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Received: 29 February 2024 | Revised: 2 April 2025 | Accepted: 14 April 2025

DOI: 10.1111/csp2.70068

CONTRIBUTED PAPER

Conservation Science and Practice
A journal of the Society for Conservation Biology
Open Access

WILEY

Stakeholder-driven management strategies for recovering large herbivores

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Abstract

In modern landscapes, the sustainable coexistence of humans and wildlife depends on involving stakeholders in the development and implementation of management strategies. This is particularly important for species like the European bison (*Bison bonasus*) and Eurasian moose (*Alces alces*), which are reoccupying regions between Germany and Poland after a prolonged absence. The return of these species generates mixed emotions, as interactions with these species are associated with both costs and benefits to people. Addressing the apparent unpreparedness in managing these trade-offs, we implemented a digital participatory impact assessment in two steps. First, we engaged bison and moose experts to develop management scenarios and assessment criteria. Then, in a subsequent virtual workshop, stakeholders evaluated four scenarios along economic, social, and ecological dimensions. Quantitative and qualitative analyses revealed divergent perspectives and priorities, yet consensus emerged on the necessary future steps: formulating a comprehensive management strategy with guidelines and protocols for managing specific conflict scenarios, such as the incursion of large herbivores onto highways. Our approach underscores the importance of early stakeholder engagement in fostering a more equitable and sustainable management of human-wildlife interactions. Moreover, demonstrating the feasibility of remote stakeholder involvement, our study presents a robust model for enhancing coexistence, adaptable even where in-person meetings are challenging.

KEYWORDS

cross-border wildlife management, European bison, human-wildlife coexistence, human-wildlife interactions, moose, participatory research, returning wildlife species, stakeholder engagement, transboundary conservation, wildlife conservation

1 | INTRODUCTION

The return of wildlife species to their former habitats is a considerable conservation success, particularly during times of catastrophic loss of global biodiversity (Dietz & Adger, 2003; Doherty et al., 2016; Pimm et al., 1995; Tanentzap & Smith, 2018). Yet, the recovery of large mammals in human-dominated landscapes presents

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challenges for both humans and animals (Ceauşu et al., 2015; Chapron et al., 2014; Hackländer & Zachos, 2020; Treves et al., 2009). To ensure the long-term success of species conservation initiatives and the establishment of stable wildlife populations, it is imperative to implement wildlife management practices that encompass both economic and social considerations (Carter & Linnell, 2016; Ceauşu et al., 2019).

In Eastern and Central Europe, European bison (*Bison bonasus* LINNÉ, 1758: hereafter bison) and Eurasian moose (*Alces alces* LINNÉ, 1758: hereafter moose) are making a remarkable comeback. Once near extinction due to extensive hunting and habitat loss, free-living bison now number close to 9000 in 10 different countries, with some populations living in reserves or under close management (Raczyński, 2023). The survival of bison populations is still dependent on conservation measures. According to the IUCN Bison Specialist Group, human-related conflicts and lack of public support are major obstacles to bison conservation (Olech & Perzanowski, 2022). Similarly, the moose population is recovering thanks to conservation efforts and a hunting ban in Poland (Borowik et al., 2021; Główny Urząd Statystyczny, 2019) after having experienced a significant decline since the Middle Ages due to land use expansion, urbanization, hunting pressure, and habitat loss (Baskin, 2009; Schönfeld, 2009). Following recent population growth in western Poland (König, Carter, et al., 2021a; König, Ceauşu, et al., 2021b; Kümmerle et al., 2017; Olech & Perzanowski, 2022; Raczyński, 2023), bison are now found just east of the German-Polish border, and moose have expanded their range across the German-Polish border, with increasing sightings in northeastern Germany (Bluhm et al., 2023; Dobiáš, 2019; Niedziałkowska et al., 2014; Ostermann-Miyashita et al., 2023).

The return of both large herbivore species presents a remarkable opportunity for ecological restoration and the reinstatement of their crucial roles in shaping landscapes (Dunn-Capper et al., 2024). Both species are considered ecosystem engineers. They form and maintain habitats by preventing the progression of succession, which creates more open vegetation patches. This diversification of habitats and landscapes contributes to the maintenance of biodiversity (Bernes et al., 2018; Edenius et al., 2002; Gordon et al., 2004; Schwerk et al., 2021; Svenning, 2002; Zielke et al., 2019). At the same time, the long-term coexistence of these large herbivores and humans requires sustainable and inclusive solutions to balance the benefits and costs associated with their return in a fair manner. Conflicts may arise in the heavily modified and densely populated landscape of Central Europe due to damages in agricultural and forested areas (Herfindal et al., 2015; König, Carter, et al., 2021a; König, Ceauşu, et al., 2021b; Nieszała et al., 2022), road traffic accidents (Klich et al., 2023; Lavsund & Sandegren, 1991; Plaschke et al., 2021), and lack of social acceptance (Klich et al., 2018, 2021; Ostermann-Miyashita et al., 2022).

Although the recovery of bison and moose is encouraging from a conservation perspective, it has brought forth complex dynamics between humans and wildlife. The concept of human-wildlife conflict often extends beyond direct human-wildlife interactions (Peterson et al., 2010), reflecting broader social conflicts over wildlife management strategies (Ostermann-Miyashita et al., 2021; Redpath et al., 2013). Therefore, it is important to understand and engage societal groups that are differently affected (Carter & Linnell, 2016; Hill et al., 2017; Kansky & Knight, 2014; Zimmermann et al., 2020), particularly key actors or stakeholders who are both directly impacted by and capable of influencing wildlife management outcomes (Freeman & McVea, 2001; Prell et al., 2009). Early involvement of stakeholders is crucial for policy design, management intervention acceptance (König et al., 2020) and overall sustainability (Duggan et al., 2013; Grimble & Wellard, 1997; Prell et al., 2009). Therefore, participatory approaches are increasingly recognized in environmental management (Dougill et al., 2006; Mushove & Vogel, 2005; Prell et al., 2009; Reed, 2008). These approaches involve engaging stakeholders at various decision-making levels, facilitating direct communication among participants (Prell et al., 2009).

Recognizing the significance of diverse perspectives, our study employs the Framework for Participatory Impact Assessment (FoPIA). FoPIA has previously been applied in various contexts, such as evaluating the effectiveness of livelihood intervention projects in the humanitarian sector (Catley et al., 2008), assessing the impacts of land use policies at the European Union level (Morris et al., 2011), and addressing human-wildlife conflicts in regional contexts (König, Carter, et al., 2021a; König, Ceauşu, et al., 2021b). The methodological framework facilitates an ex-ante assessment by fostering a process-oriented exchange of knowledge and perspectives among stakeholder groups. This collaborative process involves jointly evaluating scenarios and exploring trade-offs between different interests, with the aim to produce concrete results for a specific impact assessment (Catley et al., 2008; König, Carter, et al., 2021a; König, Ceauşu, et al., 2021b; Morris et al., 2011). Combining scenario studies with stakeholder participation can be a helpful strategy for identifying and discussing different interests and needs (Grunewald & Bastian, 2013; Peterson et al., 2010; Rotmans et al., 2000; Syrbe et al., 2013; Tress & Tress, 2003). This is particularly relevant when

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discussing sustainability issues, as long-term developments can be analyzed from interdisciplinary perspectives (Beach & Clark, 2015; Syrbe et al., 2013; Walz et al., 2007).

Adapting to digital formats due to COVID-19 related public health measures, our study aims to: (1) explore diverse stakeholder perspectives on the return of bison and moose; (2) identify opportunities and shared concerns for management approaches; and (3) assess the practicability and challenges of distinct management scenarios. We adopted the FoPIA approach to support transboundary wildlife management for bison and moose in Germany and Poland. Specifically, we employed the FoPIA approach to evaluate different management scenarios for the return of bison and moose to the German federal state of Brandenburg to highlight future development possibilities and outline the consequences or conflicting goals of specific management actions. While bison and moose have distinct characteristics, their shared ecological role, habitat overlap, and recent recovery across the wider region made it beneficial to combine them in a single impact assessment, optimizing resources and promoting a broader understanding of management challenges and opportunities for coexisting with large herbivores in agricultural landscapes. In this study, we developed four distinct management approach scenarios ("Monitoring", "Deterrence", "Translocation", and "Culling"). To facilitate stakeholder engagement and knowledge transfer, we collaboratively discussed potential scenarios and subsequently assessed the impacts of different wildlife management approaches for these two species.

