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RESEARCH PAPER

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Application of the ecosystem services concept in stakeholder communication—Results of a workshop including a planning game at the Lower Mulde River (Dessau-Roßlau, Germany)

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Abstract

The concept of ecosystem services (ES) is a powerful tool for communicating with stakeholders because it highlights the benefits of ecosystems for people and demonstrates their economic importance through monetized values. However, this hypothesis has rarely been substantiated in the context of local landscape planning. To investigate which ecosystem services information formats (ESIF) stakeholders prefer in decision situations, we experimented with a highly conflictual planning situation about the Lower Mulde restoration in Germany. We invited local stakeholders to a so-called 'future vision workshop'. It included a paper-based, non-competitive planning game, which combined the freedom of choice with strict rules for justifying the proposed measures. We tested how often participants used different ESIFs to justify their decisions, focusing on quantification, monetization, and the default qualitative (ordinal-scaled) format applied in landscape planning. A total of 17 representatives from stakeholder groups such as nature conservation, recreation, and local politics attended. We provided information on four ES and eight related measure proposals to the stakeholders, who used them to select, locate, and justify actions for the area's future development. The participants applied the ordinal-qualitative format in more than two-thirds of the decisions. Quantification and monetization were used with approximately equal frequency, mostly for measures that favoured flood risk regulation. Actions supporting habitat provision and biodiversity were justified exclusively in ordinal-qualitative terms. Instead of our provided quantifications, some participants mentioned numbers they were already familiar with before. They also partly doubted our monetization approaches. In conclusion, we recommend combined and context-specific uses of several ESIFs, while using the ordinal-qualitative format as the basis. Furthermore, the participants appreciated the workshop and requested that the results be presented to the city

Abbreviations: ES, ecosystem services; ESIF, ecosystem services information format; FB, food and biomass (ecosystem service); FR, flood risk regulation (ecosystem service); HB, habitats and biodiversity (ecosystem service); MON1/MON2, monetary argument (of 1st/2nd degree) (Figure 5); NA1/NA2, not assignable argument (of 1st/2nd degree) (Figure 5); ORD1/ORD2/ORD3, ordinal-scaled, qualitative argument (of 1st/2nd/3rd degree) (Figure 5); QNF1/QNF2, cardinal-scaled quantitative argument (of 1st/2nd degree) (Figure 5); RE, recreational quality (ecosystem service); WFD, Water framework directive.

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council. The workshop also confirmed that the ES concept is challenging to understand, especially for laypeople unfamiliar with ES and landscape planning.

KEYWORDS
ecosystem services, landscape planning, participatory planning, river landscape, stakeholder communication

1 | INTRODUCTION

Since landscape planning was introduced in Germany, some positive developments have been achieved, such as a significant improvement of surface water quality (Karthe et al., 2017). However, other negative trends, such as biodiversity loss, have continued (BMU, 2018; Hallmann et al., 2017). Additionally, new challenges emerged, especially concerning climate change (Michaelowa, 2008). Likewise, restoring the good ecological status, required by the European water framework directive (WFD, 2000), is a huge challenge in this context. Its implementation is processing slowly, for which a lack of acceptance among residents and other stakeholders is a significant reason (BMU, 2013). This apparent continued reluctance among some decision-makers and other stakeholders to implement measures contrasts strongly with the renewed rise in environmental awareness (BMU & UBA, 2019), also illustrated by the Fridays for Future movement.

One reason for this is that environmental planners still struggle to communicate complex, uncertain information about the current state of the environment and future developments (von Haaren & Othengrafen, 2019). As a possible remedy to this dilemma, the concept of ecosystem services (ES) has been suggested repeatedly (von Haaren et al., 2019; Naturkapital Deutschland–TEEB DE, 2012). ES, which we understand as the direct and indirect contributions of ecosystems to human well-being (TEEB, 2010; UK NEA, 2011), have received much attention in research and politics over the past decade, as demonstrated by their comprehensive integration into the EU Biodiversity Strategy (European Commission, 2011).

Usually, assessments of landscape functions in landscape planning are based on qualitative or semiqualitative spatial data and information that are transformed in a multilevel ordinal scale to represent the *status quo* of landscape functions (von Haaren et al., 2019; Lovett & Sünnberg, 2019). In contrast, the benefits of ES to people are frequently communicated using quantification and monetization (Costanza et al., 1997; Fisher et al., 2009). Especially the monetarization is frequently questioned. Criticisms range from methodological aspects to concerns about unintended responses to their rejection on ethical reasons (Albert et al., 2014; Eppink et al., 2016; Gómez-Baggethun & Ruiz-Pérez, 2011). Nevertheless, monetization of ES is still applied across different ecosystems and countries (Förster et al., 2019; Mehvar et al., 2018; Russi et al., 2013). However, practical applications of the ES concept, especially regarding the consideration of ES information in decision-making processes, are still lacking (Costanza et al., 2017; Saarikoski et al., 2018). Consequently, the question of the potential added value of quantification and monetization in the communication of environmental values has not been satisfactorily answered.

