Identifying a shared vision for peatland restoration: adapting the Delphi method to enhance collaboration

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SUMMARY

In this article we propose and apply a methodology for collaboratively creating and reaching agreement over a shared vision for peatland restoration. The purpose is to identify a shared understanding of the various parts of a just, inclusive and sustainable restored peatland as well as productive tensions between and across divergent disciplinary domains focused on peatland restoration. We involved an interdisciplinary group of researchers and practitioners working on various aspects of tropical peatland restoration and management in Indonesia, where there is a recognised need for clearer goals and/or definitions of restoration outcomes to focus manifold stakeholder efforts. To increase opportunities for participation and interaction between participants, our methodology built on and adapted a well-established Delphi survey method by combining it with focus group discussions. This allowed multiple points of view to be considered and new knowledge to emerge. The vision produced through this process bridges across different disciplinary tensions to fulfil ecological and social outcomes. While the vision is specific to the complex political economic and socio-ecological context of Indonesia's tropical peatland, the phased methodology for collaborative visioning can be adapted for application to other social ecological challenges, or to guide planning and practice by other stakeholder groups aiming to articulate a desired future state.

KEY WORDS: collaborative, interdisciplinary, socio-ecological restoration, tropical peatland, Indonesia

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INTRODUCTION

In 2019, the United Nations declared 2021–2030 the 'U.N. Decade for Ecosystem Restoration', with a goal to restore 350 million hectares of degraded land globally. In line with this goal, Indonesia's government has set a target of restoring 1.2 million hectares of degraded peatland by 2024. Ecological restoration initiatives face particular social and environmental challenges, such as how much they should be informed by historical conditions (Walpole *et al.* 2017, Sigman & Elias 2021) and how to strike a balance between historical and current uses and users (Jewitt *et al.* 2014, Medrilzam *et al.* 2014, Elias *et al.* 2021).

Restoring degraded tropical peatland in Indonesia is particularly difficult owing to the ecological complexity of tropical peatland ecosystems, socio-political dynamics such as weak and overlapping tenurial claims and regulatory regimes (McCarthy 2000, Uda *et al.* 2017, Purnomo *et al.* 2019, Januar *et al.* 2021, Sari *et al.* 2021), the prevalence of marginalised livelihoods on degraded peatland (Silvianingsih *et al.* 2020, Yuwati *et al.* 2021) and lack of agreement over a definition or vision for success (Dohong *et al.* 2017, Harrison *et al.* 2020, Puspitaloka *et al.* 2020, Sayer *et al.* 2021). Recent literature has called for restoration to ensure social inclusivity, not only by balancing social and ecological principles, but also by considering the needs of those most marginalised (Osborne *et al.* 2021, Robinson *et al.* 2021, Elias *et al.* 2022). While broad restoration principles are invaluable, there has been less work on detailing a process for collaboratively identifying and conceptualising a shared restoration vision (Walpole *et al.* 2017), and even less on tropical peatland restoration in Indonesia or elsewhere.

Previous research on peatland restoration in Indonesia, as well as in other regions, has concentrated primarily on the ecological and technical aspects of peatland restoration, particularly hydrological (Jaenicke *et al.* 2010, Ritzema *et al.* 2014), vegetation (Giesen 2004, Graham *et al*. 2017), carbon (Jauhiainen *et al.* 2012, Warren *et al.* 2017, Sakabe *et al.* 2018, Murdiyarso *et al*. 2019), and carbon and hydrological (Hirano *et al.* 2007, Sundari *et al.* 2012, Lestari *et al.* 2022). However, there is a growing recognition that interdisciplinary approaches, integrating both natural and social science perspectives, are necessary to develop comprehensive and sustainable strategies (Graham 2013, Thornton 2017, Uda *et al.* 2017, Thornton *et al.* 2020, Fleming *et al.* 2021, Mishra *et al.* 2021). This shift aligns with broader calls for adopting a social-ecological approach to restoration (Fernández-Manjarrés *et al.* 2018, Osborne *et al.* 2021, Elias *et al.* 2022).

Acknowledging the multiple benefits of peatland restoration, the Indonesian government prioritised it by establishing the Peatland Restoration Agency in 2016.[1] Their approach, which centres around their 'Three Rs' of restoration (rewetting, revegetation, revitalisation), recognises the social and ecological dimensions of restoration. However, concerns have been raised about top-down decision-making approaches, limited involvement of local communities and stakeholders, inadequate coordination and information sharing among government agencies and non-government organisations, and a lack of clear interconnected goals (Pantau Gambut 2019, Wiesner & Dargusch 2022). In response to these challenges, recent work defines good practice social-ecological peatland restoration in Indonesia as 'a process of assisting the recovery of degraded peatland ecosystems to achieve the appropriate trajectories that are defined through multi-stakeholder collaboration within social-ecological contexts' (Puspitaloka *et al.* 2020, page 444). Building on this interdisciplinary knowledge base and the need for clearly defined goals, our research aims to facilitate the development of a shared vision for just, inclusive and sustainable restored peatlands in Indonesia.

In this article we address the question: *how can we devise a methodology that brings together researchers and practitioners from various disciplines to identify and reach agreement on a shared vision for just, inclusive and sustainable tropical peatland restoration in Indonesia?* We sought to develop an approach that enables adaptive participation, both in-person and remotely, iteratively and collaboratively, allowing participants from different disciplines to discuss, reflect on, refine and reach agreement around a shared restoration vision. As well as ensuring a safe shared space for interactions, the components of iteration, reflexivity and adaptation were central considerations in developing our methodology, which modifies a Delphi method for iterative surveys by combining it with focus group discussions (FDGs) to allow participants to contribute to analysis. This phased methodology could be applied in other contexts to develop shared visions for a wide range of desired social and ecological conditions.

THEORETICAL FRAMEWORK

Social ecological systems (SES) approach

Recognising that the restoration of tropical peatlands involves a multitude of interrelated social and ecological elements (Cole *et al.* 2021, Fleming *et al.* 2021, Mishra *et al.* 2021), our analysis is grounded in the perspective of interdisciplinarity. It necessitates the collaboration and integration of diverse disciplinary perspectives and various forms of both scientific and non-scientific knowledge (Fernández-Manjarrés *et al.* 2018, Fischer *et al.* 2021). Interdisciplinary research involves approaching an issue from multiple disciplinary standpoints and ensuring that each discipline's contribution is acknowledged and integrated to generate a holistic and systematic outcome (Lyall *et al.* 2011). This requires researchers to focus on a common complex problem, critically examine their own epistemologies, and seek new ways to connect interdisciplinary thinking with social action (Leslie *et al.* 2015, Villeneuve *et al*. 2020).

We base our analysis on social ecological systems (SES) thinking, which explores the interconnections between human and biophysical systems, recognising that the feedback dynamics between social and ecological systems are complex, connected and uncertain (Berkes & Folke 1998, Cote & Nightingale 2012, Biggs *et al.* 2015). Bringing together multiple disciplines within an SES thinking framework requires that we acknowledge and value diverse understandings and knowledges (Rawluk *et al.* 2020, 2021) that encompass varying perceptions of reality

[1] Through Presidential Decree No. 1 2016, concerning the Peatland Restoration Agency (*Badan Restorasi Gambut*).

and knowledge, different geographical and material scales of focus (Rutting *et al.* 2022), and the navigation of power dynamics associated with culture, knowledge and science (Fabinyi *et al.* 2014, Virapongse *et al.* 2016). These assumptions of SES thinking formed the basis of an iterative process for developing a shared vision that captures both the complexity and the diversity of tropical peatland restoration in Indonesia, whilst providing a practical guidepost for collaboration and learning.