Our study builds on previous research (König et al., 2013; König, Carter, et al., 2021a; König, Ceauşu, et al., 2021b; Morris et al., 2011) by applying scenario development, criterion weighting, and sustainability assessment, but has a specific focus on wildlife management. Unlike studies that examined the management of animal population sizes (König, Carter, et al., 2021a; König, Ceauşu, et al., 2021b) or land use scenarios (König et al., 2013; Morris et al., 2011), our study primarily focusses on the impact assessment of specific wildlife management scenarios. Additionally, while earlier studies employed in-person workshops, we used a digital format via the Zoom platform. Finally, our approach emphasizes joint evaluation in a (digital) workshop setting with selected stakeholders, thereby fostering a more interdisciplinary and collaborative learning process in comparison to individual impact assessments employed in earlier studies (e.g., König, Carter, et al., 2021a; König, Ceauşu, et al., 2021b). We discuss how this approach supports key aspects of improving human-wildlife coexistence (Carter & Linnell, 2016) by facilitating continued learning and supporting adaptive and co-designed management.

2 | MATERIALS AND METHODS

2.1 | Study area

The study focused on the German federal state of Brandenburg, which borders Poland. While moose are occasionally sighted in the area, evidence of their reproduction is limited (Ostermann-Miyashita et al., 2023; Schönfeld, 2009). Currently, there are no reports of free-ranging bison in Brandenburg, except for a single bison that crossed the river Oder, which forms the border with Poland, into the municipality of Lebus in 2017. This animal was illegally shot following an apparently ill-informed decision made by local authorities (Kaufmann, 2019). However, due to the growing bison population in western Poland, the likelihood of transboundary bison movement is increasing (Bluhm et al., 2025). In Brandenburg, there exists a management plan for moose dating back to 2013 (Martin, 2013); however, no corresponding plan is currently in place for bison. According to a habitat analysis (Bluhm et al., 2023), substantial areas of Brandenburg are suitable for both moose and bison. Although both species may become more widespread in our study area in the future, practical experience with them is still limited. Therefore, it is urgent to develop comprehensive approaches aimed at fostering long-term coexistence between humans and these large herbivores (IUCN, 2020; Martin, 2013; Nebelsieck & Ratshow, 2021; Pucek, 2004; Siebert et al., 2021).

2.2 | Experts and stakeholder groups

In this study, we considered knowledge from two main sources. One source is from "experts", who are considered to have a strong background in bison and moose biology, recovery potential, and management practices in Central and Eastern Europe. The other source is from "stakeholders" who are, by definition, likely to impact or be affected by decisions concerning the return of bison and moose to northeastern Germany. The experts, with backgrounds in science and practice, guided the development of the management scenarios, ensured the consistency and comprehensibility of the evaluation matrix, and helped identify key stakeholders for the participatory process.

By combining the findings of experts' consultation with the analysis of a 2021 master's thesis (Kehl, 2021), we identified six sectoral-stakeholder groups: agriculture, forestry, hunting, nature conservation, road safety, and tourism. We initially contacted high-level regional representatives from these groups and then used the snowball

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method to expand our reach. The selected stakeholders were either already involved with at least one of the two species in their professional practice (e.g., professional monitoring of these species) or would serve as contact persons (e.g., for land users, hunters or road safety) if the species were to become established.

Given our focus on the effects of wildlife management measures rather than their development and recognizing that policy makers are often not directly affected, we did not include them as stakeholders in this study.

2.3 | Ethical considerations

This study involved interviews and a stakeholder workshop; during all steps, we adhered to ethical standards to ensure the rights, well-being, and privacy of the participants and complied with the General Data Protection Regulation (GDPR). To protect the privacy of interviewees, we anonymized quotes and restricted access to personal data. Prior to sending the paper out for review, we obtained explicit consent from all participants.

2.4 | Workflow of the FoPIA method

The digital application of FoPIA involved four steps:

1. Development of an evaluation matrix: We created an evaluation matrix to assess the impact of four management scenarios on six criteria, each with two indicators. These criteria covered the three dimensions of sustainable development: social, economic, and ecological.
2. Preference analysis: We conducted interviews with key stakeholders to determine the relative importance of each of the six sustainability criteria.
3. Impact assessment: We held a virtual workshop in which stakeholders evaluated the management scenarios against the six sustainability criteria using the evaluation matrix. Discussions focused on the potential impacts of each scenario and potential combinations or implementations.
4. Sustainability analysis: We performed a quantitative analysis of the participants' responses to the preference analysis and the impact assessment (Figure 1).

We followed the "storyline" approach (Rotmans et al., 2000) and developed four scenarios based on the literature and expert consultation, accompanied by visual aids and maps (Dougill et al., 2006). To stimulate contrasting views and to encourage broad assessment and discussion, the scenarios incorporate distinct management approaches without specific implementation details. A fictional map featuring landscape characteristics and land uses typical of northeastern Germany served as the backdrop (Figure 2). It includes agricultural and forestry land, small settlements, meadows, and water bodies. Based on the typical behavior of the two species, we defined the scenarios as either a single male moose or

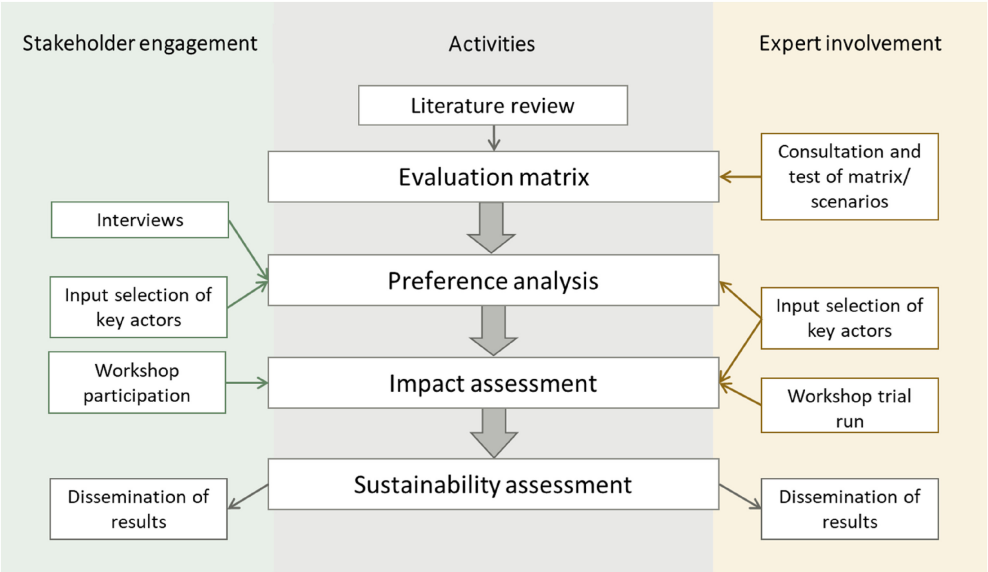

FIGURE 1 Overview of the methodological workflow of the FoPIA method (centre panel) and involvement of the stakeholder groups (left panel) and experts (right panel) in each of the activities. The experts' main role was to examine the scientific theoretical background as well as to pre-test the interviews and the workshop. Stakeholders were the main participants of the interviews and the workshop and contributed their knowledge and experiences.