In a real planning case as part of a restoration project at the Mulde River in Germany ('Wilde Mulde', Schulz-Zunkel et al., 2017; Schulz-Zunkel et al., in this issue), we had the opportunity to investigate a wide range of stakeholders' responses to different ecosystem information formats (ESIF). Here, we present the methodology and the results of a so-called 'future vision workshop' with an integrated planning game. Participants from different stakeholder groups designed and located measures to support specific ESs. We asked them to justify their decisions with one of three ESIFs: (A) qualitative valuation (ordinal-scaled), (B) quantitative accounting (cardinal-scaled), and (C) monetizations (cardinal-scaled in €) (Albert et al., 2014). We addressed the following research questions:

- Q1: Which information format do participants use most frequently to justify measures for improving ES?
- Q2: Do participants prefer a particular information format for specific ES?
- Q3: Do members of specific stakeholder groups prefer a particular information format?

Finally, we discuss recommendations for further applications of our planning game and the ES concept in communication with stakeholders.

2 | MATERIALS AND METHODS

2.1 | Study area and ecosystem services

The study area included large parts of the Lower Mulde floodplain near the city of Dessau-Roßlau in Saxony-Anhalt (Figure 1). We defined the boundaries according to the administrative borders and the original floodplain delimitation (Brunotte et al., 2009).

As an information base for the workshop, we used a comprehensive ES assessment for the case study region. We based our ES terminology on the River Ecosystem Service Index (Hornung et al., 2019; Podschun et al., 2018) and adjusted it for lay audiences. Based on their relevance to the stakeholders, we considered the following ES: yield potential as 'food and biomass' (FB), flood risk regulation (FR), maintaining habitats (habitats and biodiversity [HB]), and 'opportunities for nonwater-related activities' (Thiele et al., 2020), which

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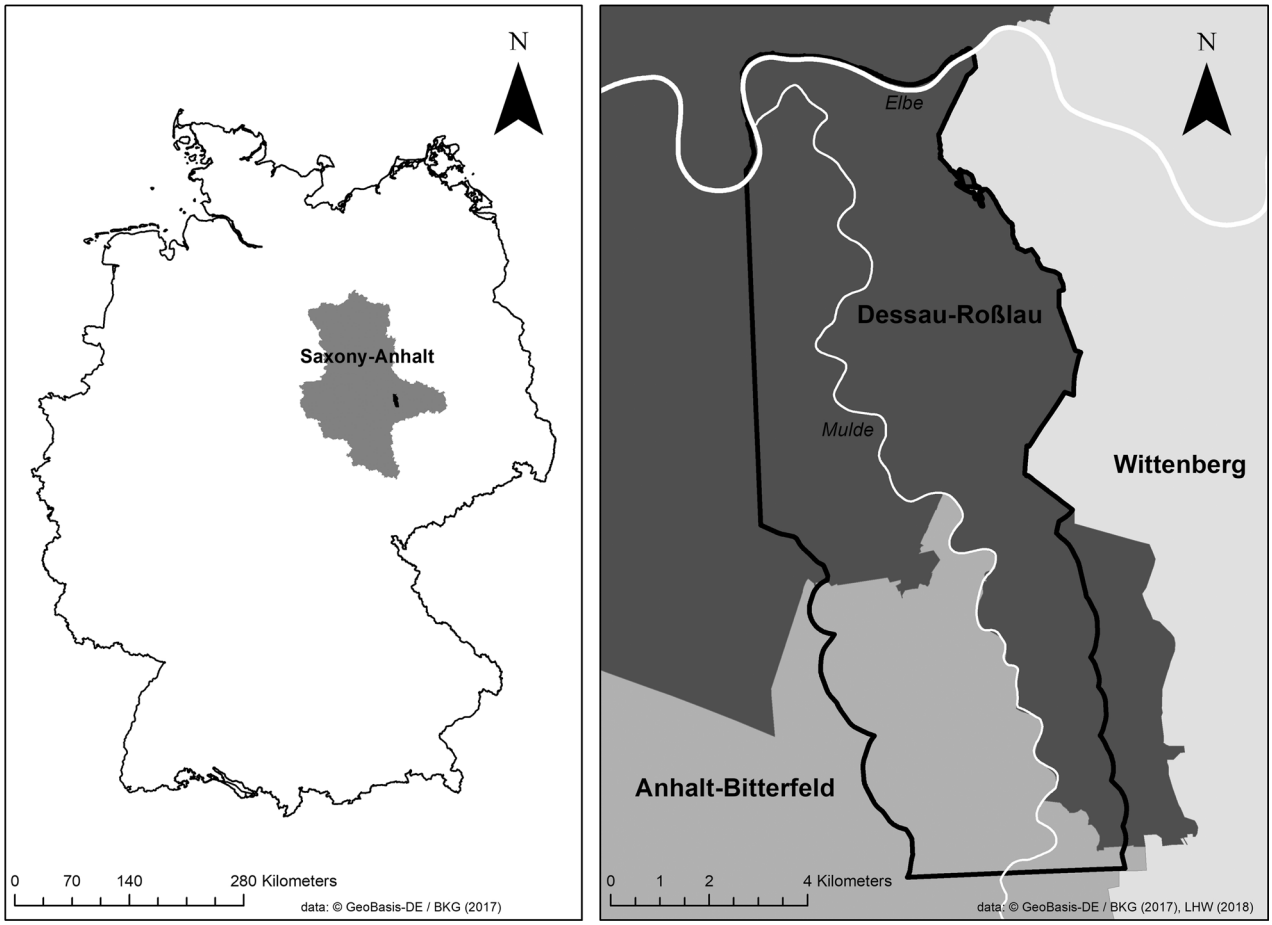

FIGURE 1 The study area covers the current and former floodplain of the Mulde River within the city of Dessau and the county of Anhalt-Bitterfeld, based on the data set 'Ecosystem functions of river floodplains', BfN (2012)© GeoBasis-DE/BKG (2009)

is called 'recreational quality' (RE) in our study. For details on applied ES assessment methods, we refer to Supporting Information 1.