Visioning

Visioning is a powerful process for formulating a desirable future state or condition scenario (Wiek & Iwaniec 2014, Costanza 2000). A collaborative or participatory approach to visioning allows interested actors to deliberate, reflect on and refine their ideas through engagement with one another (Sanginga & Chitsike 2004). This approach democratises the process of knowledge creation and decision making, promotes participants' ownership of the outcome (the vision), and fosters a better understanding of one's own ideas and priorities as well as those of other participants (Wiek & Iwaniec 2014, Chilvers & Kearnes 2015, Revez *et al.* 2020, Rawluk *et al.* 2022). The socio-ecological complexity of tropical peatlands means that their restoration requires the involvement of participants from different disciplinary backgrounds (Bonn *et al.* 2016, Carmenta & Vira 2018).

While there is recognition that formulation of a vision for restoration should be a collaborative interdisciplinary process (McKee *et al.* 2015, Rogers *et al.* 2020), literature on visioning often lacks detailed procedural steps, limiting transparency and replicability (Wiek & Iwaniec 2014). Some approaches to visioning rely on interviews[2] or one-off in-person workshops, with limited follow-up engagement of participants (Gregory & Brierley 2010, Davies *et al.* 2012, Boedhihartono & Sayer 2012, Walpole *et al.* 2017, Rana *et al.* 2020, Soria-Lara *et al.* 2021, Tori *et al.* 2022); although recent examples have highlighted the benefit of a phased process to allow for reflection and refinement of the vision (McKee *et al.* 2015). A phased, iterative and reflective process supports compliance with the ten quality criteria for sustainability visioning (visionary, sustainable, systemic, coherent, plausible, tangible, relevant, nuanced, motivational and shared) provided by Wiek & Iwaniec (2014).

Delphi method

The Delphi method is a confidential and iterative survey method for structuring group communication and collaboration (Linstone & Turoff 1975). It is commonly used to bring together experts to tackle complex problems where empirical data are lacking or incomplete, to develop a shared understanding of the underlying issues and reach agreement around solutions (Linstone & Turoff 1975, Hasson *et al.* 2000). The key purpose of the Delphi method is 'the collection of informed judgment on issues that are largely unexplored, difficult to define, highly context and expertise specific, or future-oriented' (Fletcher & Marchildon 2014, page 3). As a well-established social and policy research technique for facilitating decision-making, the Delphi method is increasingly used in studies dealing with environmental governance issues, such as in the design of forest management strategies and indicators (Makkonen *et al.* 2016, Filyushkina *et al.* 2018, Waldron *et al.* 2020, Caglayan *et al.* 2021), public transport (Hirschhorn 2019), and energy transitions (Revez *et al.* 2020). In Indonesia, it has been used to identify interventions to address complex and persistent forest and land governance issues (Toumbourou 2020).

The Delphi method is increasingly used to enhance rigour and inclusivity in participatory research. Its principal design characteristic of anonymity helps avoid power dynamics that may otherwise affect face-to-face settings and interdisciplinary interactions (Gardner 2013, Fletcher & Marchildon 2014, Avella 2016, Kezar & Maxey 2016). In face-to-face group discussions, for instance, the loudest or most confident participant can often influence group discussion (despite not necessarily being the most knowledgeable), restricting the contribution of those less confident or from more marginalised social groups or disciplinary domains (Morgan 2018). The anonymity allowed with the Delphi method enables participants to express their opinions more freely (de França Doria *et al.* 2009). Another significant strength of the Delphi method is its iterative process. Panellists participate in at least two iterations (called rounds), involving an initial exploration phase where a topic is explored using broad questions (Ziglio 1995). Anonymised individual responses are collated, analysed and summarised before being returned to participants in a following round to allow for evaluation and consideration of knowledge collated

[2] Several recent studies have used an approach in which local community members contribute to the development of scenarios then are involved in follow-up interviews to gain insight into their visions of the future in response to the scenarios (Soria-Lara *et al.* 2021, Tori *et al.* 2022).

from the previous round (Linstone & Turoff 1975). This allows respondents to reflect and build on their contributions and those of others (Brady 2015), sometimes resulting in them changing or adapting their opinion in response (Makkonen *et al.* 2016). Through iteration and reflection, participants can reflexively interrogate and transcend their own disciplines and assumptions - important elements of interdisciplinary research (Pohl & Hadorn 2007, Oughton & Bracken 2009, Srivastava & Hopwood 2009, Revez *et al.* 2020, Iwanaga *et al.* 2021).

Despite its strengths, the Delphi method has been criticised for certain weaknesses. There is a potential to force consensus through a reductive distillation of participants' words (Green *et al.* 1999) in approaching a so-called 'truth' (Landeta 2006, p. 469). This risks compressing difference to erase contrasting views and voices (Yates-Doerr 2019), neglecting potential insight (Fletcher & Marchildon 2014). Erasures of local voices and disregard for local aspirations and concerns has been the reason that some restoration projects have failed to achieve their aims of improving local livelihoods and conserving forests in Southeast Asia (Lounela 2020, Sen *et al.* 2021), or worse, dispossessed local communities (McElwee & Nghi 2021). We aimed to identify areas of shared agreement, but also to capture a diversity of views and reveal potential productive tensions, to avoid the erasure of difference and to allow new ideas or knowledge to emerge (Avella 2016). In doing so, we also aimed to increase participants' awareness of the variation in views and elements involved in a restored peatland (García-Melón *et al.* 2012).

Focus group discussions (FGDs)

The Delphi method relies heavily on a central moderator who conducts the data analysis and presents the findings, which can introduce bias (Avella 2016, Hirschhorn 2019). This can result in inadequate summaries of participant contributions (de Villiers *et al.* 2005). Following recent participatory modifications combining the Delphi method with participatory action research (Fletcher & Marchildon 2014, Revez *et al.* 2020), we adapted the Delphi method to devolve power away from a central moderator by allowing participants to be involved in data collection and analysis though FGDs. In FGDs, participants must explain themselves and give focused examples, uncovering nuances including points of difference and shared views or commonalities (Biber *et al.* 2006, Liamputtong 2013). FGDs reduced reliance on the written word and the dominant role of the administrator in data analysis and results presentation (as is typical of a conventional Delphi method) (Avella 2016, Hirschhorn 2019). This also allowed new patterns to be identified from the data and knowledge to be produced beyond what might have been generated from a moderator working alone (Bryant & Charmaz 2007, Patton 2015).

METHODS

Process and participants

Researchers conducting the study (twelve women and two men, all listed as authors of this article) composed a diverse sub-team of Indonesian and Australian researchers participating in the 6-year research-for-development project 'Improving community fire management and peatland restoration: Gambut Kita', which focused on developing scientific knowledge to support Indonesia's fire control and peatland restoration practices. Expertise amongst the sub-team encompassed a wide range of disciplines relevant to peatland restoration across natural science (soil science, restoration ecology, wetland ecology, sustainable forest management, silviculture) and social science (economics and policy, environmental social science, livelihood analysis, gender and inclusion). Drawn from various institutional settings including NGOs, universities and government agencies, the researchers had a solid understanding of, and extensive experience working with, the priorities of different peatland restoration stakeholders including government agencies (village, sub-national and national levels), development sector actors (NGOs and their donors), private companies and local communities. This diverse experience enabled us to address multifaceted aspects of peatland restoration from different perspectives, and to ensure a holistic and systematic multidisciplinary research approach.