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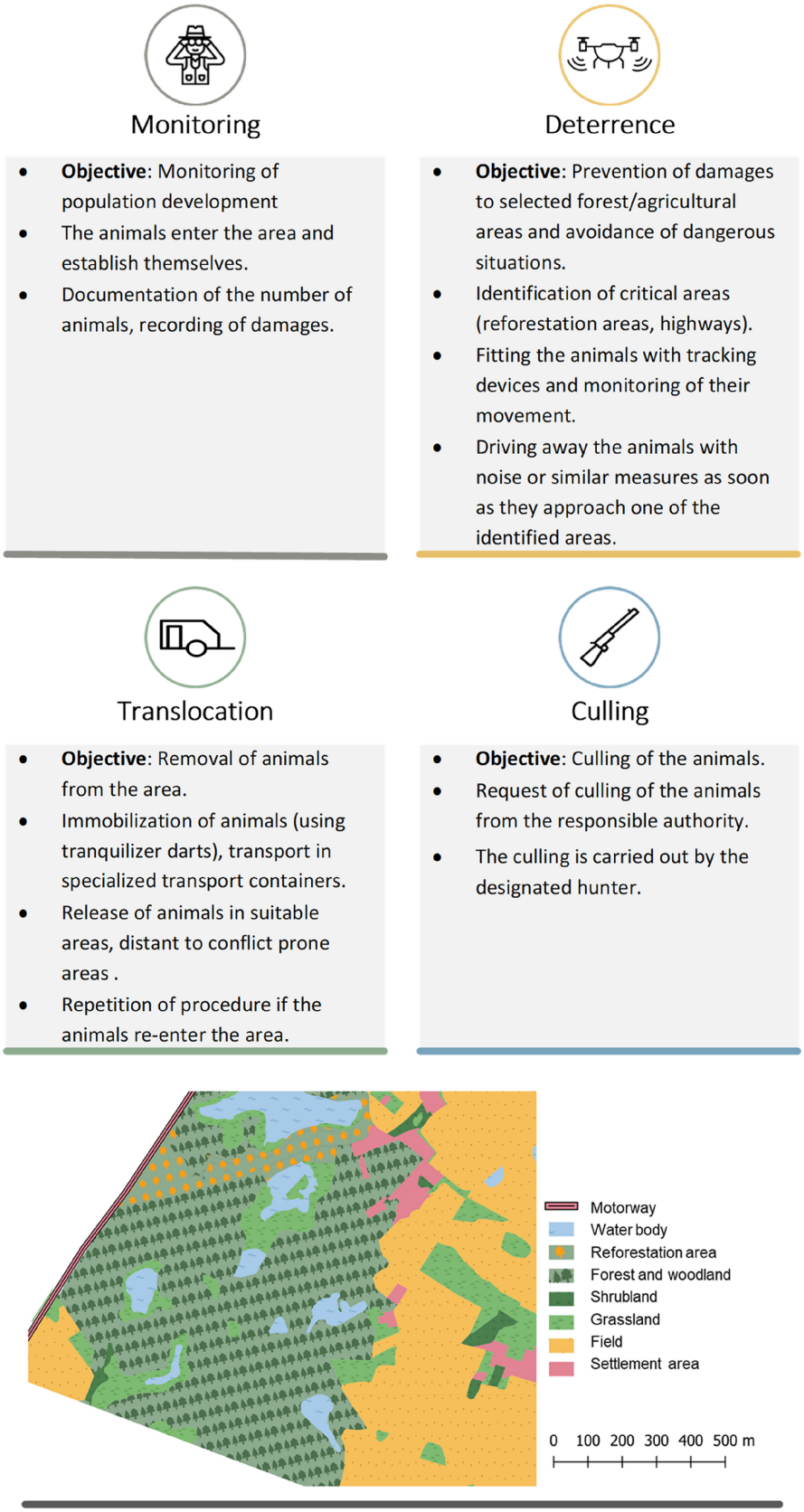

FIGURE 2 Description of the four scenarios for the future management of bison and moose in Germany ("Monitoring"/"Deterrence"/"Translocation"/"Culling") and their objectives. The map at the bottom depicts the scenario setting, a fictional cultural landscape in northeastern Germany with multiple land uses. These illustrations were used during interviews and a workshop with key actors.

a group of three or more female bison with calves entering the area and remaining there for an extended time period.

The four scenarios, escalating in intervention intensity, were informed by practical management experience from West Pomerania, Poland. The objective of scenario 1

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"Monitoring" is to monitor the population development and document any associated impacts. While the animals are observed, no interventions are conducted. Scenario 2 "Deterrence" aims to prevent damages in agricultural or forestry areas by deterring the animals with drones. The animals are fitted with satellite collars to monitor their movements and detect when they venture into critical areas, such as crop fields or settlements (ZTP staff, 2021). In Scenario 3 "Translocation", the animals are relocated as a pre-emptive measure to designated areas deemed suitable. This measure is repeated if the animals return to conflict-prone areas (ZTP staff, 2021). Scenario 4 "Culling" involves the lethal removal of the animals.

For the evaluation of the four management scenarios, we established six sustainability criteria with two indicators each to cover the social, economic and ecological dimensions of sustainable development (Pérez-Soba et al., 2008). In the ecological dimension, we defined two criteria: "species richness", referring to the variety of animal and plant species in an area, and "ecosystem resilience", which indicates how well an ecosystem functions and recovers from disturbance. The proposed social sustainability criteria include the perceived "quality of life" of people living in the area, encompassing their mental and physical well-being and "cultural identity", which represents the distinctiveness and beauty of a landscape. For the economic dimension, we selected the "agricultural and forestry production" capacity of the landscape, including its yield potential and its "touristic appeal" and related value-added activities. We based the selection of criteria and indicators on a literature review, drawing from related studies (Blazejczak & Edler, 2004; Helming et al., 2008; König et al., 2012, 2013; Morris et al., 2011) and expert consultation.

We conducted a preference analysis to assess the relevance of each sustainability criterion in the context of the study through semi-structured interviews via phone or Zoom with 14 representatives from six stakeholder groups. Stakeholders were asked to rate the criteria on their significance for future bison/moose management in northeastern Germany on a 0–10 scale (where 0 indicated no significance, 5 moderate significance, and 10 very high significance), and to make specific reference to their professional practice and experience (see Figure A1 [original in German] and Figure A2 [English translation]). The interviews took place between May and July 2021. Prior to the interviews, all participants received a document outlining the criteria and the 10-point scale. During the interviews, this information was available, either via the provided document or, in the case of Zoom interviews, through a shared screen. Participant feedback indicated a clear understanding of the criteria and scale, giving us confidence in the reliability of the responses and the suitability of the 10-point scale in the digital interview setting.

We conducted the impact assessment during a 3.5-h virtual workshop on July 7, 2021. A professional moderator and three project team members facilitated the workshop and provided technical assistance. We invited one representative from each stakeholder group, resulting in a small yet effective group size that encouraged candid and thorough discussions. Because of unforeseen circumstances, the representative of the traffic safety group was unable to attend, and we included an additional participant from the nature conservation group. The final group consisted of six actors. These included a representative from a hunting association (hereafter referred to as "Hunter"), a wildlife park director representing the tourism sector ("Tourism"), representatives from associations of land users ("Landuse") and forest owners ("Forestry") and two representatives from conservation organizations ("Conservation 1" and "Conservation 2"). During the workshop the stakeholder rated the perceived impact of the scenarios on the criteria (scale: −3 = "very negative impact"; ...; 0 = "no impact"; ...; 3 = "very positive impact").

During the interviews and workshop, participants provided a single rating for both bison and moose. While differences between the species were raised during the discussion, participants were encouraged to focus on unifying aspects and to reach a consensus response pertaining to both species. This approach ensured a balanced assessment while capturing key shared impacts.

For the workshop, we used Zoom for videoconferencing and Miro as a digital whiteboard. We enabled screen-sharing to allow all participants to view workspace outcomes and stakeholder assessments—a critical aspect of FoPIA. Prior to the workshop, we provided participants with a technology checklist and granted access to a pre-event testing session. For subsequent analysis, we recorded the session with consent from all participants.

The study was conducted in German. All interviews and workshop discussions were transcribed and translated into English by the author. To ensure translation accuracy, two of the authors back-translated the English version into German.

2.5 | Analysis

To analyze participants' preferences and conduct the impact assessment we combined quantitative and qualitative methods. First, we transcribed the interviews and

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workshop discussions and grouped the participants responses according to the criteria and scenarios discussed during the interaction. We then categorized numerical responses of 14 participants by stakeholder group and calculated mean values per criterion. Finally, we multiplied these aggregated results of the preference analysis by those of the impact assessment using R 4.1.3 (RCoreTeam, 2020) to compute the weighted sustainability assessment.

3 | RESULTS

3.1 | Preference analysis

Table 1 summarizes the key feedback from individual interview partners. "Species richness" received mixed responses, with some stakeholders not feeling qualified to assess its relevance based on their professional expertise. A key point of debate was determining the threshold for herd size or number of individuals to have a positive effect on the ecological dimension. Increased tourism, which may be associated with increased traffic, was another point of discussion. Landscape attractiveness and its cultural identity were considered the least important among the criteria. Stakeholders suggested "conflict potential" as a social criterion, encompassing hybridization concerns (between bison and cattle) and damage to forests. Other potential criteria suggested were personal freedom, security, and management costs.