2.2 | Stakeholder groups and workshop participants

In the first stage of the Mulde restoration project, we, together with the partners responsible for implementation, identified relevant stakeholders from the city of Dessau-Roßlau, the surrounding counties and the state of Saxony-Anhalt and finally grouped them according to their primary area of interest. We focused on the following stakeholder groups: nature conservation, water management, flood protection, recreation and tourism, historic preservation, agriculture, forestry and hunting (Figure 2). These stakeholders occupied different roles in the project, such as permitting authority, public interest body, and land user or owner. Consequently, they held very different views about the Lower Mulde floodplain's future development. In the restoration project's early stages, severe conflicts arose about planned measures in the Mulde river, especially anchoring dead trees in the river bed and restoring unsecured banks (see Supporting Information 2 for more details).

We invited 60 people and institutions to the workshop and requested people who could not attend to send a substitute. In addition to the institutions presented in Figure 2, we invited representatives of all political factions in the Dessau city council, the general administration, social institutions, education institutions and tourism companies. In early January 2019, invitations were sent by e-mail, and a reminder followed 2 weeks later. We then called the people who had not yet responded.

2.3 | Workshop design and planning game

We examined the use of different ESIFs in communication and decision-making processes within a self-developed, collaborative participation format that combined elements of a structured workshop and the focus group technique (e.g., Beckley et al., 2006; Creighton, 2005). We announced the workshop as a nonofficial participation opportunity and simulated a typical local planning situation. The workshop took place on February 13, 2019. It lasted 3.5 h and consisted of five parts: (1) Welcoming, (2) Introductory presentation, (3) Planning game, (4) Synopsis of planning outcomes, and (5) Discussion and conclusion (see Supporting Information 3 for further details).

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FIGURE 2 Relevant stakeholder groups at the Lower Mulde. Groups marked with *were noted but not examined further

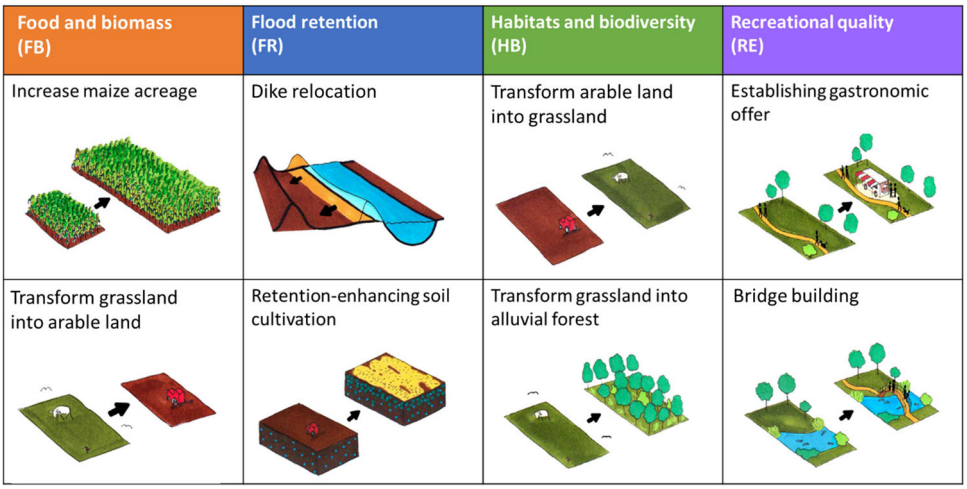

FIGURE 3 Overview of the eight prepared measure proposals. Each measure had as its primary objective the improvement of one of the four ecosystem services

The central part of the workshop was a paper-based planning game that we designed as a noncompetitive simulation. The participants should identify needs for action regarding the provision of the selected ES in the area and develop and locate measures to enhance them. Thus, for the first time, stakeholders could make their own suggestions within the restoration project independent of the planned restoration measures. Thereby we aimed to foster dialogue between participants and collaboratively collect and locate ideas for the study area's future development. We asked the participants to act strictly according to the rules and the game procedure, which we kept as simple as possible. Four to five people played together in groups, which we arranged ex-ante based on maximum heterogeneity regarding the stakeholder groups.

The planning game consisted of three successive rounds. In the first and second rounds each, we invited the participants to choose and locate a measure from the prepared catalogue consisting of eight proposals (Figure 3). In the third and last round, the participants were free to develop and allocate one self-developed measure ('wildcard'). For this purpose, the participants wrote down a description or drew a sketch on the blank wildcard labelled with a star. In each round, the measure allocation followed the same two-step procedure. First, participants actively and spatially allocated the measure proposals by placing an action card on the game board and adding a justification chip representing one of the three investigated ESIFs by a symbol (Figure 4). Second, the participants verbally allocated the proposals by giving a literal justification that should correspond to the ESIF