Data collection occurred over three phases, namely: (1) identify; (2) explore; and (3) consolidate. Table 1 outlines each of the three phases, their purpose and the results generated; and further detail of each activity is provided in Appendix 1. Each phase yielded insights that built on the previous phase allowing for reflection, refinement and the generation of further meaning (see Srivastava & Hopwood 2009). The following sub-sections describe the process followed at each of the three phases and give reflections from the authors of their experiences.

Phase 1: Identify

The *Identify* phase focused on generating information about the various elements (parts) of a restored peatland system and the approaches required to

Table 1. The three phases of visioning methodology.

Phases	Purpose	Results generated
1. Identify	Identify elements of a vision, and the restoration processes to follow or consider to achieve the vision.	A description of peatlands (the system); direct and indirect drivers of peatland degradation in Indonesia; principles to consider for peatland restoration; processes to follow to achieve a restoration vision; actors who should be involved; and opportunities for restoration.
2. Explore	Analyse the relationships between and across elements of a vision and processes (approaches) to follow.	A vision for restoration identified. Approaches to follow and challenges for restoration identified. The relationships / connections between elements of a restored peatland and the approaches to follow.
3. Consolidate	Reach agreement over and refine a consolidated vision that incorporates various interrelationships (as identified in the exploration phase).	Vision refined and agreement reached. Challenges prioritised by significance. Eight approaches to follow ordered by sequence.

achieve sustainable and just restoration. We held fortnightly meetings to discuss, revise or improve the activities/methods. For the Delphi Round 1 survey, we developed a brief set of open-ended questions based on a preliminary literature review. After capturing basic background information (three questions), the Phase 1 survey asked eight questions (see Appendix 2). The purpose was to understand how respondents from different disciplines and backgrounds (a) view the 'system' of tropical peatland, (b) understand what constitutes the problem of peatland degradation, (c) consider to be important principles for restoration and the approaches that will lead to a desired restoration outcome, and (d) identify opportunities to leverage support for restoration. Through this process we aimed to reveal areas where understandings are shared, but also where there are productive tensions, to recognise divergent values and priorities for restoration.

The Phase 1 survey was emailed to all 64 researchers and practitioners involved in the Gambut Kita project. Our research group supervisor sent an individual email to all members of Gambut Kita, inviting them to participate voluntarily in the study. This was followed by emails from senior leadership (i.e. key gatekeepers) to their respective project teams, emphasising that our research (and the participation of all Gambut Kita team members) was supported by the organisation's leadership (Lindsay 2005). To emphasise the benefits of participation, the invitation email described how the survey would help to construct a vision aiming to improve peatland restoration, and how each invitee's knowledge was important to informing this vision.

The survey was completed by 27 people (13 men, 14 women). The majority (19) were from natural sciences backgrounds including soil science, restoration ecology, wetland ecology, sustainable forest management and silviculture. This proportion of expertise reflected the distribution of disciplines in the broader project. Eight were from social sciences including socio-economic forest policy, environmental governance, community engagement and livelihoods analysis. This number of participants is within the range considered sufficient for generating productive data, as Delphi panels (in the first round) commonly have 11 to 25 participants (Hsu & Sandford 2007, Diamond *et al.* 2014). However, considering that we were recruiting directly from staff working on a dedicated project with an established interest in improving restoration practice, this was a relatively low level of involvement. It is possible that participation could have been boosted by an additional follow-up email or a personalised message.

Responses were compiled by the lead author who also developed an initial coding template and codebook. The lead and senior authors then conducted training to provide researchers with an overview of qualitative analysis and the specific approach taken in this study. Applying training, all the participants coded the results of the Phase 1 survey for themes, using a hybrid coding process (Fereday & Muir-Cochrane 2006, Clarke *et al.* 2015).

Phase 2: Explore

We used a series of FGDs to explore the relationships between the parts and approaches we had identified in Phase 1, to: (1) make sense of the relationship between parts and processes and (2) identify emerging patterns. Participants of in-person or online FGDs came from the same cohort as Phase 1. For example, one FGD was made up of participants with expertise in various natural and social sciences backgrounds including social economics, community engagement, gender inclusion, fire management, silviculture, forest policy and soil science. We initially divided Gambut Kita into small interdisciplinary groups, and then assigned two researchers to run each FGD. We conducted three virtual FGDs and two face-to-face FGDs, facilitated by researchers involved in the project (i.e. the sub-team). For each FGD, we recruited participants from both countries first by email and then by follow-up message or in-person visit. We found that email recruitment was not very successful, for various reasons - many participants were busy, unsure how relevant their knowledge was, or lacked confidence in their English language skills. We also found that, in order to recruit sufficient numbers to FGDs, it was important to follow up individually with WhatsApp messages or in-person visits to explain the aim of the FGDs, how and why the participant could meaningfully contribute, and that the facilitators would translate between English and Indonesian.

Utilising the guidance of SES thinking, we used the online collaboration software Miro (RealtimeBoard.inc 2023; http://www.miro.com) to visually present the different parts of a restored peatland and the approaches involved in peatland restoration, and to aid and facilitate discussion. In the FGDs, participants were asked to describe the interconnections between the various parts and approaches to restoration. Participant interaction supported productive discussion by exploring and interrogating relationships and assumptions in the system (Cornish *et al.* 2013), in order to construct new ideas through the interaction between participants' diverse perspectives (Allen *et al.* 2019, Hennink 2013). To facilitate and document the discussions, a facilitator and a note-taker were assigned for each FGD. We found it was important to assign these roles to researchers from different disciplines (e.g. a natural scientist and a social scientist) to help promote cross-disciplinary discussion, including the exchange and translation of key disciplinary concepts and priorities. Additionally, we found that using examples from familiar contexts provided a framework for participants from different disciplines to contribute and apply their knowledge, helping make the discussion more tangible and accessible.

Using online video meeting technology to host FGDs allowed us to overcome geographical barriers and simplify data collection by recording the audio and visual components of the discussion in Miro. Discussion in the online FGDs tended to be more concise than the discussions in face-to-face FGDs - a benefit for analysis of transcripts (Ochieng *et al.* 2018). However, a significant challenge for recruiting and facilitating virtual discussions was fatigue with online meetings due to their ubiquity during the COVID-19 pandemic (from March 2020). Reading body language and probing participants for further insights were also more difficult in virtual discussions, challenging the skills of facilitators. In contrast, face-to-face discussions were considered more engaging, were better attended, and yielded more detailed exploration of each topic. How well participants knew one another also shaped discussion, with more vibrant discussion emerging from groups where people were more familiar with one another and shared the same native language (see also McKee *et al.* 2015). On reflection, scheduling FGDs at a time when participants are more likely to be fresh/focused, and through a forum that enables active participation in the language they are most comfortable with, are both key to generating productive discussions. Where face-to-face discussions are not feasible, online discussions must be kept brief to avoid participant fatigue.