The interviews revealed a nuanced picture, with notable disparities in the perceived relevance of each criterion for different stakeholders. "Cultural identity" had the lowest mean score (4.8), while "resilience" had the highest (7.8). Criteria with intermediate ratings included the economic criterion "agricultural and forestry production" (6.3), "tourist appeal" (6.0), "quality of life" (6.8) and "species richness" (6.1) (Table 2).

TABLE 1 Summarized qualitative feedback from the interview partners on the sustainability criteria.

Criteria	Assessment (and feedback) from stakeholders during interviews
Species richness	• Conservation goals may vary and be contradictory depending on the specific species of focus, making the criteria less definitive. • The emphasis should be more on specific species rather than number of species.
Resilience	• Particularly in the context of climate change, protection of existing and protected ecosystems is of high importance. • Differentiation between the impact on ecosystems: ○ European bison has a greater impact (bark stripping, large herds) ○ Moose is less relevant (selective browsing, individuals)
Quality of life	• Increased risk of traffic accidents but critical number of animals is debatable. • The status of the European bison as a national animal in Poland serves as a positive example, but a similar cultural appreciation is not expected in Germany.
Cultural identity	• Moose were previously considered the national animal of Germany and still have the potential to enhance the perception of landscapes. • Potential increase in wildlife crossings signs may be viewed as unsightly landscape elements, but they offer advantages for wildlife and traffic safety.
Agricultural/ forestry production	• Forestry is currently at a critical point due to the consequences of heatwaves and droughts. ○ Forest transformation is in progress, may be impacted by higher number of large herbivores ○ Damage from browsing and brak stripping would strongly depend on population densities. • Potential risk for livestock due to pathogen transmission.
Touristic appeal	• Increased tourism would also result in more traffic.

3.2 | Impact assessment workshop

The impact assessment workshop included three steps: (i) an introductory round, followed by (ii) a qualitative and quantitative evaluation of the four scenarios. During the closing session, (iii) we integrated and summarized the collective assessments and feedback received.

3.2.1 | Introduction

During the introduction, participants shared their interest in bison and moose management. Three out of six participants highlighted the impact of the two species on the current cultural landscape. The group also discussed differences in wildlife management between Germany and Poland. The ecology of the animals and suitable habitats were of particular interest. It was clear that the participants had different interpretations of the scenarios, as the following quotes illustrate:

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TABLE 2 Aggregated results from the preference analysis, interviews with 14 stakeholders across six stakeholder groups to determine the perceived relevance of the six sustainability criteria for future moose/bison management in Germany (rating scale 0 = no relevance; …; 10 = very high relevance).

Criteria	Interviewed stakeholder																						All stakeholder groups	
	Forestry				Hunting				Landuse				Conservation				Tourism				Traffic			
	1	2	Ø	SE	1	2	Ø	SE	1	2	3	Ø	SE	1	2	3	Ø	SE	1	2	Ø	SE	1	2	Ø	SE	Ø	SE
Ecological dimension																									6.9	1.2
Species richness	2	9	5.5	4.9	10	8	9.0	1.4	10	2	9	7.0	4.4	8	9	7	8.0	1.0	2	7	4.5	3.5	0	5	2.5	3.5	6.1	2.4
Resilience	8	10	9.0	1.4	10	8	9.0	1.4	9	9	10	9.3	0.6	10	7	8	8.3	1.5	4	6	5.0	1.4	4	8	6.0	2.8	7.8	1.8
Social dimension																									5.8	1.4
Quality of life	8	7	7.5	0.5	7	5	6.0	1.4	5	9	7	7.0	2.0	8	6	7	7.0	1.0	2	7	4.5	3.5	9	8	8.5	0.7	6.8	1.4
Cultural identity	5	2	3.5	1.5	7	2	4.5	3.5	5	5	5	5.0	0.0	5	7	6	6.0	1.0	2	5	3.5	2.1	6	6	6.0	0.0	4.8	1.1
Economic dimension																									6.2	0.2
Agricultural & forestry production	10	5	7.5	3.5	10	2	6.0	5.7	10	10	10	10.0	0.0	6	5	7	6.0	1.0	10	3	6.5	4.9	1	3	2.0	1.4	6.3	2.6
Touristic appeal	7	9	8.0	1.4	6	5	5.5	0.7	3	1	8	4.0	3.6	8	7	8	7.7	0.6	4	5	4.5	0.7	7	6	6.5	0.7	6.0	1.6

Note: Results are depicted as number of responses per stakeholder(1/2/3), mean values (Ø) per stakeholder group and standard errors (SE) of the ratings within the group.

> "If monitoring is associated with disturbing the species, it can lead to negative impacts on the resilience of these ecosystems, as these are keystone species of the ecosystem." (Stakeholder Conservation 1)
> "Monitoring means not intervening, allowing the animals to come and live there. From this perspective, it would have a positive impact on the biodiversity of the area because the animals can live there." (Stakeholder Tourism)

3.2.2 | Qualitative and quantitative evaluation of the four scenarios

Table 3 summarizes the numerical ranking of the four scenarios and the results of the impact assessment.

Monitoring scenario

Generally, stakeholders viewed the impact of the monitoring scenario on the sustainability criteria positively. However, one participant anticipated a negative impact (−1) on both the ecosystem's resilience and the area's tourist appeal. Four individuals considered the impact of the monitoring scenario on agricultural and forestry production to be somewhat negative or negative.

There was no consensus on the impacts of bison and moose on the ecosystem. Positive effects were discussed, including the creation of new habitats through structural changes induced by the animals, juxtaposed with potential damage to forests and agricultural areas. Several participants highlighted that the impact depends on the number of animals present in the area. For instance, a small animal population in a vast area can complicate visitor management.

> "*I believe that the presence of one, two, or three moose or bison in an agricultural landscape or commercial forest does not have any significance for species diversity. […] But if we say that a herd of bison establishes itself in a larger area, then it is a game changer.*"
> (Comment of Hunter Stakeholder about the Monitoring Scenario—rated the effect of the scenario on the respective criteria "species richness": 0)
> "*It is true that the number of animals is crucial for the positive impact on species diversity, that's beyond question. On the other hand, even a single bison or a small group of bison will shape their habitat.*"
> (Conservation 2 about the Monitoring Scenario—rated "species richness": +3)

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TABLE 3 Results from the impact assessment of the workshop for the four scenarios from six stakeholders, representing five stakeholder groups.

	Stakeholder groups					
Criteria	**Hunter**	**Tourism**	**Landuse**	**Forestry**	**Conservation1**	**Conservation2**
Monitoring scenario						
Species richness	0	3	2	2	1	3
Resilience	0	3	0	−1	1	2
Quality of life	2	3	1	1	0	1
Cultural identity	2	3	1	1	1	1
Agricultural and forestry production	0	−2	−2	−2	−1	0
Touristic appeal	2	3	0	−1	2	2
Deterrence scenario						
Species richness	0	−1	0	1	−1	−2
Resilience	0	−1	1	2	0	0
Quality of life	1	1	1	1	1	−1
Cultural identity	1	−1	0	1	−1	−1
Agricultural and forestry production	2	1	2	2	2	2
Touristic appeal	0	0	−1	−1	−1	−2
Translocation scenario						
Species richness	0	−3	1	2	−3	−2
Resilience	0	−3	0	2	−1	0
Quality of life	1	−2	1	1	0	−1
Cultural identity	0	−2	0	1	−2	−1
Agricultural and forestry production	2	3	2	2	2	2
Touristic appeal	0	−3	−1	−1	−2	−1
Culling scenario						
Species richness	0	−3	−1	2	−3	−3
Resilience	0	−3	0	−1	−1	−1
Quality of life	0	−3	−1	−1	−2	−1
Cultural identity	0	−3	−1	−1	−3	−1
Agricultural and forestry production	2	3	2	2	2	1
Touristic appeal	0	−3	0	−1	−2	−3

Note: Assessment scale −3 = very negative impact on the scenario; −2 = negative impact; −1 = rather negative ...; 0 = no impact ...; 1 = rather positive; 2 = positive; 3 = very positive impact on the criteria.

