.pdf (accessed 27 May 2021).
- Hoppe, R., 2010. From “knowledge use” towards “boundary work”: sketch of an emerging new agenda for inquiry into science-policy interaction, in: In 't Veld, R.J. (Ed.), *Knowledge Democracy: Consequences for Science, Politics, and Media*. Springer, Heidelberg, pp. 169–186.
- Irwin, A., 2006. The Politics of Talk: Coming to Terms with the ‘New’ Scientific Governance. *Soc. Stud. Sci.* 36, 299–320. doi:10.1177%2F0306312706053350.
- Jasanoff, S., 2004. *States of Knowledge. The co-production of science and social order*. Routledge, London.
- Jasanoff, S., 2003. Technologies of humility: Citizen Participation in Governing Science. *Minerva* 41, 223–244. doi:10.1023/A:1025557512320.
- Jax, K., Furman, E., Saarikoski, H., Barton, D.N., Delbaere, B., Dick, J., Watt, A.D., 2018. Handling a messy world: Lessons learned when trying to make the ecosystem services concept operational. *Ecosyst. Serv.* 29, 415–427. <https://doi.org/10.1016/j.ecoser.2017.08.001>.
- Joly, P.-B., Rip, A., Callon, M., 2010. Re-inventing Innovation. In: Arentsen, M.J., Van Rossum, W., Steenge, A.E. (Eds.), *Governance of Innovation, Firms, Clusters and Institutions in a Changing Setting*. Elgar, Cheltenham.
- Kershaw, A., Dahl, S., Roberts, I., 2021. Designing for Public Services, NESTA, London. <https://www.nesta.org.uk/blog/introducing-designing-for-public-services-a-practical-guide/> (accessed 26 May 2021).
- Kister, J., Klingler, M., Baaske, W., Schleyer, C., Politur, H., Seebacher, E., 2020. Documentation of Constructive Innovation Assessment (CINA) workshops: Innovation Region Eisenwurzen, Austria. D4.2 subreport, InnoForEST, Eberswalde. <https://innoforest.eu/enabling-innovation/#fusion-tab-deliverables> (accessed 27 May 2021).
- Klůváňková, T., Špaček, M., Sorge, S., Mann, C., Schleyer, C., 2020. Deliverable 3.2: Application Summary of Prototypes for Ecosystem Service Governance Modes-Demonstrator, InnoForEST, Eberswalde. <https://innoforest.eu/enabling-innovation/#fusion-tab-deliverables> (accessed 30 November 2020).
- Kuhlmann, S., Stegmaier, P., Konrad, K., 2019. The tentative governance of emerging science and technology—A conceptual introduction. *Res. Policy* 5, 1091–1097. <https://doi.org/10.1016/j.respol.2019.01.006>.
- Langemeyer, J., Palomo, I., Baraibar, S., Gómez-Baggethun, E., 2018. Participatory multi-criteria decision aid: Operationalizing an integrated assessment of ecosystem services. *Ecosyst. Serv.* 30, 49–60. <https://doi.org/10.1016/j.ecoser.2018.01.012>.
- Lindner, R., Edler, J., Hufnagel, M., Kimpeler, S., Kroll, H., Wittmann, F., & Yorulmaz, M. (2021). Mission-oriented innovation policy: From ambition to successful implementation. Perspectives - Policy Brief, No. 02 / 2021. Karlsruhe: Fraunhofer-Institut für System- und Innovationsforschung ISI.
- Loeber, A., 2004. *Practical wisdom in Risk Society. Methods and practice of interpretive analysis on questions of sustainable development*. UvA-DARE, Amsterdam.
- Loft, L., Stegmaier, P., Aukes, E., Sorge, S., Schleyer, C., Klingler, M., Zoll, F., Kister, J., Mann, C., 2020. Deliverable 4.3: The emergence of governance innovations for the sustainable provision of European forest ecosystem services: A comparison of six innovation journeys, InnoForEST, Eberswalde. <https://innoforest.eu/enabling-innovation/#fusion-tab-deliverables> (accessed 30 November 2020).
- Loft, L., Mann, C., Hansjürgens, B., 2015. Challenges in ecosystem services governance: Multi-levels, multi-actors, multi-rationalities. *Ecosyst. Serv.* 16, 150–157. <https://doi.org/10.1016/j.ecoser.2015.11.002>.