While Miro proved to be a useful tool for virtual discussions, familiarity and practice was required to use it effectively and rapidly enough to match the pace of group discussion. We chose to use Miro because all FGD participants had some prior training and experience in using this tool. However, even for experienced users, it presented some challenges for the facilitator and note-taker who had to ensure that all participants' contributions were accurately represented on the board, and this was particularly difficult when participants joined from mobile phones or had poor internet connection. We found that 5–6 participants contributing to the Miro board was manageable. Beyond this number, it became increasingly difficult to facilitate and document participant contributions effectively, and to ensure that each contribution to the Miro board was also explained orally so the FGD would generate sufficient data for analysis.

Each FGD recording was transcribed by a human transcription service. Each FGD facilitator and note-taker then coded their own FGD transcript individually. The purpose of having two coders for each FGD transcript was to enhance trustworthiness and rigour, counter individual bias, and increase the likelihood of capturing themes (Bryant & Charmaz 2007, Guest & MacQueen 2008, Sanders & Cuneo 2010, Cornish *et al.* 2013). In addition, the lead author coded all the FGD transcripts then compared codes with those of the FGD coding partners. Following a process of thematic analysis, the lead author arranged these into themes. Like Hall *et al.* (2005), we held regular fortnightly meetings throughout the coding process to discuss emergent themes. The lead author then drafted an explanatory framework for discussion by the team and arranged the themes into a narrative. The elements of a just, inclusive and sustainable restored peatland and the various processes to achieve this outcome were presented. Points of productive tension were also highlighted.

Phase 3: Consolidation (Delphi round 2)

In the Phase 3 survey (round 2) we presented a one-page vision for a just, inclusive and sustainable restored peatland, divided into three sections. Presenting the vision in three parts allowed more nuanced insight and avoided the possibility of participants rejecting the vision in its entirety should they disagree with one element. For the vision, participants were asked to (1) to indicate their level of agreement as to whether this vision broadly reflected their priorities, and (2) make any changes to each vision statement (round 2 survey questions are can be found in Appendix 2). The survey also provided a list of 21 challenges affecting restoration practice, with participants asked to (1) rank challenges by significance and (2) suggest any revised changes to the text. Finally, for a list of eight restoration processes, participants were asked to (1) order the processes by priority, i.e., from what should be done first to later, and (2) explain their order and suggest any revisions to the text. Phase 3 was emailed to all 64 Gambut Kita members, in both English and Indonesian language versions. There were 29 participants in this second round including 15 who had participated in the first round; 15 were men and 14 were women. Although many worked across various disciplines, 19 were natural scientists and 10 were social scientists. Some of these participants did not complete all parts of the survey.

RESULTS

Phase 1 (Delphi round 1)

The survey generated detailed descriptions of various key elements of a peatland system, which fit within the broader themes of direct and indirect drivers (c.f. Dohong *et al.* 2017). There was strong agreement regarding the direct drivers being artificial drainage canals, industrial resource extraction such as logging and plantations, road infrastructure, human settlements, and smallholders. Indirect drivers encompass issues related to land use policy and governance, as well as climate change. These drivers corroborate the relevant literature on drivers of peatland degradation (Medrilzam *et al.* 2014, Dohong *et al.* 2017, Horton *et al.* 2021, Mishra *et al.* 2021).

Parts of a restored peatland fitted into the broad themes of ecological conditions, social and livelihood conditions, and governance and management. Examples included: ‘Canals are blocked and backfilled ... peat rivers are full of fish, peat accumulation is occurring again.’ Examples from social conditions include: ‘Women, young and old people share in decision making about the use of peatland resources.’ Examples from livelihoods include: ‘Blocked canals used as fisheries, as well as duck farming and agroforestry.’

Processes to follow to achieve a restored peatland included the following elements: technical interventions, revegetation, community aspects, governance and management and knowledge and development. Examples of technical interventions include: ‘A lot of knowledge is needed about peatland and surrounding social, economic and ecological conditions before deciding what technological interventions and approaches can be applied.’ Examples of livelihoods include: ‘Support for multiple, alternative livelihoods’, and governance includes ‘Enforcing laws to prevent peatland conversion.’

Actors involved in peatland restoration were identified as: the Peatland Restoration and Mangrove Agency, Ministry of Environment and Forestry, Ministry of Agriculture, Ministry of Home Affairs, Ministry of Public Works, National Planning and Development Agency, Ministry of Finance, National Research and Innovation Agency, The House of Representatives, the sub-national government, the private sector (including timber plantation concessionaries), non-government organisations and local communities.

Opportunities for restoration included: environmental and social benefits that will be delivered through restoration, improving knowledge and awareness of the need for peatland restoration at different scales (local, national and international), involvement and collaboration between local communities and governments, recent governance and regulatory considerations including the government's willingness to restore peatland, emerging financing opportunities, and developments in technology, agricultural techniques and non-timber forest products to assist and enable restoration.

Phases 2 and 3 (FGD and second Delphi round)

The data generated from the survey and FGD discussions were consolidated into a vision for a just, inclusive and sustainable restored peatland in Indonesia. Delphi survey comments for refining or revising the vision were incorporated into a final version of the vision (see Table 2). Comments included a caution that the return of drinkable water in flowing rivers may not be achievable even in a healthy peatland due to acidity - this detail was removed. Another comment emphasised the need to ensure that a thorough consent-seeking process is undertaken to secure approval for canal blocking from canal users, to ensure that no negative impact on livelihoods is introduced with canal blocking - detail was added to specify that consent would be obtained and canal users appropriately compensated. The revised vision sets out a relatively comprehensive desired future state incorporating both social and ecological elements of restoration, centred around creating conditions for a 'thriving, abundant future' for all forms of life that actively involves local communities (Osborne *et al.* 2021, page 3). Each part or element of the system articulated in the vision triggers or activates another, all of which are crucial for successful peatland restoration. For example, the vision describes a landscape where: 'Canals have been blocked and, in many places… backfilled.' The blocking of canals then activates another element, namely restored hydrological flows and processes. This creates rewetted conditions that result in reduced fire intensity and incidences which allows the planting or natural regeneration of vegetation, improving faunal habitat.

Robust agreement reached over the vision

Robust agreement was reached over all three parts of the vision:

1. 71 % strongly agreed to the detail of the hydrological (rewetted) conditions (6 % somewhat agreed and 23 % agreed but only with modification).
2. 60 % strongly agreed to the detail of the land and forest cover (forests returning) (13 % somewhat agreed, 23 % agreed but only with modification, and 3 % were neutral),
3. 73 % strongly agreed to the detail of social elements (community livelihoods and wellbeing enhanced) (7 % somewhat agreed, 20 % agreed but only with modification).

Agreement over the vision and processes was 70–80 %, inclusive of the last three indicators on the 6-point Likert scale. This strong level of agreement indicates that the vision reflects most participants' perspectives, even before the minor modifications were introduced. No participants indicated disagreement over the vision.

Sequence of approaches to achieve restoration

The data identified eight processes to be followed to achieve a restored peatland (Figure 1). These include criteria to consider in selecting sites for restoration and approaches to take to adapt restoration techniques to the specific conditions of each site. They also include technical steps to follow, and considerations relating to fire suppression, revegetation, the involvement of local communities, and livelihood and governance concerns. The second Delphi survey (*Phase 3*) asked participants to sequentially order the processes by priority, to achieve the shared vision for a restored peatland. The sequencing identified some agreement over approaches to prioritise early in restoration, but no robust agreement over sequencing of approaches emerged.