Deterrence scenario

Stakeholders perceived mixed impacts on sustainability criteria. The deterrence measures were perceived as having predominantly negative consequences for species diversity, while having predominantly positive impacts on ecosystem resilience. Opinions on the impact in the social dimension were mixed. For the economic dimension, participants expressed only (rather) positive consequences for agricultural and forestry production, while no or negative consequences were identified for tourist attractiveness.

Stakeholders discussed whether the deterrence measures, leading to the absence of moose or bison in the area, would reduce species richness. One participant suggested that changes in the lower vegetation layers due to browsing could increase biodiversity. Others argued that implementing deterrence measures could help protect other species. Overall, the consensus was that deterrence measures are a useful tool to promote acceptance of the species.

> "*The question is a little difficult for me. I consider deterrence, at the specific location where*

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conflicts arise, as a positive way to defuse these conflicts. If deterrence is carried out in one place, for example, for silvicultural or agricultural reasons, of course, a species is temporarily no longer present in the area. But the intention might be to protect other species with it." (Forestry about the Deterrence Scenario—"Species richness": 1)

"*We are operating exactly within this conflict potential and tension regarding the local acceptance of these species. On one hand, there is forestry, and on the other hand, there is biodiversity. When we talk about species richness, the simple rule applies: the lower the vegetation, the higher the species diversity. And when it comes to browsing in the forest, I agree with you, the discussion is currently focused on the 'forest before wildlife' issue. Bison and moose would contribute to the conflict. On the other hand, they would also have a positive effect on the ecosystem.*" (Conservation 2 rating the Deterrence Scenario—"Species richness": −2)

Translocation scenario

The assessment of this scenario's impact varied. Its impact on ecological criteria ranged from positive (2) to very negative (−3), while ratings on social criteria ranged from rather positive (1) to negative (−2). Agricultural and forestry production was considered to be positively affected by all participants. In contrast, all participants predicted neutral to very negative impacts on tourism.

One participant emphasized that the reason for the translocation is pivotal in determining its impact on the social dimension. While the disappearance of a species is generally perceived as negative, translocation may enhance the quality of life for residents in conflict situations. The stakeholders' discussion unveiled a range of interpretations of the criteria related to the impacts on the social dimension.

"*I do believe that the presence of such large species is naturally welcomed. [...] Therefore, I would consider it negative if the animals were to disappear. But [...] it of course depends on where the animals are located and what effects we observe, for example, in commercial forests.*" (Conservation 2 about the Translocation Scenario—"Quality of life": −1/"Cultural identity": −1)

Culling scenario

Participants mostly evaluated the impact of the culling scenario as neutral to negative. Only one stakeholder considered the impact on species diversity to be positive. Agricultural and forestry production was considered to be positively affected. However, several participants emphasized that culling should only be considered as a last resort in cases of prior conflicts. According to participants, the poor management of livestock losses due to wolf (*Canis lupus*) predation serves as a negative example of how a lack of intervention by authorities leads to feelings of helplessness among those affected, resulting in a demand for culling to overcome this sentiment.

"*If deterrence measures etc. are not effective, it is legitimate to cull animals. [...] I also notice this in the discussion about wolves, people feel powerless, being at the mercy of a problem without any options for action [...] this is a major drawback. And I believe it is actually positive to be able to take action on-site, if necessary, because killing animals is never an easy decision. I would consider it positive for species diversity in a case where for example a herd of bison has negatively impacted other species that were desired in that area. In that situation, considering killing them becomes an option.*" (Forestry about the Culling Scenario—"species richness": 2)

"*Assumption: Bison migrate into the Prignitz region. [...] It is a major cattle farming area that gains its scenic beauty and appeal through this form of utilization. The presence of wild bison challenges this dynamic. Therefore, it is not a negative impact to prevent the establishment of bison in such an area. On the contrary, it is actually seen as a positive action, defending a specific cultural identity.*" (Hunter about the Culling Scenario—"Quality of life"/"Cultural identity": 0/0)

3.2.3 | Closing session of the workshop

During the closing session, stakeholders affirmed that their position on the return of the species had not fundamentally changed during the discussion process. Three participants acknowledged that their comprehension of the matter had evolved, leading them to adapt their responses accordingly. Additionally, several participants highlighted that the challenges and relevance of the issue

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had become more apparent through the exchange, leading to a better understanding of each other's views. Two participants emphasized the general agreement among stakeholders. All participants expressed a strong interest in increased collaboration within an expanded forum including representatives from wildlife administrations, to foster the development of actionable management. Quotes from the participants' final feedback are presented in Table A1.

3.3 | Sustainability assessment

Across all criteria, only the monitoring scenario received an overall positive evaluation. The deterrence scenario received a negative evaluation in the ecological criteria, but a positive impact on the social and economic criteria. Conversely, both the translocation and culling scenarios were evaluated as having negative impacts in the ecological and social dimensions, whilst showing positive impacts on economic criteria. For the ecological and social criteria, increased management intensity of the scenario was generally associated with a more negative assessment. Notably, there was considerable variation among participants regarding the ecological criteria, while the economic criteria remained fairly constant across all scenarios (Figure 3).

4 | DISCUSSION

Involving local key stakeholders and different perspectives in wildlife management is essential for achieving sustainable coexistence between humans and wildlife. Our study suggests that stakeholder involvement in online formats, as done here under pandemic restrictions, is not only possible but provides an opportunity to reach agreements and identify practical solutions for coexistence with large wildlife species in shared landscapes. We first discuss the technical aspects of implementing the FoPIA methodology, with particular attention to digital formats in response to Covid-19 restrictions. We then discuss findings of the participatory process and assess the feasibility of the proposed measures, considering legal restrictions, ecological factors, and experience from a bison conservation project in West Pomerania, Poland. Lastly, we offer recommendations for improving digital participation frameworks to enhance human-wildlife coexistence.

4.1 | Technical implementation of FoPIA

Establishing long-term stakeholder support and commitment to collaborative decisions requires trusting communication, an enabling environment, and a willingness to consider other's viewpoints (Reed, 2008; Richards et al., 2004). The digital FoPIA implementation effectively provided a platform for stakeholders to discuss wildlife management options and obtain detailed quantitative and qualitative results. While implementing FoPIA digitally encountered similar challenges to the traditional face-to-face settings, such as recruiting suitable participants (Beach & Clark, 2015), the digital format offered distinct advantages: (1) the possibility to engage stakeholders from various geographic locations, (2) a

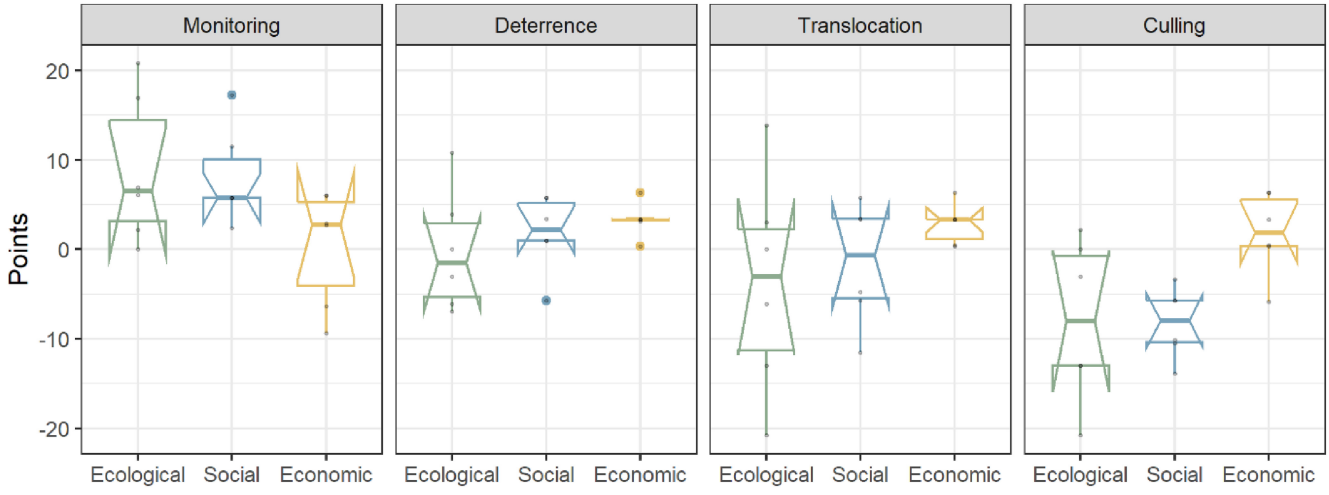

FIGURE 3 Box plots illustrating the results of the sustainability analysis, which combines the findings of the impact assessment conducted during the workshop with the criteria weighting achieved during the preference analysis. The weighted impact of each management scenario ("Monitoring"/"Deterrence"/"Translocation"/"Culling") on the ecological, social, and economic dimensions is illustrated, with the scenarios ranked on a scale from −20 (very negative) to 0 (neutral) to 20 (very positive).