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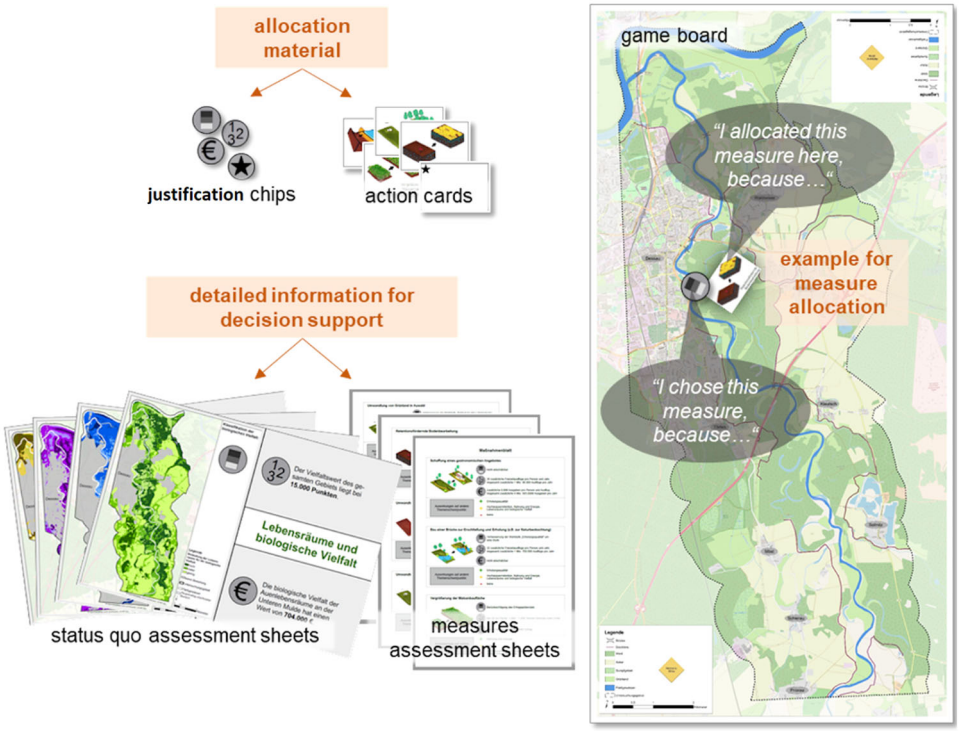

FIGURE 4 Overview of the game materials and example procedure of measure allocation. The different symbols on the justification chips represent the three investigated ecosystem services information formats: the colour scale represents the map legend's ordinal scale (qualitative), the numbers represent quantification, and the € symbol represents the monetary format. *A wildcard argument. For instance, one participant wanted to increase the share of organic agriculture in the floodplain in principle, without linking this to the improvement of an ecosystem services

visualized on the justification chip (for more details on the game procedure, see Supporting Information 4E). We monitored each group of the planning game to see if they followed the rules, what measure they selected or invented, and what reasoning they provided for it.

Accompanying the planning game, we provided additional, in-depth information material for the participants (Figure 4 and Supporting Information 4A–D) to support the development, location, and justification of measures (Beaumont et al., 2018; Klein et al., 2015). The material contained:

- the current provision of the four selected ES in all three ESIFs,
- information on positive impacts of prepared measures on the provision of one targeted service, expressed in all three ESIFs,
- and possible synergies and trade-offs of the prepared measures with the other ES.

The three ESIFs were represented by identical symbols on all materials (e.g., '€' for monetarization or colour ranges for qualitative expressions, Figure 4). Ordinal-scaled (qualitative) information about the ES supply was expressed using three classes (high–medium–low). Quantitative and monetary information was presented as simple-worded, consolidated statements. To avoid distortion due to unfamiliarity with technical terms or the ES concept itself, the technical term 'ecosystem services' was intentionally never used in the workshop (Friedrich et al., 2020; Sitas et al., 2014).

After the planning game, each group presented their designed measures to the plenary. Thus, all attendees gained insight into the ideas of the other groups. Additionally, this served as a starting point for a plenary discussion about the study area's properties and challenges. This discussion also allowed us to gain additional information about the participants' attitudes towards and preferences for the tested ESIFs. We documented all statements made during the writing workshop and audio-recorded the planning game for later analysis.

2.4 | Assigning the justifications to the information formats

The subsequent evaluation of all measures, literal justifications and laid justification chips showed that the participants had difficulties assigning their justification to the appropriate information format (see Supporting Information 5). Therefore, we assigned the statements in retrospect to the ESIF categories. For this purpose, we defined criteria to determine which keywords counted as a justification for a particular ESIF. We collected all keywords relevant to the justification iteratively and assigned them to the three ESIFs (Table 1).

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TABLE 1 Keywords for the assignment of participant's statements to ESIFs

ESIF	Keywords (translated)
Ordinal (ORD) (qualitative valuation)	*One of the following keywords was used*: Value (class) (intangible), quality, enhancement, support, improvement, increase restoration, maintenance, protection, establishment, relevant/important (for), positive effects (on)
Quantified (QNF) (cardinal-scaled)	*Mention of a quantified ES indicator or its unit*: Harvest yields (tons), retention volume (litres/cubic metres), diversity value (points), visitors/trips (amount), at best together with a definite numerical value
Monetary (MON)	*One of the following economic keywords was used*: money, euros (€), profit, proceeds, revenue, payment, costs, damage (economic) at best together with a definite numerical value

For an assignment to be understood as 'quantified' a participant had to mention one of the quantified ES indicators or the corresponding unit. An economic term had to be stated for an assignment to be considered 'monetary'. As keywords for ordinal were also used in combination with quantification indicators, we created a decision tree (Figure 5). The decision-tree also made it possible to distinguish between quantified and monetary arguments of the 1st degree (with numerical values, leading to a high probability of correct assignment; QNF1 and MON1) and the 2nd degree (without numerical values, leading to a lower probability of correct assignment; QNF2 and MON2).