However, there was some agreement over the approaches that should be prioritised earlier in the sequence, with participants agreeing that: 'Prioritis[ing] sites where restoration is most likely to be successful, based on a thorough understanding of ecological, hydrological, and social conditions' should occur either first (10 participants; 36 %) or second (10 participants; 36 %) in a sequence. There was also strong indication that 'Tailor[ing] restoration approaches to the specific conditions of each site' should be prioritised second (12 participants; 43 %). These approaches are criteria for considering site selection and adapting approaches to the conditions of each site.

While unanimous agreement was not reached, the following order with most agreement was: 3rd - block canals effectively using robust, sustainable materials

Table 2. The vision for a just, inclusive and sustainable restored peatland in Indonesia.

Re-wet conditions
Canals have been effectively blocked and, in many places, where the community has opted for this (following extended community engagement, approval and compensation), backfilled and are no longer visible in the landscape. Canal blocking has successfully restored hydrological flows and processes and has led to a raised water table. With rewetted peat conditions, in the dry season (and during the El Nino period) there are no longer massive fire occurrences. Where fire does occur, it is controlled to burn target vegetation only and does not burn peat soil. Haze air pollution is rare, and human health and atmospheric outcomes improve. The full ecohydrological functioning of peatland ecosystems, such as habitat for local flora and fauna, has been re-established and new peat is accumulating, buffering flooding. Water in peat swamp rivers is healthy and full of fish.

Forests returning and livelihoods thriving
Peat swamp forests cover peatlands, stabilising peat soil and providing food, energy, water, and oxygen. Forests over peatlands have a net positive sequestration of carbon and provide multiple ecological, economic and social benefits. Intact, mature forests are conserved and managed by the government together with local communities. Where forest has previously been cleared, endemic forest species are growing well and these revegetating forests appear lush green. Mature and regrowing secondary forests are thriving over peat domes with deep peat. The diversity of plants in the revegetating forest provide livelihoods for villagers. Forest over deep peat domes, and the rivers that flow between them, provide local communities with rich sources of food, medicines, timber and other materials and products, where they sustainably hunt, forage, harvest and fish. Blocked canals support fisheries, as well as duck farming and paludiculture. Agriculture is productive on shallow peat areas and mineral soils, which are planted with species that provide healthy food for local consumption and economically viable food and fibre products for income generation. There is a strong local and regional market for peatland derived products and services, and services available to enable local people to save cash income. Local communities around peatland areas receive the support they need to ensure they have secure, sustainable livelihoods, and good measures of locally-defined wellbeing.

Community wellbeing enhanced
Local communities are a part of restoring and protecting, as well as benefiting from, tropical peatland restoration. Women and men within communities derive financial support for restoration and stewardship of the peatland. Restoration is highly participatory with local men and women playing active roles at every stage, including in peatland management and fire hazard reduction. Participation and agency are central, with Dayak and other Indigenous communities controlling their lands while also ensuring access and benefits for other locally residing social and ethnic groups. Women, youth and elders share in the decision making about the use and management of peatland resources. The governance of peatlands is adaptive, effective and considers long-term sustainable development outcomes. Governance integrates resilient livelihoods and ecosystem improvement, with all related stakeholders involved in restoration - all levels of government, private sector, non-government organisations and actors and all social and ethnic groups within villages. Clear and legal land rights and use are determined, with authorities and institutions managing peatlands and their functions in line with locally unique ecological and social conditions.

to raise water tables and by working with land and canal users (7 participants; 25 %); 4th - prevent and suppress fires including by coordinating efforts across all stakeholders and through strategies that align with local traditional livelihood practices (9 participants; 32 %); 5th - adjust revegetation strategies to the changing conditions of natural regeneration and hydrological functions in the target site, taking into account community food and income-earning needs and priorities (11 participants; 39 %); 6th - ensure that restoration improves livelihoods and wellbeing sustainably for all villagers, including through improved access to markets and savings mechanism (11 participants; 39 %); and 7th - ensure that local communities' active participation is genuine, empowering and based on informed consent (9 participants; 32 %).

There were, however, different views about the sequence of 'Establish collaborative and holistic governance and management catered to multiple

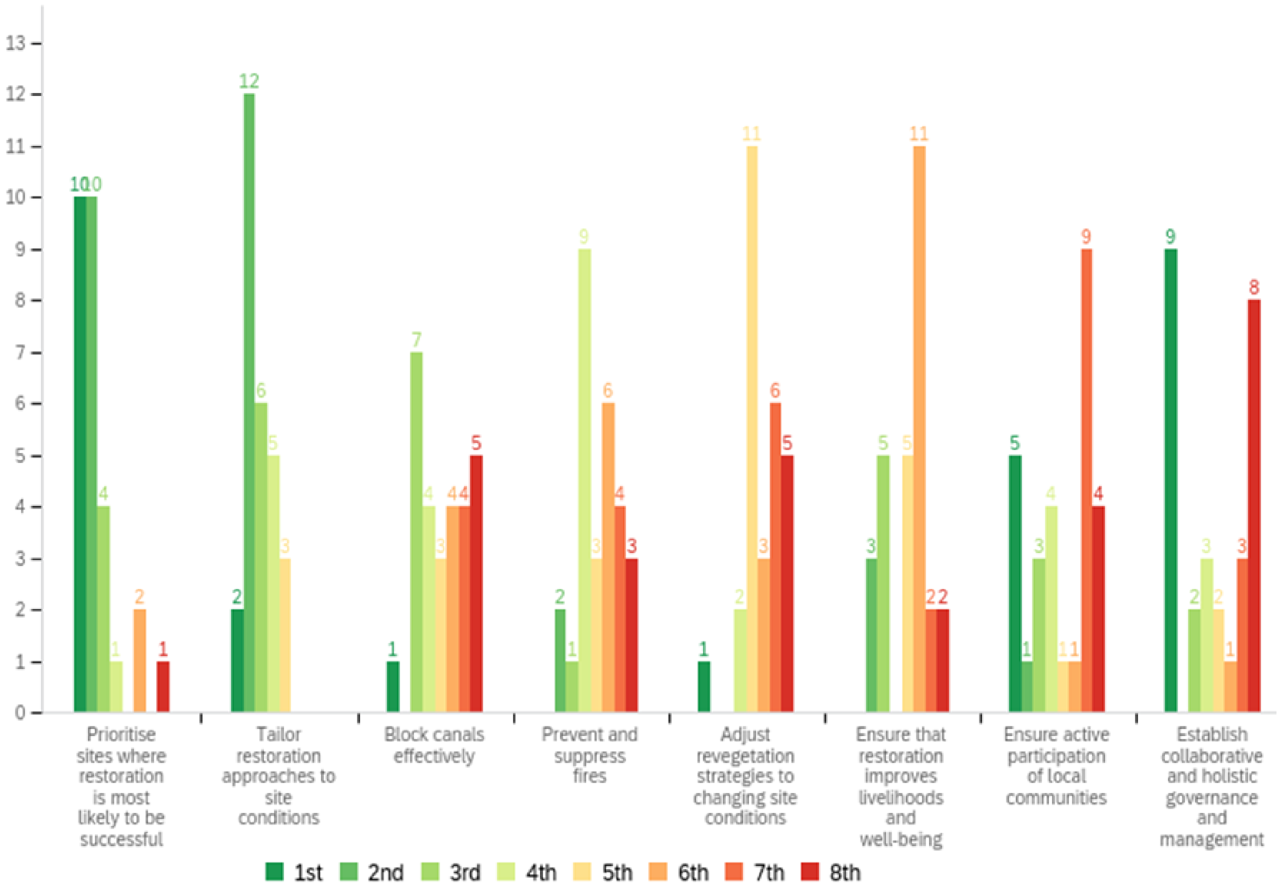

Figure 1. Sequence of approaches recommended to achieve ecosystem restoration. The heights of the bars indicate the numbers of participants who placed each option in each of the eight positions in the sequence.