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reduction in travel time and expenses and reducing carbon emissions, which resulted in a lower barrier for participation, and (3) the option (with participants' consent) to record the workshop, which facilitated analysis.

Face-to-face communication is ideal for establishing and maintaining interpersonal trust (Bos et al., 2002). Challenges emerge in the digital sphere as not all nonverbal communication channels can be effectively conveyed. As nonverbal cues carry crucial information about emotional states (Ambady & Rosenthal, 1998; Ebner & Thompson, 2014), digital formats can hinder trust development (Bos et al., 2002). To address these challenges, we employed a professional moderator who fostered engagement and trust by encouraging open dialogue, quickly clarifying misunderstandings, and ensuring that all participants have an equal opportunity to contribute. We also used video conferencing tools and interactive tools to help visualize concepts to mitigate these limitations.

The implementation of the digital FoPIA format demonstrated notable cost reduction and practical benefits. However, the process of building trust may take longer compared to in-person formats. Acknowledging the strengths and shortcomings of digital formats is therefore crucial to their selection and use. In this study, the digital implementation of FoPIA effectively engaged influential individuals from key stakeholder groups, laying the groundwork for wider impact.

4.2 | Insights from the participatory development of scenarios and the impact assessment

As noted by Morris et al. (2011), FoPIA acts as a means of raising awareness and identifying areas of concern. The four scenarios achieved this objective not only by sparking discussion and debate on the specific measures but also by stimulating discussion on the interpretation of the scenarios themselves, their impact on the two species and on the criteria. Furthermore, stakeholder feedback indicated a greater understanding of the potential impact of the species' return, reflecting their openness to different perspectives.

Correspondingly, the methodological framework bears the capacity to elucidate the social, ecological, and economic linkages and impacts of human-wildlife co-occurrence in a regional context. Importantly, FoPIA effectively facilitates the integration of interdisciplinary knowledge and transparent communication (König et al., 2013). Participants of this study praised the consideration of the three sustainability dimensions, highlighting the multidimensional and complex nature of this topic. The quantitative findings, along with the insights gained from initial interviews, discussions, and feedback sessions, serve as intellectual stimulus and basis for future decision-making processes (Morris et al., 2011).

4.3 | Feasibility of wildlife management measures and restrictions

While we deliberately designed well-differentiated scenarios, we recognize that certain management options are limited by legal constraints, environmental factors, and management capacities. For example, certain active management practices permissible in Poland are not legally feasible in Germany.

Legal obligations set out in the German Federal Nature Conservation Act (BNatSchG § 37 (1); § 38 (1)) mandate the establishment of conservation and development goals for protected mammal species (i.e., bison) and require systematic monitoring (Nebelsieck & Ratshow, 2021). This means that monitoring is not only allowed under current legislation but is mandatory. Additionally, monitoring for infectious diseases is recommended by the IUCN Bison Specialist Group and is essential for bison conservation (Olech & Perzanowski, 2022). Considering the still very small population size of moose in Germany (Ostermann-Miyashita et al., 2023), combined with the mortality risk due to animal-vehicle collisions and the conservation goal of enabling population growth (see Section 1 Paragraph 1 No. 1, Paragraph 2 No. 1 BNatSchG), it is imperative to implement systematic moose monitoring (Nebelsieck & Ratshow, 2021).

Legal considerations are crucial in the deterrence scenario, especially concerning potential violations of species protection obligations, such as the disturbance prohibition (§ 39 (1) no. 1 BNatSchG) regarding bison. However, exceptions can be granted if these measures are necessary for the species conservation and do not harm the species (Nebelsieck & Ratshow, 2021). In West Pomerania (Poland), active deterrence measures have proven effective in mitigating conflicts with land users (ZTP staff, 2021).

Legal review indicates that the relocation of the animals may violate the prohibitions of access under the German Nature Conservation Act for animal relocation and would require an exemption. Such an exemption may allow access to safeguard higher-priority species protection interests, for example if it is necessary to counteract the endangerment of a species. In addition, there should be no reasonable alternatives, and the conservation status of the population of a species should not be negatively affected by the measure (Nebelsieck & Ratshow, 2021). In West Pomerania (Poland), bison are translocated to manage herd sizes and facilitate genetic

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exchange, and also to prevent conflicts by relocating animals from conflict-prone areas to larger forested areas (ZTP staff, 2021). Exception permits, granted under justifiable circumstances, would also be necessary for the culling scenario (Nebelsieck & Ratshow, 2021).

In summary, the current legal framework in Germany requires justification for any form of intervention. While strong species protection laws offer clear advantages, they also prolong the decision-making process. Practices in Poland suggest that swiftly implementing interventions, such as deterrence and translocation, can effectively address stakeholder concerns and reduce damages and accidents. Therefore, an overarching management strategy with clear decision guidelines and action chains agreed by all stakeholders was considered a crucial step toward effective and timely wildlife management.

4.4 | Limitations of the study

The insights of our study are subject to several limitations. First, the limited number of participants and their willingness to participate may introduce a bias toward individuals with a particular interest in the topic. Second, the small group size limits the representativeness of the sustainability criteria and scenario assessments. Nevertheless, the careful selection of stakeholders and the diversity of professional perspectives ensure the qualitative robustness of the impact assessment and provide a solid foundation for inclusive and just wildlife management. Third, the virtual nature of the workshop may have impacted trust development among participants. While digital communication tools are valuable, they cannot fully replicate the benefits of face-to-face interactions, particularly in terms of nonverbal cues.

Finally, the theoretical discussion of management scenarios was limited by the legal constraints in Germany. While participants were aware of these limitations and recognized the associated implications for practical management, they appreciated the opportunity to discuss scenarios beyond the current legal framework. This allowed for a more open-ended exploration of potential solutions and strategies. Addressing the legal constraints and developing feasible management plans remain a focus for future research and policy considerations.

4.5 | Recommendations for participatory wildlife management

This study highlights how stakeholder participation can help identify potential areas of conflict, foster dialogue and trust between different stakeholder groups, and establish a decision-making panel that values diverse engagement and expertise. Evidence suggests that this approach supports long-term acceptance of management measures, enhances understanding of current issues, and leads to more sustainable solutions (Carter & Linnell, 2016; Khanyari et al., 2023; Reed, 2008).

Syntheses from different case studies underscore the importance of recognizing the unique ecological and social contexts when developing wildlife management interventions that meet the needs of both animals and people (König, Carter, et al., 2021a; König, Ceauşu, et al., 2021b; Zimmermann et al., 2021). Given this case-by-case variation and considering that stakeholder involvement is key to resolving these often entrenched situations (Redpath et al., 2013), the chosen methodological approach must align with the capacities of the stakeholders involved. For an inclusive and successful participatory process, we recommend the following considerations:

- Early and active involvement of key stakeholders to ensure that all perspectives are considered.
- Tailoring the process to stakeholders' needs, using suitable communication tools, and providing necessary training and support.
- Fostering a trusting and collaborative environment through one-on-one discussions and consensus-building techniques.

5 | CONCLUSION

Implementing FoPIA digitally allowed us to effectively obtain quantitative and qualitative data on stakeholders' opinions on wildlife management scenarios. The stakeholders engaged constructively and showed a high willingness for ongoing collaboration. Their dedication, coupled with the tangible outcomes, underscores the possibility for achieving mutually acceptable solutions for improving human-wildlife coexistence. Additional participatory processes are essential to enhance the quality, credibility, and public acceptance of a comprehensive management strategy. FoPIA has demonstrated its value as a tool for initial stakeholder involvement and sustainability assessment. Key conclusions from the workshop stress the need for a well-defined overarching strategy, defined decision-making processes, and specific actions to effectively address areas of conflict. According to major stakeholders, key priorities for fostering coexistence between people and large herbivores in this region include establishing a monitoring strategy, actively managing animal movements, compensating for damages,

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raising public awareness, and improving traffic safety infrastructure.