3 | RESULTS

3.1 | Composition of the participants and selected measures

Of those invited, 20 people agreed to participate. One person cancelled due to illness shortly before. Of the remaining 19 participants,

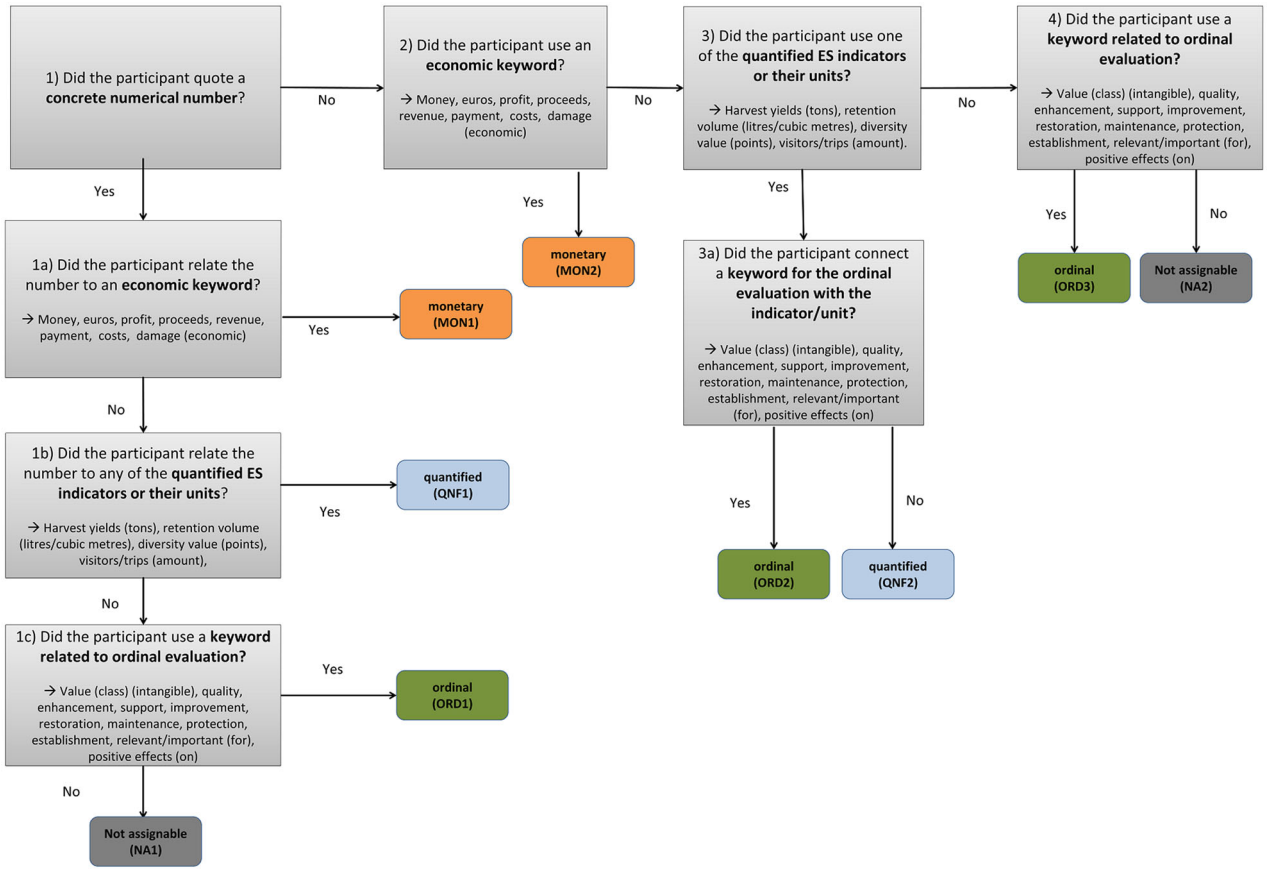

FIGURE 5 Decision tree for an exact assignment of the argumentation to ESIFs. If a participant used an economic keyword (even without a number), the justification was counted as 'monetary' (MON2). If a participant referred to a quantification indicator/unit without using a keyword of the ordinal category, it was assigned to 'quantified' (QNF2). If a participant referred to a quantification indicator/unit but used a qualitative keyword for the ordinal evaluation, it was counted as an ordinal argument (ORD2). All statements with matching keywords that did not contain an indicator/unit of quantification or a monetary keyword were also counted as ordinal, regardless of whether a number was mentioned (ORD1) or not (ORD3). The numbers had to explicitly refer to the indicator/unit of quantification or the monetary concept to be considered quantified (QNF1) or monetary (MON1). For justifications that did not fit any of the defined criteria, not assignable (NA) was noted as information format

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TABLE 2 Participants of the workshop and their assignment to the stakeholder groups

Game group	Participant no.	Stakeholder group
A	1	Recreation and tourism
	2	Water management
	3	Monument protection
	4	Agriculture
B	5	Hunting
	6	Nature conservation
	7	Nature conservation
	8	Flood protection (P)
C	9	Recreation and tourism (P)
	10	Recreation and tourism
	11	Nature conservation
	12	Recreation and tourism
	13	Flood protection (P)
D	14	Hunting
	15	Nature conservation, water management
	16	Nature conservation (Social Issues)
	17	Recreation and tourism
Left before planning game	18	City administration
	19	Flood protection (P)

Note: Individuals marked with (P) are political representatives as well.

two women left after the introductory presentation (Table 2), so 15 men and two women participated in the planning game. Nature conservation and recreation/tourism were the most strongly represented stakeholder groups, with five participants each. The two attendees, who were primarily committed to flood protection, did so in their function as political representatives. The participants also included a river ecologist, who represented both nature conservation and water management.