- Loft, L., Schleyer, C., Klingler, M., Kister, J., Zoll, F., Stegmaier, P., Aukes, E., Sorge, S., Mann, C., 2022. The development of governance innovations for the sustainable provision of forest ecosystem services in Europe: A comparative analysis of four pilot innovation processes. *Ecosyst. Serv.* 58 <https://doi.org/10.1016/j.ecoser.2022.101481>.
- Maczka, K., Chmielewski, P., Jeran, A., Matczak, P., van Riper, C.J., 2019. The ecosystem services concept as a tool for public participation in management of Poland's Natura 2000 network. *Ecosyst. Serv.* 35, 173–183. <https://doi.org/10.1016/j.ecoser.2018.12.005>.
- Mann, C., 2015. Strategies for sustainable policy design: Constructive assessment of biodiversity offsets and banking. *Ecosyst. Serv.* 16, 266–274. <https://doi.org/10.1016/j.ecoser.2015.07.001>.
- McBride, M.F., Lambert, K.F., Huff, E.S., Theoharides, K.A., Field, P., Thompson, J.R., 2017. Increasing the effectiveness of participatory scenario development through codesign. *Ecol. Soc.* 22, 16. <https://doi.org/10.5751/ES-09386-220316>.
- Owens, S., Petts, J., Bulkeley, H., 2006. Boundary work: knowledge, policy, and the urban environment. *Environ. Plan. C: Gov. Policy* 24, 633–643. <https://doi.org/10.1068/c0606>.
- Paavola, J., Hubacek, K., 2013. Ecosystem Services, Governance, and Stakeholder Participation: an Introduction. *Ecol. Soc.* 18, 42. <https://doi.org/10.5751/es-06019-180442>.
- Paloniemi, R., Hujala, T., Rantala, S., Harlio, A., Salomaa, A., Primmer, E., Pynnönen, S., Arponen, A., 2018. Integrating Social and Ecological Knowledge for Targeting Voluntary Biodiversity Conservation. *Conserv. Lett.* 11 <https://doi.org/10.1111/conl.12340>.
- Parandian, A., 2012. *Constructive TA of newly emerging technologies. Stimulating learning by anticipation through bridging events*. Technical University of Delft, Delft. Ph.D. thesis.
- Parandian, A., Rip, A., 2013. Scenarios to explore the futures of the emerging technology of organic and large area electronics. *Eur. J. Futures Res.* 1, 1–18. <https://doi.org/10.1007/s40309-013-0009-2>.
- Pekkonen, M., Varumo, L., Kuusela, S., Granander, M., Primmer, E., 2020. Documentation of Constructive Innovation Assessment (CINA) workshops: InnoForEST Innovation Region Habitat Bank of Finland Helsinki, Finland. D4.2 subreport, InnoForEST, Eberswalde. <https://innoforest.eu/enabling-innovation/#fusion-tab-deliverables> (accessed 27 May 2021).
- Pollitt, C., Hupe, P., 2010. Talking About Government. The role of magic concepts. *Public Manag. Rev.* 13, 641–658. <https://doi.org/10.1080/14719037.2010.532963>.
- Potschin-Young, M., Haines-Young, R., Görg, C., Heink, U., Jax, K., Schleyer, C., 2018. Understanding the role of conceptual frameworks: Reading the ecosystem service cascade. *Ecosyst. Serv.* 29, 428–440. <https://doi.org/10.1016/j.ecoser.2017.05.015>.
- Pratt, M.G., Kaplan, S., Whittington, R., 2020. Editorial Essay: The Tumult over Transparency: Decoupling Transparency from Replication in Establishing Trustworthy Qualitative Research. *Adm. Sci. Q.* 65 (1), 1–19. <https://doi.org/10.1177/0001839219887663>.
- Primmer, E., Orsi, F., Varumo, L., Krause, T., Geneletti, D., Brogaard, S., Loft, L., Meyer, C., Schleyer, C., Stegmaier, P., Aukes, E., Sorge, S., Grossmann, C., Maier, C., Sarvasova, Z., Kister, J., 2019. Deliverable 2.1: Mapping of forest ecosystem services and institutional frameworks. InnoForEST, Eberswalde. <https://innoforest.eu/enabling-innovation/#fusion-tab-deliverables> (accessed 30 November 2020).
- Primmer, E., Jokinen, P., Blicharska, M., Barton, D.N., Bugter, R., Potschin, M., 2015. Governance of Ecosystem Services: A framework for empirical analysis. *Ecosyst. Serv.* 16, 158–166. <https://doi.org/10.1016/j.ecoser.2015.05.002>.