functions, actors, needs and interests', with 32 % (9) ranking this as first priority and 28 % (8) ranking it as last priority. While a sequence order emerged, it was only with relatively low levels of agreement. There were no clear disciplinary differences in the sequencing, in part because the text of the approaches detailed both ecological and social dynamics, forcing all panellists to think across disciplines. The presenting approaches did not align neatly with the boundaries of natural or social science disciplines. However, the prevalence of natural scientists, whose work has tended to prioritise technical modifications aimed at altering the ecohydrological functions of peatlands from a positivist disciplinary standpoint, might partially account for the emphasis on interventions targeting ecological systems (i.e. Jaenicke *et al*. 2010, Ritzema *et al*. 2014). In contrast, social science disciplines, which focus on understanding the social dynamics present in various contexts (that may impede the adoption or effectiveness of ecological restoration interventions; Ward *et al*. 2020) held less influence, explaining the lower prioritisation of involving local communities in the sequencing.

The different views over sequence of approaches reveals another significant challenge for restoration practice - that of bridging differences between practitioners' and researchers' priorities even within an organisation focused on the same restoration issue/s. Without understanding and reaching a middle ground between different priorities, restoration actions can end up being 'scattergun', limiting success. In the open-ended comment section, where participants explained their ordering of priorities, there was strong emphasis on prioritising active involvement and engagement of the local community and the need to develop a collaborative governance structure.

Key challenges

In addition, 19 challenges were identified from the data (for a full list, see Appendix 2). These include the continued construction and use of canals, issues relating to fire, and issues internal to government bodies established to oversee peatland restoration. Thirteen challenges were very significant to a majority (14 or more) of the 28 participants who completed this section of the survey. These most significant challenges are listed in Table 3.

Table 3. Most significant challenges

Key challenges	Percentage of participants who rated this very significant
Fire remains a major risk, threatening revegetation	82 %
Conflict between government policies promoting development and conservation	73 %
Ineffective internal coordination within public agencies tasked with restoration	67 %
Low levels of community involvement in, and support for, restoration	63 %
Assisting local communities to transition their livelihoods away from cultivation over deep peat	58 %
Timeframes for implementing restoration programs are unrealistic	58 %
Maintenance and monitoring are not prioritised	58 %
Some revegetation attempts have not flourished	55 %
Lack of a commonly agreed definition or vision for successful restoration	55 %
Highly degraded areas of deep peat are difficult and costly to restore	55 %
New canal construction continues	53 %
Existing canals continue to be used for drainage, access and water supply	52 %
Lack of up-to-date, publicly available data (including maps) on peatland conductions	52 %

These challenges corroborate and build on the socio-ecological literature on peatland restoration in Indonesia that has also explored challenges (Dohong *et al.* 2017, Harrison *et al.* 2020). While the vital contribution of Harrison *et al.* (2020) has identified long lists of challenges for restoration, our work adds several new considerations and ranks them in order of priority. The strongest indication of our findings is that peatland restoration in Indonesia faces challenges due to a lack of emphasis on fire prevention and suppression, as corroborated by recent literature (Dohong *et al.* 2018, Harrison *et al.* 2020, Puspitaloka *et al*. 2020, Uda *et al*. 2020). Other challenges include conflicting government policies, centralised top-down designed restoration policies, and internal coordination issues within government agencies that contribute to limiting community engagement and support for restoration (Galudra *et al*. 2011, Ward *et al.* 2020, Januar *et al*. 2021, Merten *et al.* 2021).[3] Alternative options for income generation on rewetted peatland, like paludiculture, still face challenges, so transitioning communities away from cultivating deep peat is difficult (Miller *et al.* 2021, Miller 2022). Short restoration timelines set by both government and other donor stakeholders (Harrison *et al.* 2020) and insufficient prioritisation of, and funding for, maintenance and monitoring (Graham *et al.* 2017, Pantau Gambut 2019, Ward *et al.* 2020) are significant concerns. Past strategies for revegetation have enjoyed limited success due to a limited understanding of (highly complex) tropical peatland plant ecology (Mishra *et al.* 2021). The objectives of, and indicators for, restoration are not always well defined (Puspitaloka *et al.* 2020, Ward *et al.* 2020) and different stakeholders have competing priorities over preferences for ecological or social outcomes (Harrison *et al.* 2020, Puspitaloka *et al.* 2020). Highly degraded areas of deep peat are

[3] Internal coordination is particularly an issue within the Peatland and Mangrove Restoration Agency (BRGM), a government agency responsible for peatland restoration in Indonesia. In line with government priorities for restoration, the BRGM is divided into three divisions, namely: rewetting, revegetation and revitalisation, each with their own targets. Due to pressures on each division to meet time-based targets, the process of restoration is often not sequential or coordinated across divisions (i.e., revegetation of species suited to moist conditions does not always follow rewetting).

difficult and costly to restore (Graham *et al.* 2017, Hansson & Dargusch 2018) and new canal construction continues, while reliance on existing canals for drainage, access and water supply continues, limiting opportunities to block these (Medrilzam *et al.* 2017, Resosudarmo *et al.* 2019, Harrison *et al.* 2020, Silvianingsih *et al.* 2020, Uda *et al.* 2020). There remains a lack of up-to-date and publicly available data on peat depth, peat cover and groundwater depth (Uda *et al.* 2020, Sari *et al.* 2021). Navigating these challenges is crucial to the design of approaches to achieve restored peatland.

In producing and writing up our results, we applied the same iterative, reflective practice in our discussions as we had done in our research process. Through weekly discussions we reflected on the process, considering the strengths and weaknesses of our combined methods and what we might do differently in future or in a different context. These reflections are incorporated into the Results and Discussion sections. We used a shared document to immediately translate our discussions into text - a process that proved to be a productive and culturally suitable way to write together collaboratively (as compared to writing alone then compiling different texts together). Outside of our weekly discussions, co-authors added suggestions to our shared document as comments, that the lead author then incorporated into the text.

DISCUSSION

The three phases of our methodology - identify, explore, and consolidate - are built on iteration and individual and group reflection to produce a shared vision for just, inclusive and sustainable restored peatland. The visioning process responds to an ongoing challenge for peatland restoration in Indonesia - the lack of a commonly agreed definition or vision for successful peatland restoration (Harrison *et al.* 2020, Puspitaloka *et al.* 2020, Sayer *et al.* 2021). A shared vision articulates the desired future environmental and social conditions, ensuring efforts to achieve these conditions are efficient and aligned towards the same outcome (Urgenson *et al.* 2017). To ensure a comprehensive and nuanced vision, we assembled a diverse research team representing different disciplinary domains that represent different elements of a peatland system - the hydrological, social and terrestrial. This interdisciplinary collaboration enabled productive communication and integration of diverse disciplinary knowledges and resulted in a vision in which all components were nuanced, plausible and accurate. In the same way, a diverse range of participants (as constitutes the interdisciplinary research team) was also crucial to our generating a systematic and holistic vision that balances social and ecological elements of a restored peatland. For future application, a more even balance of social and natural science disciplines (with an appropriate level of expertise and experience) may help to better reach a middle ground to navigate the various social-ecological considerations involved in generating an encompassing restoration vision, and in sequencing approaches for implementation.