One person skipped one round, while the others all submitted three measures each. As a result, we recorded 50 measure proposals (for an overview of all measures, see Supporting Information 5). Measures from our predefined catalogue were selected 33 times (see Supporting Information 6 for an ES-specific overview). The most frequent selections were dike relocation (9) and land-use changes in favour of nature conservation (8 and 7). According to our ex-ante classification, 15 out of these 33 measures focused on the services 'FR' and 'HB' each. Seven measures addressed the RE service. No participant chose our predefined measures addressing FB. The wild card measures focused mainly on HB (6), followed by FR (3). The measure 'Compensation for agricultural management restrictions' was related to the FB service.

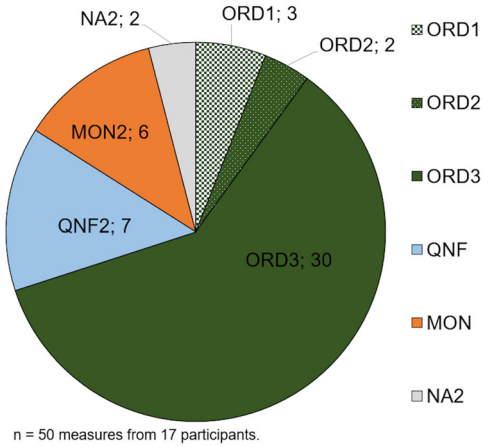

FIGURE 6 Overview of the justifications' assignment to the ESIFs

3.2 | Assignment to ecosystem service information formats

Following the decision tree (Figure 5), we assigned 35 of the 50 justifications for the measures to the ordinal-scaled ESIF (70%), seven statements (14%) to the quantified, and six to the monetary format (12%). As no participant justified a measure directly using explicit numerical values, only quantified and monetary arguments of 2nd degree were present (Figure 6). Only three attendees mentioned numbers but not directly related to the justifications and the addressed ES (Supporting Information 5). For instance, the river ecologist described the problem of river bed deepening with numbers familiar to him. A politician, committed to flood protection, wanted to remove river wood from the Mulde river and drew attention to the high number of trees already lying in the river bed. Because they were finally justified generally in terms of improving ES, we assigned these statements to the ordinal category (ORD3). Two wild card measures' argumentations we marked as 'not assignable'.

Participants used quantified justifications exclusively in connection with two ES (Figure 7a), namely FR (5) and RE (2). Monetary justifications were also put forward mainly for the FR service (4) and once each for RE and FB. We assigned all the justifications for HB to the ordinal-scaled ESIF, except one argument, which was not assignable (the third measure of participant No. 3, Supporting Information 5). Seven participants applied quantified justifications. These were mainly representatives of nature conservation and the recreation and tourism group (Figure 7b). Monetary justifications were used twice, each by a water manager and the representative of agriculture, as well as by two politicians who were committed to flood protection.

4 | DISCUSSION

4.1 | Ecosystem services and information formats

The small sample of 17 participants, even though predefined by the selected participation methods (Beckley et al., 2006), limits our

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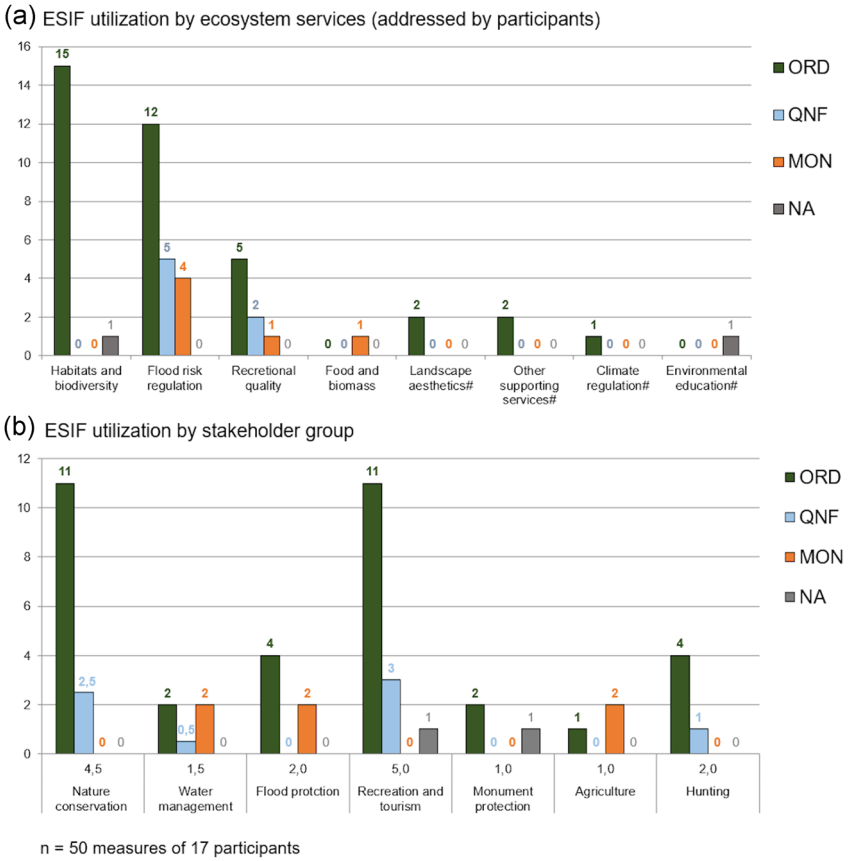