- Primmer, E., Varumo, L., Krause, T., Orsi, F., Geneletti, D., Brogaard, S., Aukes, E., Ciolli, M., Grossmann, C., Hernández-Morcillo, M., Kister, J., Klůváňková, T., Loft, L., Maier, C., Meyer, C., Schleyer, C., Spacek, M., Mann, C., 2021. Mapping Europe's institutional landscape for forest ecosystem service provision, innovations and governance. *Ecosyst. Serv.* 47, 101225 <https://doi.org/10.1016/j.ecoser.2020.101225>.
- Ragin, C.C., Becker, H.S. (Eds.), 1992. *What Is a Case? Exploring the Foundations of Social Inquiry*. Cambridge University Press, Cambridge.
- Raum, S., 2018. A framework for integrating systematic stakeholder analysis in ecosystem services research: Stakeholder mapping for forest ecosystem services in the UK. *Ecosyst. Serv.* 29, 170–184. <https://doi.org/10.1016/j.ecoser.2018.01.001>.
- Rey-Valette, H., Mathé, S., Salles, J.M., 2017. An assessment method of ecosystem services based on stakeholders' perceptions: The Rapid Ecosystem Services Participatory Appraisal (RESPA). *Ecosyst. Serv.* 28, 311–319. <https://doi.org/10.1016/j.ecoser.2017.08.002>.
- Rip, A., 2018. *Constructive Technology Assessment*. In: Rip, A. (Ed.), *Futures of Science and Technology in Society*. Springer VS, Wiesbaden, pp. 97–114.
- Rip, A., Te Kulve, H., 2008. Constructive Technology Assessment and Socio-Technical Scenarios, in: Fisher, E., Selin, C., Wetmore, J.M. (Eds.), *The Yearbook of Nanotechnology in Society, Volume I: Presenting Futures*. Springer Netherlands, Dordrecht, pp. 49–70.
- Rip, A., Robinson, D.K.R., 2013. *Constructive Technology Assessment and the Methodology of Insertion*. In: Doorn, N., Schuurbers, D., Poel, I.V.D., Gorman, M.E. (Eds.), *Early Engagement and New Technologies: Opening up the Laboratory*. Springer, pp. 37–53.
- Rip, A., Van den Belt, H., 1986. Constructive technology assessment: Influencing technological development? *J. Entwicklungspolitik* 2, 24–40. <https://doi.org/10.20446/JEP-2414-3197-02-3-24>.
- Rip, A., 2016. Constructive Technology Assessment. Presentation for a workshop of the Chinese Academy of Science, Institutes of Science and Development, Beijing, 21 November 2016.
- Robinson, D.K.R., 2009. Co-evolutionary scenarios: an application to prospecting futures of the responsible development of nanotechnology. *Technol. Forecast. Soc. Change* 76, 1222–1239. <https://doi.org/10.1016/j.techfore.2009.07.015>.
- Robinson, D.K.R., 2010. *Constructive Technology Assessment of Emerging Nanotechnologies. Experiments in Interactions*. Ph.D. thesis, University of Twente, Enschede.
- Ryan, B., 2012. Co-production: Option or Obligation? *Aust. J. Public Adm.* 71, 314–324. <https://doi.org/10.1111/j.1467-8500.2012.00780.x>.
- Sarkki, S., Parpan, T., Melnykovich, M., Zahvoyska, L., Derbal, J., Voloshyna, N., Nijnik, M., 2019. Beyond participation! Social innovations facilitating movement from authoritative state to participatory forest governance in Ukraine. *Landsc. Ecol.* 34, 1601–1618. <https://doi.org/10.1007/s10980-019-00787-x>.
- Sattler, C., Loft, L., Mann, C., Meyer, C., 2018. Methods in ecosystem services governance analysis: An introduction. *Ecosyst. Serv.* 34, 155–168. <https://doi.org/10.1016/j.ecoser.2018.11.007>.
- Schleyer, C., Kister, J., Klingler, M., Stegmaier, P., Aukes, E., 2019. Deliverable 5.2: Report on stakeholders' interests, visions, and concerns, InnoForEST, Eberswalde.

- <https://innoforest.eu/enabling-innovation/#fusion-tab-deliverables> (accessed 30 November 2020).
- Schleyer, C., Kister, J., Klingler, M., 2020. Deliverable 5.4: Design on training events to develop innovation capacities and innovation knowledge, InnoForEST, Eberswalde. <https://innoforest.eu/wp-content/uploads/innoforest-deliverable-5.4.pdf> (accessed 26 May 2021).