Our methodology employs an iterative process, with each phase building upon the data from the previous phase. Phase 1 used a survey to generate and consolidate various elements of a restored peatland and approaches to follow to restore peatland, ensuring the vision generated is visionary (the first quality criterion for visioning of Wiek & Iwaniec (2014)). Phase 2 used FGDs to explore the relationships and dynamics between elements and approaches to understand the complexity of this vision and the considerations and challenges to consider, to ensure the vision is systematic and sustainable (aligning with the second and third quality criteria of Wiek & Iwaniec (2014)). In adding this method, we contribute to the small but growing number of participatory studies that detail their engagement of participants in the data analysis and interpretation phases (Cornish *et al.* 2013, Allen *et al*. 2019, Binet *et al.* 2019). Phase 3 involved consolidating the complexity of the vision, allowing panellists to suggest changes to further refine and validate the vision. The changes added nuance to the vision and improved its coherence, plausibility, tangibility and relevance to local ecological, political and social systems settings, in line with quality criteria four to eight for visioning (Wiek & Iwaniec 2014). The phased, sequential process allowed participants to reflect on and build upon the contributions and ideas of other participants from different disciplines, and from previous phases of data collection, leading to a deeper comprehension of the various elements of restoration and new ideas for how to address entangled socio-ecological issues (Srivastava & Hopwood 2009, Brady 2015). This enabled deeper engagement and ownership over the visioning process (linking to the ninth quality criterion of Wiek & Iwaniec (2014)), and allowed further insight and more systematic, nuanced and plausible approaches to restoration to be generated than might be produced otherwise through a single phase where the researcher analyses the data and reaches conclusions with little further input from participants.

This phased process enabled individual and group reflection. The first phase (Delphi survey) relied on individual reflection, generating key considerations of a restored peatland and processes for restoration from different disciplines. We chose an anonymised survey to mitigate the power dynamics that occur in group discussions that risk erasing more marginalised perspectives. This approach revealed a variety of - and some contrasting - values and ideas. Group discussion in the second phase allowed for exploration of the underlying assumptions and inter-relationships through participant interaction. In the final phase of consolidation, we presented back to participants a shared vision for restoration to allow for further reflection and refinement. Yet while agreement was reached over the vision, some difference was evident between the sequence of approaches to follow to achieve restoration. This highlights the challenge, but also the central importance of, working collaboratively - although this is difficult, not doing so is more likely to result in a scattered or ineffective outcome.

Our methodology consists of three phases that enabled us to examine the various productive tensions and priorities evident across different participants' disciplinary domains and experiences related to restoring peatland. Grounding our approach in SES thinking allowed exploration of the diversity of understandings of the peatland restoration system and to identify the connections between them. The tensions that emerged through this exploration reflect a broader debate about the primary goals of restoration, such as whether it should prioritise ecosystem function and aim to 'return' conditions to a pre-disturbance state (Bradshaw 1992), or incorporate various land users' social and cultural needs and aspirations (i.e. Singh *et al.* 2021, Elias *et al.* 2022). The exploratory second phase allowed participants to better understand the different underlying assumptions and priorities of those from other disciplines. Each sequential phase was important in building towards a coherent, nuanced vision that aligns with the social, political, economic and ecological complexities of restoring peatland. The final survey provided a clear indication of agreement around the shared vision (the tenth quality criterion for visioning of Wiek & Iwaniec 2014)), yet concurrently highlighted that there remained a diversity of views on how to approach restoration and the priorities of different individuals and disciplines. For large interdisciplinary project teams, we recommend assigning a dedicated role to facilitate communication and discussion across disciplines to help each member understand the priorities of others and find ways to work collaboratively. Allocating ample time for iteration and reflection is also crucial for facilitating discussions of complex systems and revealing and navigating differences.

While our methods were suitable for stakeholder groups familiar with online and written forms of communication - evident in the outcome of strong agreement reached over the vision - modification of the methods is necessary if applying this methodology with other stakeholder groups. When working with local communities, in some contexts it may be more appropriate to change surveys to in-person or virtual group discussions (potentially using a familiar social media platform) that allow respondents anonymity in responses, enabling individuals who feel less confident or empowered to contribute freely. Anonymity serves as a crucial strategy for mitigating power differentials across various forms of hierarchy and discipline (Fletcher & Marchildon 2014). Just as the methods must be adapted to the cultural and social context, all visioning processes need to be monitored and adapted as they unfold. A vision is something articulated at the present moment in time. Because systems are always in flux and change, a shared vision should be continually navigated and adjusted to ensure its ongoing relevance as contexts and conditions change. Finally, a remaining and recognised challenge for future research is getting from a vision that constitutes broad ideals for future conditions, to specific recommendations for how to achieve this (Urgenson *et al.* 2017). Our phased process provides a broad framework to apply in developing a strategy for implementation. Working from a specific site makes exploration of restoration less abstract and may also help to resolve differences around the sequence of approaches to prioritise (Urgenson *et al.* 2017).

The process reminded us to carefully consider methods that align with cultural and social norms and preferences of participants (Watkins 2010). One challenge we faced was that our survey response rate was relatively low. Using a survey approach to deduce individual opinion relies on participants to feel confident with the authority of their individual knowledge. On reflection, an online written survey may not be appropriate to capture detailed responses if this is not a familiar practice in the social context in which the research is being undertaken; other research methods (in the form of an interview or small group discussion) may be more appropriate. To encourage participation and to yield new knowledge and insight, methods for generating a vision must align with local cultural values and be convivial and enjoyable for participants. To commit to participating, participants need also to see how the process will yield valuable knowledge or outcomes.

Our methodology aimed to foster collaboration among researchers from diverse social and natural science disciplines, with the objective of establishing a shared vision for tropical peatland restoration in Indonesia. The process encompassed identifying the various components of a restored peatland and processes for restoration, examining the interrelationships and dynamics among these elements, and consolidating the complexity of the vision. The vision generated integrates social and ecological priorities, aligning with recent calls to consider both ecosystems and their associated social systems in restoration (Osborne *et al.* 2021, Robinson *et al.* 2021, Elias *et al.* 2022). It provides a holistic and detailed framework to guide social-ecological restoration practice and addresses the challenge of bridging disciplines among team members and stakeholders who held divergent priorities.

Acknowledging and understanding the diversity of priorities was crucial in navigating difference and working toward a shared outcome - in our case, a vision for peatland restoration. By transparently recognising and comprehending differences, we can find compatibility and ways to foster effective collaboration. Existing restoration approaches are often limited by disciplinary boundaries, focusing solely on specific (often natural science) aspects while often neglecting social considerations. Marginalised voices are silenced in forums that perpetuate power differentials. Our phased methodological approach of (1) Identify, (2) Explore, and (3) Consolidate offers a valuable framework to foster communication and knowledge sharing across diverse disciplines and stakeholders involved in or affected by peatland restoration. By acknowledging and appreciating different understandings, we reveal diversity and navigate differences, generating an outcome that offers a more integrated construction of the desired end goal of restoration. We believe that this methodology holds broader applicability to peatland policy and practice, as well as other complex social ecological challenges. It allows for the participation of all groups - especially local communities - affected by restoration and reduces the power asymmetries (across disciplines and knowledge domains) that play out in face-to-face discussions. This methodology can help to overcome the fragmented nature of current restoration approaches by identifying desired outcomes that bridge across all aspects of restoration, for example, linking the Three R's (rewetting, revegetation, and revitalisation of livelihoods) in a holistic, shared vision. Focusing on a vision for a desired future outcome, we generate the energy and motivation needed to overcome the challenges in peatland restoration. Embracing inclusivity in visioning helps find areas of agreement while also revealing difference among diverse stakeholders, paving the way for effective and sustainable peatland restoration.