FIGURE 7 Overview of ex-post assigned ESIFs for the justification of measures: (a) related to the service addressed by participants, (b) related to the stakeholder groups. ES marked with # are additional services addressed by the participants wild card measures

results' representativeness. The sample showed a comparatively high average age and a substantial overrepresentation of men caused by the selective invitation of people representing the identified stakeholder groups in the region. These characteristics reflected the actual distribution of managers in Germany (Kohaut & Möller, 2019) and the average age of Dessau-Roßlau's population, which is among the highest in Europe (Richter, 2019). As typical for stakeholder approaches (Antunes et al., 2009), some groups were overrepresented, for instance, the nature conservationists. We compensated for this through a balanced ex-ante group allocation in the planning game.

As mentioned in Section 2.4, the participants misinterpreted the symbols on the justification chips and had difficulties distinguishing the different ESIFs, especially the quantified and monetized format. Consequently, we recommend adapting the quantitative symbol to the units of ES quantifications. To better understand the ordinal-qualitative ESIF in the future, we suggest bars of different lengths with inscriptions, similar to energy efficiency classes.

Furthermore, our subsequent assignment of the participants' arguments to the ESIFs contained uncertainties. First, the classification of keywords was not always explicit. For example, we could have assigned the word 'increase' to the quantified format, but we considered this too uncertain. Second, arguments rated as 'N.A.' in our study could have been included in the ordinal category instead (e.g., general attitude). Moreover, there were problems with some ambiguous terms on the game material that reduced the clarity of justifications. Initially, we considered defining explicit numerical values mandatory for quantified and monetized categories, but we rejected this tough assignment due to the mentioned uncertainties.

Nevertheless, the detected preference for the ordinal-qualitative format was consistent with the results of a nationwide and representative survey we conducted in Germany (Gapinski et al., 2020). In this study, we conducted a choice experiment with three different groups, in which each group received only one of the three ESIFs (Gapinski, 2021). The rare use of quantified justifications in the planning game might be explained by the possibly overstraining amount of information presented in the opening talk and supporting materials (Antunes et al., 2009; Friedrich et al., 2020). The numbers and calculations provided may have been difficult to understand for laypeople in the field of landscape planning and ES (Albert et al., 2014; Bull et al., 2016; Johnston et al., 2011). Additionally, some participants doubted the information we provided, as they revealed in the discussion by comparing it to other familiar values. James and Jorgensen (2009) and Hatton MacDonald et al. (2014) made similar observations and concluded that the knowledge provided by scientists competes with many other sources of knowledge. If such problems can be avoided, quantified ES information in participation processes can improve planning results and make them more comprehensive (Arkema et al., 2015). Planners in Germany recognized an opportunity to increase transparency through quantitative accounting but also a danger of pretending pseudo-accuracy (Albert et al., 2014).

Participants also criticized the monetary valuations. One person specifically doubted the underlying willingness to pay for HB, referring to

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other studies, and requested more background information. Despite the legitimate claim to specify reference values and magnitudes on cardinal scales, which monetary values also belong to (EPA, 2009; Johnston et al., 2011), it should be weighed against the total amount of information. For this reason, we decided to exclude this information. We further observed a general scepticism regarding the monetary valuation, particularly concerning HB. No participant argued in favour of this ES using the monetary format. The Nature conservationists avoided monetarized arguments completely. In the plenary discussion, the nature conservationists highlighted the dangers of monetary valuation. The first frequently discussed issue mentioned was the danger of overemphasizing monetary values (Albert et al., 2014; Bull et al., 2016; Fisher & Brown, 2014). Their use could contradict environmental protection objectives, and they neglect nonmaterial values such as the existence value. Another familiar concern is the possibility of miscalculations, especially underestimations, among the various methods (Albert et al., 2014; Boithias et al., 2016). The river ecologist stressed that monetary valuation is occasionally required for comparisons. However, a nature conservationist (NGO) warned that people could disregard a lower calculated ES value compared to a higher economic benchmark (e.g., business profit). Hatton MacDonald et al. (2014) and Beaumont et al. (2018) also document a fundamental rejection of monetizing nature aspects, mainly in this stakeholder group. Similarly, planners in Germany have a distrustful attitude towards the monetary ESIF (Albert et al., 2014), which has seen little integration into planning except for the intervention regulation (von Haaren & Albert, 2011). All in all, the attendees emphasized that transparency and trust, along with an appropriate context, should be mandatory requirements for applying monetizations.

There was no criticism against qualitative, ordinal-scaled representations. Also, interviewed planners in Germany, even without previous knowledge, described this format as 'particularly useful for decisions'. Caution is required, however, because it contains 'intransparent prior weighting' (Albert et al., 2014), which requires expert knowledge to evaluate.