- Schleyer, C., Lux, A., Mehring, M., Görg, C., 2017. Ecosystem services as a boundary concept: arguments from social ecology. *Sustainability* 9, 1107. <https://doi.org/10.3390/su9071107>.
- Schleyer, C., Kister, J., Klingler, M., 2022. Balancing the provisioning of Forest Ecosystem Services through innovation processes in Forest-Wood Value chains in Eisenwurzen, Austria. *Ecosyst. Serv.* Manuscript submitted for publication.
- Schröter, B., Hauck, J., Hackenberg, I., Matzdorf, B., 2018. Bringing transparency into the process: Social network analysis as a tool to support the participatory design and implementation process of Payments for Ecosystem Services. *Ecosyst. Serv.* <https://doi.org/10.1016/j.ecoser.2018.03.007>.
- Schuurbiers, D., Doorn, N., van de Poel, I., Gorman, M.E., 2013. Mandates and Methods for Early Engagement. In: Doorn, N., Schuurbiers, D., van de Poel, I., Gorman, M.E. (Eds.), *Early Engagement and New Technologies: Opening Up the Laboratory*. Springer, Dordrecht, pp. 3–14.
- Schwartz-Shea, P., 2014. Judging Quality: Evaluative Criteria and Epistemic Communities. In: Yanow, D., Schwartz-Shea, P. (Eds.), *Interpretation and Method: Empirical Research Methods and the Interpretive Turn*, 2nd ed. M.E. Sharpe, Armonk, New York, pp. 120–146.
- Schwartz-Shea, P., Yanow, D., 2012. *Interpretive Research Design. Concepts and Processes*. Routledge, Oxford.
- Schwerdtner, W., Siebert, R., Busse, M., Freisinger, U., 2015. Regional Open Innovation Roadmapping: A New Framework for Innovation-Based Regional Development. *Sustainability* 7, 2301–2321. <https://doi.org/10.3390/su7032301>.
- Seawright, J., Gerring, J., 2008. Case Selection Techniques in Case Study Research: A Menu of Qualitative and Quantitative Options. *Political Res. Q.* 61 (2), 294–308. <https://doi.org/10.1177/1065912907313077>.
- Secco, L., Pettenella, D.M., Gatto, P., 2011. Forestry governance and collective learning process in Italy: Likelihood or utopia? *For. Policy Econ.* 13, 104–112. <https://doi.org/10.1016/j.forpol.2010.04.002>.
- Secco, L., Favero, M., Masiero, M., Pettenella, D.M., 2017. Failures of political decentralization in promoting network governance in the forest sector: Observations from Italy. *Land Use Policy* 62, 79–100. <https://doi.org/10.1016/j.landusepol.2016.11.013>.
- Smits, R.E., Kuhlmann, S., Shapira, P. (Eds.), 2010. *The Theory and Practice of Innovation Policy. An international handbook*. Elgar, Cheltenham.
- Sorge, S., Mann, C., Schleyer, C., Loft, L., Spacek, M., Hernández-Morcillo, M., Klůvanková, T., 2022. Understanding dynamics of forest ecosystem services governance: A socio-ecological-technical-analytical framework. *Ecosyst. Serv.* 55, 101427. <https://doi.org/10.1016/j.ecoser.2022.101427>.
- Špaček, M., Klůvanková, T., Louda, J., Dubová, L., 2020. Documentation of Constructive Innovation Assessment (CINA) workshops: InnoForEST Innovation Region Čmelak, Czech Republic (and Hybe, Slovakia). D4.2 subreport, InnoForEST, Eberswalde. <https://innoforest.eu/enabling-innovation/#fusion-tab-deliverables> (accessed 27 May 2021).
- Spangenberg, J.H., Görg, C., Settele, J., 2015. Stakeholder involvement in ESS research and governance: Between conceptual ambition and practical experiences – risks, challenges and tested tools. *Ecosyst. Serv.* 16, 201–211. <https://doi.org/10.1016/j.ecoser.2015.10.006>.
- Stegmaier, P., 2009. The rock ‘n’ roll of knowledge co-production. *EMBO rep.* 10, 114–119. www.nature.com/embor/journal/v10/n2/full/embor2008253.html.
- Stegmaier, P., 2020. Constructive Technology Assessment (CTA): Innovationsmitgestaltung als Prozess gesellschaftlicher Aufklärung und Erwartungsmoderation. In: Blättel-Mink, B., Schulz-Schaeffer, L., Windeler, A. (Eds.), *Handbuch Innovationsforschung*. Springer VS, Wiesbaden. <https://doi.org/10.1007/978-3-658-17671-6>.