AUTHOR CONTRIBUTIONS

Sophia Hibler: conceptualization, methodology, investigation, formal analysis, writing—original draft, visualization. Christian Kiffner: writing—original draft, writing—review & editing, supervision. Hannes J. König: conceptualization, writing—review & editing, supervision. Niels Blaum: writing—review & editing, supervision. Emu-Felicitas Ostermann-Miyashita: conceptualization, methodology, formal analysis, writing—original draft, visualization.

ACKNOWLEDGMENTS

This study was conducted as part of the EU Interreg Project (INT144) "LosBonasus—Crossing! Improving transboundary wildlife management for European bison and moose" and we extend our sincere appreciation for financing the project. Our gratitude extends to all project partners who contributed their expertise, to the working groups InterFAL of the Leibniz Centre for Agricultural Landscape Research (ZALF) and Plant Ecology and Nature Conservation of Potsdam University, along with their network, for their assistance in developing the evaluation matrix and testing the material. We express thanks to the stakeholders who participated in the study, dedicating their time, energy and open-mindedness. We also would like to thank Biodiversa+, the European Biodiversity Partnership, in the context of the TransWILD project for supporting the contribution of the coauthors CK, HJK and EFOM to this manuscript. Open Access funding enabled and organized by Projekt DEAL.

CONFLICT OF INTEREST STATEMENT

One of the authors, Dr. Christian Kiffner, serves as a senior associate editor in the journal *Conservation Science and Practice*. He was not involved in the review or decision-making process for this manuscript.

DATA AVAILABILITY STATEMENT

Data accessibility for this study is restricted due to privacy regulations, particularly given the limited number of participating stakeholders and the confined research area. In accordance with privacy standards, all shared data have been anonymized and are included in the annex of the manuscript.

ETHICS STATEMENT

This study involved interviews and a stakeholder workshop; during all steps, we adhered to ethical standards to ensure the rights, well-being and privacy of the participants and complied with the General Data Protection Regulation (GDPR). To protect the privacy of interviewees we anonymized quotes and restricted access to personal data. Prior to sending the paper out for review, we obtained explicit consent from all participants.

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How to cite this article: Hibler, S., Kiffner, C., König, H. J., Blaum, N., & Ostermann-Miyashita, E.-F. (2025). Stakeholder-driven management strategies for recovering large herbivores. *Conservation Science and Practice*, *7*(6), e70068. https://doi.org/10.1111/csp2.70068

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APPENDIX A

Tabelle: Nachhaltigkeitskriterien für den Umgang mit Wisent und Elch

				Gewichtung*										
				geringe				mittlere				sehr hohe Bedeutung		
Bereich	Kriterium	Erläuterung	Indikator	0	1	2	3	4	5	6	7	8	9	10
Ökologisch	Artenreichtum	Zahl der Tier- und Pflanzenarten im Gebiet	· Artenzahlen (#) · Zahl gefährdeter Arten (#)											
	Widerstandsfähigkeit	Funktionsfähigkeit eines Ökosystems und die Regenerationsfähigkeit nach Störungen	· Belastbarkeit (qualt.) · Nachhaltige Nutzbarkeit der Naturgüter (qualt.)											
Sozial	Lebensqualität	Geistiges und körperliches Wohlbefinden von Individuen/ sozialen Gruppen.	· Zufriedenheit der im Gebiet lebenden Menschen (qualt.) · Verkehrssicherheit (# Wildunfälle/ Jahr)											
	Kulturelle Identität	Eigenart und Schönheit der Landschaft.	· Attraktivität der Landschaft (qualt.) · Alleinstellungsmerkmale (qualt.)											
Ökonomisch	Land- und Forstwirtschaftliche Produktion	Ertragspotential der Landschaft.	· Forstwirtschaftlicher Ertrag pro Fläche (m^3/ha) · Landwirtschaftlicher Ertrag pro Fläche (t/ha)											
	Touristische Attraktivität	Lokale Wertschöpfungsmöglichkeiten durch nachhaltigen Tourismus.	· Einnahmen durch nachhaltige touristische Aktivitäten (€/a) · Arbeitsplätze im nachhaltigen Tourismus Sektor (#)											

wobei 0= keine Bedeutung; ...; 5= mittlere Bedeutung; ...; 10= sehr hohe Bedeutung

Status: Mai 2021

FIGURE A1 Rating scale for six sustainability criteria used during interviews for preference analysis (German original).

Table: Sustainability criteria for handling bison and moose

				Weighing*										
				low				medium				very high relevance		
Dimension	Criteria	Description	Indicator	0	1	2	3	4	5	6	7	8	9	10
Ecological	Species richness	Number plant and animal species in the area	Number of species (#) Number of endangered species (#)											
	Resilience	Functionality and regenerative capacity of the ecosystem	Resilience (qualitative) Sustainable usability of the natural assets (qualt.)											
Social	Quality of life	Mental and physical well-being of individuals/social groups	Contentment of the people living in the area (qualt.) Road safety (# wildlife accidents/year)											
	Cultural identity	Landscape uniqueness and beauty	Attractiveness of the landscape (qualt.) Distinctive landscape features (qualt.)											
Economic	Agricultural/forestry production	Yield potential of the landscape	Forestry yield per area (m3/ha) Agricultural yield per area (m3/ha)											
	Touristic appeal	Local value-added opportunities through sustainable tourism	Income from sustainable tourism activities (€/year) Jobs in the sustainable tourism sector (#)											

whereby 0= no relevance; ...; 5= medium relevance; ...; 10= very high relevance

FIGURE A2 Rating scale for six sustainability criteria used during interviews for preference analysis (English translation).

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TABLE A1 Responses from stakeholders attending the workshop participants during the closing round.