Regarding the distribution of the ESIF among stakeholders and ES, we could only formulate hypotheses based on our observations. However, it was quite apparent that quantitative and monetary arguments were increasingly put forward for FR. In addition, flood and water managers argued comparatively often in monetary terms. For politicians, due to the small number of participants, no increased preference for the monetary ESIF can be derived, despite two out of three (both flood protectors) using the format once.

4.2 | Findings from the workshop and planning game

The participation process generated several benefits. In the plenary discussion, the participants confirmed that they gained additional knowledge about the area and the other stakeholders from the workshop. Reviews on case studies also document such benefits (Hassan & Hamari, 2020; Katsaliaki & Mustafee, 2014). Additionally, participants explicitly appreciated the 'informal environment' that stimulated 'open and constructive discussions', the interactive tasks and the unexpectedly simple game process. Finally, the attendees requested that the results be published and presented to the city council. Considering the previous severe conflicts between the groups, these findings were very unexpected.

We attribute these positive outcomes to the basic concept behind our planning game. Games as a playful approach to participatory planning processes proved to be a promising alternative to conventional engagement methods. The gamification helps to break the ice between participants, enhances reflection and civic learning, motivates interactions, and provides creative space for imaginary alternatives (Barreteau et al., 2007; Gordon & Baldwin-Philippi, 2014; Katsaliaki & Mustafee, 2014; Nasir et al., 2013). Furthermore, collective experiences can positively impact future interactions and cooperations of the participants (Barreteau et al., 2007). When rules are appropriately defined, games can also help to democratize planning by enhancing open discussions and providing equal opportunity to be heard (Bots & van Daalen, 2007). Thus, games offer great potential for spatial and ES-related decision-making and provide evidence about the attendees' preferences (Merlet et al., 2018; Mulazzani et al., 2017; Nazari et al., 2020). Furthermore, the paper-based format had several advantages over digital processing. No participant was deterred or excluded by complicated technology. Additionally, it is presumed that having all material in printed versions at a glance might lead to more informed decisions (Pocewicz et al., 2012). Afterwards, the participants were allowed to take the game materials home, which was considered very appealing. Nevertheless, framing the planning simulation as a 'game' could suggest a competitive situation to the participants or call the seriousness of the planning process into question (Ampatzidou et al., 2018; Hassan & Hamari, 2020).

As for all participation formats, a disadvantage of our planning game is the tremendous time effort (Creighton, 2005). This applies especially to the preparatory work, mainly to compile the ES information (Bull et al., 2016). Our ES assessment took about 3 months, and the preparation of the workshop about 6 weeks, despite the support of students. The time needed to acquire the geodata is excluded here. However, our observations confirm the frequently finding that this effort pays off in the end through less time lost due to conflicts within the later planning phases and through more comprehensive planning results (Arkema et al., 2015; Creighton, 2005; Longato et al., 2021). On the other hand, we know that accompanying research, equipped with the needed time and financial capacity, is not always available. The impact of our workshop revealed possible substitutes: The city of Dessau-Roßlau is itself interested in testing the concept. The WWF Germany, responsible for planning and implementing the restoration measures in the Wilde Mulde-project, plans to continue the initiated path with a workshop for nature conservation aspects. This reveals another strength of the basic concept, which combines wide freedom of choice with strict rules for justifying the proposals, namely its adaptability to other planning situations. In fact, this concept will be integrated into a software-based decision support tool to plan renewable energy

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development on a local level, which is currently developed in a research project (Wiehe et al., 2021). Of course, the compilation of information (ES assessments, spatial resistance maps) is the most time-consuming part of any application and necessary to make informed decisions. However, to initiate stakeholder cooperation, this aspect might be given less priority at first.

5 | CONCLUSIONS

The results of the Mulde planning experiment support the recommendations of Albert et al. (2014) to apply case-specific combinations of the ESIFs. Ordinally scaled evaluation results should be used as the initial format in landscape planning participation, as they seem to be best understood and accepted by all stakeholder groups. Cardinally scaled quantifications and monetizations can be used to support the ordinal-qualitative ESIF. Communicating complex quantified or monetized evaluation results that include related uncertainties to laypeople remains a challenge for science communication. To this end, the ordinal scale should (1) include the full cardinal range of quantification and (2) allow comparison with other areas of investigation. Additionally, the numerical values should be as simple as possible when working with nonprofessionals. However, this is not easy for ES like HB, which can only be expressed with composite indicators. Adding the quantitative values to the ordinal classes can increase the credibility and comprehensibility of the ES information. Due to the scepticism surrounding monetization, it should only be used in an economically relevant context. According to our experiences, avoidable flood damage is relatively sure of an appropriate context. This may also apply to expected crop yield or losses or the revenue from recreation, but not for areas with high, rare, and endangered biodiversity. More practical applications or representative surveys are needed to understand the case-specific application of appropriate ESIFs better.

We recommend using the designed planning game concept at the beginning of participation processes to lay the foundation for good stakeholder cooperation. We observed that the simple procedure with strict rules to confirm each planning proposal helped to make the discussion more factual and supported compromise among stakeholders with conflicting interests or opinions. Derived improvements in wording and design to reduce emerged weaknesses still need to be tested. This also includes suggestions from the participants, such as specifying some of the predefined measures more clearly and flagging the located measures as 'consensus' or 'disagreement' to help identify conflicts. However, the basic framework can be adapted to various planning situations.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author, C.M. Gapinski. The data are not publicly available due to privacy or ethical restrictions.

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