ACKNOWLEDGEMENTS

This study was conducted as part of ACIAR project FST/2016/144 "Improving community fire management and peatland restoration". We thank each of the participants involved in the Delphi survey and the focus group discussions.

AUTHOR CONTRIBUTIONS

TDT wrote the draft manuscript and led the research process; SG contributed to securing the funding and to each phase of the research process, and reviewed and edited the manuscript; VBA, KB, NII, SL, DR, NS, MS, ST, BW, TWY all contributed to the research process, including the research design, data collection and analysis, and to writing and revising the manuscript (the authors are listed here in alphabetical order, rather than order of contribution, as all contributed equally); R contributed to the data collection; AR acquired the funding, supervised and co-led the research process and co-wrote the draft manuscript.

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Submitted 17 Mar 2023, revision 21 Jun 2023
Editor: Olivia Bragg

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Appendix 1: Activities involved in a collaborative, adapted Delphi method with FGDs.

Phase	Activity	Date	Participants
Generation	Discussion of approach, including potential methods	August	All
	Discussion of open-ended questions for Delphi survey	August	All
	Delphi survey (round 1) administered to 64 peatland restoration ‘experts’ (27 responses)	August	Lead author
	Training in facilitating FGDs	August	Lead and senior authors
	Initial collation and entry of Delphi responses into a database Development of coding process template and codebook	August	Lead author
	Training in qualitative data analysis – introduction to coding	September	Lead and senior authors
	Collaborative coding of Delphi survey responses	September	All
Exploration	Development of focus group guide – involving identifying relationships between parts and processes identified in the Delphi. Visual presentation of Delphi findings on the Miro board	September	Lead and senior authors
	Recruiting participants, using email, followed up with phone calls, Whatsapp messages or office visits to encourage participation	September	All
	Conduct of 3 virtual and 2 face-to-face FGDs using Miro board	October	All
	Transcription of FGD recordings	October	Lead author
	Development of coding process template	October	Lead author
	Training in coding FGD transcripts and strategy for ensuring consistency in assigning codes	October	Lead and senior authors
	Collaborative coding of FGD responses	November	All
	Collaborative approach to arranging codes into themes	November	All
Consolidation	Writing up themes into a narrative	November	All, led by lead author
	Discussion of how to present responses in a final Delphi round	December	All
	Dissemination of Delphi final survey (round 2) to 64 peatland restoration experts (29 responses)	January	Senior authors
	Incorporation of refinements to the vision	February	Lead author
	Collation and presentation of Delphi results	February	Lead and senior authors
	Discussion and collaborative write up of results and discussion	February - March	All

Appendix 2: Survey questions

DELPHI ROUND 1 SURVEY

Background questions:

1. What is your name?
2. How do you describe your ethnicity or cultural heritage?
3. What is your academic discipline or specialisation area?

Survey questions:

4. In your own words, how would you describe tropical peatland?
5. What causes peatland degradation in Kalimantan, Indonesia?
6. Please describe your future vision for a just, inclusive and sustainable restored peatland in Indonesia.
7. How could this future vision for a just, inclusive and sustainable restored peatland be achieved (for example, what supporting social or ecological conditions need to be in place)?
8. From the perspective of your specialist area or discipline, what should successful peatland restoration look like?
9. Who (individuals, communities and groups, agencies, organisations and/or institutions) should be involved in restoring peatland?
10. What do you see as opportunities associated with working towards a just, inclusive and sustainable restored peatland?
11. Do you have any other comments about these questions, their scope and focus or anything else related to the topic and project?

DELPHI ROUND 2 SURVEY QUESTIONS

Part 1. Vision

The following text presents a future vision for a just, inclusive and sustainable restored peatland in Indonesia in three parts (see vision in Table 2). You are asked to indicate whether each of the three parts reflects your priorities for restoration. For each of the three parts of the vision the following question was asked:

1. Does this vision broadly reflect your priorities for peatland restoration?
   - Not at all
   - Mostly not
   - Neutral
   - Somewhat agree
   - Strongly agree
   - Agree but only with modification
2. Do you have any other comments or suggestions on the vision?

Part 2. Current challenges to achieving successful restoration

3. Please rate the following challenges that currently limit the success of restoration by significance. Here 1 means a very significant challenge, and 4 means a less significant challenge for successful restoration.

Likert scale	1. Very significant challenge	2. Quite significant challenge	3. Somewhat significant challenge	4. Less significant challenge
New canal construction continues				
Existing canals continue to be used for drainage, access and water supply				
Fire remains a major risk, threatening revegetation				
Some revegetation attempts have not flourished				
Some local people can no longer access land and resources in peatland areas that they previously depended on, exacerbating food or livelihood insecurity				
Assisting local communities to transition their livelihoods away from cultivation over deep peat				
Local communities' use of fire for land clearing				
Low levels of community involvement in, and support for, restoration				
Approaches to restoration may not reflect ecosystem or social conditions				
Ineffective internal coordination within public agencies tasked with restoration				
Timeframes for implementing programs are unrealistic				
The Peatland and Mangrove Restoration Agency (BRGM) has an uncertain future beyond 2024				
Maintenance and monitoring are not prioritised				
Insufficient funding for restoration				
Unclear land tenure and ownership				
Conflict between government policies promoting development and conservation				
Weak law enforcement				
Poor coordination between stakeholders				
Lack of up-to-date, publicly available data (including maps) on peatland conditions				
Lack of a commonly agreed definition or vision for successful restoration				
Highly degraded areas of deep peat are difficult and costly to restore				

4. Please suggest any changes or additional challenges that have not yet been considered.

Part 3. Approaches to achieve this future vision for a restored peatland

5. How would you order the following 8 approaches to achieve a restored peatland? Please order the approaches in sequence of what should be done first, to what can be done later in order to achieve the vision of a restored peatland.
   - Prioritise sites where restoration is most likely to be successful, based on a thorough understanding of ecological, hydrological and social conditions.
   - Tailor restoration approaches to the specific conditions of each site, balancing social and ecological outcomes.
   - Block canals effectively using robust, sustainable materials to raise water tables and by working with land and canal users.
   - Prevent and suppress fires including by coordinating efforts across all stakeholders and through strategies that align with local traditional livelihood practices.
   - Adjust revegetation strategies to the changing conditions of natural regeneration and hydrological functions in the target site, taking into account community food and income-earning needs and priorities.
   - Ensure that restoration improves livelihoods and well-being sustainably for all villagers, including through improved access to markets and savings mechanisms.
   - Ensure that local communities' active participation is genuine, empowering and based on informed consent.
   - Establish collaborative and holistic governance and management catered to multiple functions, actors, needs and interests.
6. Why should this order be followed?
7. Please suggest anything that is missing or any revision to the text.