Has your opinion/statement changed, if so in which way?	
"Meine Meinung hat sich insofern verändert als die Skepsis, die ich habe gegenüber den ganzen den ganzen Aussichten nicht beseitigt worden ist. Das heißt ich sehe manche Probleme schärfer als ich sie vorher gesehen habe was aber nicht heißt, dass ich jetzt irgendwie ein prinzipieller Gegner der Rückkehr von Elch und wisent bin, aber mir ist klar geworden was für eine große Herausforderung das ist" (Jagd)	"My opinion has changed insofar as the skepticism I have about all the prospects has not been eliminated. That is, I see some problems more sharply than I saw them before, which does not mean that I am now somehow a principled opponent of the return of moose and bison, but I have realized what a great challenge this is." (hunter)
"Ich betrachte diese beiden Wildarten nach wie vor für sehr kritisch und sehe auch hier nur im begrenzten Umfang geeignete Lebensräume, damit diesen Arten konfliktfrei bei uns leben können. Ich könnte mir auch vorstellen, dass man beim Elch über ein leckeres Lebensmittel nachdenkt. Wir sehen das immer so ein bisschen abstrakt, aber es ist toll, es ist eine Bereicherung der Anzahl der Arten. Aber wenn man das nüchtern betrachtet, hat der Mensch die Natur immer genutzt und warum soll mal gar nicht einen Elch, der hier einwandert und der eigentlich theoretisch kein Lebensraum hier hat, oder nur im begrenzten Umfang, nicht auch nutzen. Da würde ich mich dann schon dafür aussprechen." (Forst)	"I still consider these two game species to be very critical and see only limited suitable habitats for these species to live here without conflict. I can also imagine that with the moose, people might be thinking about a tasty food. We always see it a bit abstractly, but it's great, it's an enrichment of the number of species. But if you look at it soberly, humans have always used nature and why shouldn't we also exploit moose which immigrate here and actually theoretically have no habitat here, or only to a limited extent. I would be in favor of that." (Forestry)
"Vielen Dank hat sich die Meinung geändert: ja in Teilen ganz einfach, weil man festgestellt hat, dass die Fragen, doch ich sage mal von der Interpretation, aufgrund der unterschiedlichen Einstellung und des Backgrounds der beteiligten, ganz unterschiedlich bewertet wurden. Auch ich habe einzelne Fragen erst anders interpretiert und bei der zweiten Runde vielleicht ein wenig anders bewertet als beim ersten Mal." (Naturschutz 2)	"Thank you very much, my opinion has changed: yes, in parts quite simply because it was noticed that the questions were assessed quite differently, but I would say from the interpretation, due to the different attitudes and backgrounds of the people involved. I, too, interpreted individual questions differently at first and perhaps assessed them a little differently in the second round than I did the first time." (Conservation 2)
"Ob sich meine Meinung geändert hat, das sehe ich eigentlich ähnlich wie Herr Naturschutz 2. Ich fands interessant zu sehen einfach die unterschiedlichen Perspektiven, auch auf die auf die Fragen und dass jeder die Frage auch einfach anders versteht. Und ich glaube nicht, dass sich unbedingt meine Meinung dazu geändert hat, aber doch vielleicht ein umfangreicheres Meinungsbild dadurch bekommen habe." (Naturschutz 1)	"Whether my opinion has changed, I actually see it similarly to *Conservation 2*. I found it interesting to simply see the different perspectives, also on the questions and that everyone simply understands the question differently. And I don't think that my opinion has necessarily changed, but perhaps I got a more comprehensive picture of my opinion." (Conservation 1)
What do you take away from today's round of experts?	
"Ich nehme mit aus der Experten Runde, dass doch ein weitgehender Konsens darüber besteht, dass die beiden großen Arten wieder kommen, und zwar in absehbarer Zeit und dass das nicht die Spinnerei von irgendwelchen Natur Romantikern ist, also es tatsächlich ein Thema ist, mit dem wir uns auseinandersetzen müssen. Welche Konsequenzen sich daraus ziehe: [...] das geht nicht ohne professionelle Professionalisierung des Managements." (Jagd)	"What I take away from the expert panel is that there is, after all, a broad consensus that the two big species are coming back, and in the foreseeable future, and that this is not the crankery of some nature romantic, so it is indeed an issue that we have to deal with. What consequences I draw from this: [...] this cannot be done without professionalizing management." (Hunter)
"Ich halte es wirklich auch für sehr wichtig, dass man damit [der Rückkehr] professionell umgeht und, dass man sich dann wirklich Gedanken macht. Dass man nicht so rein stolpert und sagt ‚lass mal wir gucken mal, wie sich das so entwickelt'und wenn's ganz schlimm wird dann überlegen, wie wir damit umgehen. Von daher sehe ich diese runde für absolut wichtig, wenn sie denn auch [...] wirklich ernst gemeint ist [...]. Dann kann das wirklich auch gelingen, weil wir dann auch Handlungsoptionen aufzeigen. Von da würde ich mir schon wünschen, dass wir [...] im Austausch bleiben und dass man das wirklich auch vertieft [...]." (Forst)	"I think it's really important to handle [the return] professionally and to give it some real thought. That you don't just stumble in and say, 'let's see how it develops' and then, if it gets really bad, think about how to deal with it. That's why I think this round is important if it is really meant seriously. Then it can really succeed, because we can also show options for action. I would like us [...] to remain in exchange and to really deepen this [...]." (Forestry)

(Continues)

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TABLE A1 (Continued)

"Was ich aus der Runde mitnehme, ist, dass es mir ganz wichtig erscheint auch wirklich alle interessensgruppen zu beteiligen. Das heißt aus Politik, aus Verbänden, aus Landnutzern. Das ist in jedem Fall fruchtbar für die Diskussion wie geht man letztendlich mit solch einwandernden Tierarten [...] um. Auch wenn man nicht überall einer Meinung ist, wobei ich auch glaube, dass doch in großen Teilen auch Konsens bestanden hat." (Naturschutz 2)	"What I took away from the roundtable is that it seems to me to be very important to really involve all interest groups. That means from politics, from associations, from land users. In any case, this is fruitful for the discussion on how to ultimately deal with such immigrating animal species [...]. Even if we don't agree across the board, I also believe that there was consensus on a large scale." (Conservation 2)
"Was nehme ich mit aus der Runde: ich fand das methodisch tatsächlich sehr spannend, dass man so eine Diskussion zu dem Thema jetzt [...] mal sehr fokussiert durch diese Szenarios durchgeht. Das fand ich sehr gut, anstatt eine Grundsatz Diskussion durchzuführen, [zum Thema:] Das ist gut, dass der Elch und der Wisent zurückkommen und so weiter." (Naturschutz 1)	"What I take away from the round: I actually found it methodically very exciting that we were going through such a discussion on the topic [...] in a very focussed way through these scenarios. I found that very good, instead of conducting a fundamental discussion [on the topic:] It's good that the moose and the bison come back and so on." (Conservation 1)
"Ich fand diese Runde jetzt auch sehr interessant mal so die verschiedenen Standpunkte zu hören. Als Fazit finde ich interessant, dass wir die vielen Punkten aber auch sehr ähnliche Standpunkte haben also das finde ich eigentlich sehr positiv und fände schön, wenn es regelmäßig wieder zu solchem Austausch führen würde." (Landnutzung)	"I found this round very interesting to hear the different points of view. As a conclusion, I find it interesting that we have the many points but also very similar points of view, so I think that's actually very positive and would be nice if it would regularly lead to such an exchange again." (Landuse)
In which way would you like to see further interaction?	
"Weiteren Austausch wünsche ich mir in kurzen Zeitabständen, zweitens mit irgendwann der Möglichkeit auch etwas in Augenschein zu nehmen in Polen oder auch bei uns, wenn sie etwas tut, das heißt also Exkursionen für mich." (Jagd)	"I would like to see further exchanges at short intervals, second with the possibility at some point to also take a look at something in Poland or also with us when she does something, so that means excursions for me." (Hunter)
"Und ich würde mir tatsächlich auch wünschen, [...] dass verschiedene Akteure, wir und erweitert um die relevanten Akteure, dazu den Austausch kommen. Letztendlich ist natürlich auch wichtig, dass von behördlicher Seite da dann auch Teilnehmer dabei sind, die letztendlich für das Management und das Monitoring der Umsetzung verantworten." (Naturschutz 1)	"And I would actually also wish that different actors, us and relevant stakeholders, engage in the exchange. Ultimately, it is of course important that participants from regulatory authorities are also involved, who are ultimately responsible for the management and monitoring of the implementation." (Conservation 1)
"Ich würde mir natürlich wünschen, dass diese Runde erweitert [wird] um eben entsprechende Klientel, was ich eben angesprochen habe [Anm.: Politik, Verbände, Landnutzer]. Und sich auch weiter um Handlungsempfehlungen und um den Umgang mit diesen Tieren bemüht und dementsprechend auch vielleicht irgendwann eine Vorlage entwickelt, die dann schlussendlich auch Einzug in die Politik halten könnte." (Naturschutz 2)	"Of course, I would like this round to be expanded to include the relevant clientele that I have just mentioned [note: politicians, associations, land users]. And to continue to work on recommendations for action and on how to deal with these animals and, accordingly, perhaps at some point to develop a template that could ultimately find its way into politics." (Conservation 2)
"Das fand ich wirklich sehr gut, dass man konkret an diesen Szenarien sich lang hangelt. Das würde ich mir deshalb auch für den weiteren Austausch wünschen. Also ich würde mir wünschen, dass es den weitergibt und dass man wirklich versucht, sehr konkret anstimmten Handlungsoptionen zu diskutieren und auch wie die sich umsetzen lassen und mit wem. Und ich würde mir tatsächlich auch wünschen, wenn das Projekt dazu noch ein Beitrag leistet, dass eben verschiedene Akteure, wir und erweitert um die relevanten Akteure, dazu in den Austausch kommen. Letztendlich ist es natürlich auch wichtig, dass von behördlicher Seite da dann auch Teilnehmer dabei sind, die letztendlich für das Management und das Monitoring der Umsetzung verantwortlich sind." (Naturschutz 1)	"I really liked that we specifically focused on these scenarios. That's something I would also like to see for future discussions. I would appreciate if we continued to discuss and try to coordinate very specifically, to talk about options for action, and also how to implement them and with whom. And I would really like the project to make a contribution to this, so that various actors, us and extended to include the relevant actors, can enter into an exchange. Ultimately, it is of course also important that participants from the authorities are there who are ultimately responsible for the management and monitoring of the implementation." (Conservation 1)

Note: We slightly adjusted citations to improve readability.

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