- Stegmaier, P., Visscher, K., 2017. A multi-layer exploration on innovations for climate services markets. EU-MACS, deliverable 1.4. http://eu-macs.eu/wp-content/uploads/2016/12/EU-MACS-D14-submitted_31102017-corrected-171113-JAK.pdf (accessed 30 November 2020).
- Star, S.L., 2010. This is Not a Boundary Object: Reflections on the Origin of a Concept. *Sci. Technol. Hum. Values* 35, 601–617. doi:10.1177%2F0162243910377624.
- Te Kulve, H., 2014. Anticipating Market Introduction of Nanotechnology-Enabled Drug Delivery Systems. In: Demir Sezer, A. (Ed.), *Application of Nanotechnology in Drug Delivery*. IntechOpen, London, pp. 501–524.
- Te Kulve, H., Konrad, K., 2017. Sectoral demand articulation: The case of emerging sensor technologies in the drinking water sector. *Technol. Forecast. Soc. Change* 119, 154–169. <https://doi.org/10.1016/j.techfore.2017.03.025>.
- Te Kulve, H., Boon, W.P.C., Konrad, K., Schuitmaker, T.J., 2018. Influencing the direction of innovation processes: the shadow of authorities in demand articulation. *Sci. Public Policy* 45, 455–467. <https://doi.org/10.1093/scipol/scy015>.
- Tusznió, J., Pietrzyk-Kaszyńska, A., Rechciński, M., Olszańska, A., Grodzińska-Jurczak, M., 2020. Application of the ecosystem services concept at the local level – Challenges, opportunities, and limitations. *Ecosyst. Serv.* 42, 101077. <https://doi.org/10.1016/j.ecoser.2020.101077>.
- Van de Ven, A., Polley, D.E., Garud, R., Venkataraman, S., 2008. *The Innovation Journey*. Oxford University Press, New York.
- Van Merkerk, R.O., Robinson, D.K.R., 2006. Characterizing the emergence of a technological field: Expectations, agendas and networks in Lab-on-a-chip technologies. *Technol. Anal. Strateg. Manag.* 18, 411–428. <https://doi.org/10.1080/09537320600777184>.
- Van Oudenhoven, A.P.E., Aukes, E., Bontje, L.E., Vikolainen, V., Van Bodegom, P.M., Slinger, J.H., 2018. ‘Mind the Gap’ between ecosystem services classification and strategic decision making. *Ecosyst. Serv.* 33, 77–88. <https://doi.org/10.1016/j.ecoser.2018.09.003>.
- Vergragt, P., Groenewegen, P., 1989. New technological development and technology assessment: A plea for an integrated research. *Proj. Apprais.* 4, 29–35. <https://doi.org/10.1080/02688867.1989.9726702>.
- Visscher, K., Stegmaier, P., Damm, A., Hamaker-Taylor, R., Harjanne, A., Giordanao, R., 2020. Climate Services. Matching Supply and Demand: A Typology of Climate Services. *Clim. Serv.* 17. <https://doi.org/10.1016/j.cliser.2019.100136>.
- Voorberg, W.H., Bekkers, V.J.J.M., Tummers, L.G., 2015. A Systematic Review of Co-Creation and Co-Production: Embarking on the social innovation journey. *Public Manag. Rev.* 17, 1333–1357. <https://doi.org/10.1080/14719037.2014.930505>.
- Webster, A., 2007. Reflections on Reflexive Engagement: Response to Nowotny and Wynne. *Sci. Technol. Hum. Values* 32, 608–615. <https://doi.org/10.1177/0895904805303208>.
- Yanow, D., 2014. Interpretive Analysis and Comparative Research. In: Engeli, I., Rothmayer Allison, C. (Eds.), *Comparative Policy Studies. Conceptual and Methodological Challenges*. Palgrave Macmillan, Basingstoke, pp. 131–159.
- Zoderer, B.M., Tasser, E., Carver, S., Tappeiner, U., 2019. Stakeholder perspectives on ecosystem service supply and ecosystem service demand bundles. *Ecosyst. Serv.* 37, 100938. <https://doi.org/10.1016/j.ecoser.2019.100938>.
- Zwick, D., Bonsu, S.K., Darmody, A., 2008. Putting Consumers to Work: ‘Co-creation’ and new marketing governmentality. *J. Consum. Cult.* 8, 163–196. doi:10.1177%2F1469540508090089.