This working draft is made available online to support a public event held in hybrid format on 24 November 2025 at ISEAS – Yusof Ishak Institute, Singapore. The event is intended to disseminate findings from research project CRRP2022-03MY-Muhamad Varkkey, supported by the Asia Pacific Network on Global Change Research Collaborative Regional Research Programme. This manuscript will continue to be updated as comments from the editors are integrated, before being submitted for publication as part of an edited book.

PARTICIPATORY METHODS TO INFORM POLICY AND GOVERNANCE IN SOUTHEAST ASIA'S PEATLANDS

Helena Varkkey, Matthew J. Ashfold, Gusti Z. Anshari, Alex M. Lechner, Sharon Seah, Fatima Tuzzahara Alkaf, Nurisa Wijayanti

Abstract

Peatlands in Southeast Asia represent critical yet understudied ecosystems, characterised by complex ecological dynamics and significant global environmental importance. There are multiple challenges inherent in studying these fragile ecosystems: limited scientific data, complex socio-political contexts, and the historical marginalisation of local knowledge systems. This chapter explores innovative participatory research methodologies that bridge scientific investigation, community knowledge, and policy development in data-sparse tropical peatland landscapes. Our approach integrates multiple knowledge sources, emphasising community-driven research strategies that complement traditional scientific methodologies. Through a comparative study across Indonesia and Malaysia, we illustrate how participatory methods can generate a nuanced, contextually rich understanding of peatland ecosystems. By challenging traditional research paradigms, we demonstrate how collaborative approaches can address fundamental knowledge gaps in peatland ecosystem services. Key methodological innovations include community-led data collection techniques and knowledge exchange sessions that bring together academics, practitioners, and local communities. These approaches not only generate valuable ecological insights but also challenge extractive research models by prioritising local agency, knowledge co-production, and ethical engagement. The chapter critically examines the potential of participatory research to inform policy development, highlighting the importance of institutional collaboration, capacity building, and equitable knowledge exchange. By centring local perspectives and experiences, we propose a more inclusive and comprehensive approach to understanding and managing peatland ecosystem services in the Global South. Our experiences underscore the transformative potential of participatory research methodologies in addressing complex environmental challenges, offering a replicable model for interdisciplinary, community-engaged scientific investigation.

Introduction

Despite being the provider of many essential ecosystem services, tropical peatlands in Indonesia and Malaysia remain understudied. There are multiple challenges inherent in studying these fragile ecosystems: limited and contradictory scientific data, complex socio-political governance contexts, and the historical marginalisation of local knowledge systems. This has hindered informed and effective policymaking at both national and regional levels. We argue that participatory approaches that centre on local perspectives and experiences can complement traditional scientific methodologies to generate a nuanced, contextually rich understanding of peatland ecosystems. This chapter thus reflects upon the methodologies used in an ongoing

comparative study across Indonesia and Malaysia funded by the Asia-Pacific Network for Global Change Research (APN, 2022). The three-year study began in 2022 and involves researchers from academic institutions in the Global South, namely Indonesia, Malaysia, and Singapore. By focusing on participatory approaches, the project intentionally challenges traditional research paradigms and extractive research models that have been normalised in academia.

This chapter begins by detailing the various ways that peatlands are an important provider of ecosystem services, locally as well as on a global scale. It then explains how inherent uncertainties in scientific peatland data necessitate the inclusion of other types of evidence for effective policymaking towards the sustainable governance of tropical peatlands. The chapter then proceeds to describe our project, which intentionally incorporates various participatory methods for data collection and knowledge creation involving peatland communities, as complementary sources of evidence for policymaking. Based on preliminary analysis, we flag several distinct ways in which community co-created knowledge can inform policy, which may not have been revealed through traditional methodologies, related to knowledge gaps, sustainability, and livelihoods. Following this is a discussion on how participatory methodologies such as these can contribute to the decolonisation of tropical peatland research. We conclude this chapter by detailing the next steps of our project and highlighting further avenues for participatory methods in future research involving peatland communities. Overall, this chapter aims to contribute towards a more inclusive and comprehensive approach to understanding and managing peatland ecosystem services in the Global South.

Peatlands as Ecosystem Services

The International Peatland Society (IPS, 2025) defines peatlands as "terrestrial wetland ecosystems in which waterlogged conditions prevent plant material from fully decomposing". The submerged carbon-rich material does not interact with the atmosphere, drastically slowing down decomposition and thus "locking away" the carbon underwater. So long as the peatlands remain waterlogged, they can function as important carbon sinks that contribute to the global carbon balance and slow down climate change. Even though the UNEP's Global Peatland Assessment (UNEP, 2022) estimates that peatlands cover only around 3–4 per cent of the planet's land surface, peatlands store and sequester more carbon than any other type of terrestrial ecosystem, containing up to one-third of the world's soil carbon.

Beyond carbon sequestration, peatlands provide many other important ecosystem services. The uniquely porous structure of peat allows peatlands to act as natural sponges and filters. Healthy peatlands store water during wet periods and release water slowly during the dry season, helping to prevent floods and droughts in surrounding areas, and ensuring water availability for local communities. Peat's filtration capacity helps to regulate the water cycle and maintain water quality in catchment areas. This also helps to support a wide array of terrestrial and aquatic flora and fauna, making peatlands some of the most diverse ecosystems in the world. With its rich biodiversity, peatlands also become important sources of livelihoods for the people who live in and around them. They provide both timber (for housing, fuel, and tools) and non-timber forest products (NTFP, like medicinal plants, vegetables, fish, dammar gum, forest honey, and game) for these communities, both for subsistence and for trade. They also have significant cultural and aesthetic value, and are often highly appreciated as sites for recreation and eco-tourism (Varkkey et al., 2024).

Tropical peatlands make up around 11 per cent of the global peatland area, and about 56 per cent of this is in Southeast Asia (Page et al., 2011; Rieley & Page, 2016). All Southeast Asian

countries have peatlands, but Indonesia has the largest area, followed by Malaysia. In Indonesia alone, peatlands store an estimated 30% more carbon than the biomass of all of Indonesia's forests (Varkkey et al., 2024). Tropical peatlands in Indonesia and Malaysia, however, are under threat from deforestation and conversion, mostly into commercial palm oil and pulpwood plantations, but also into smaller-scale crops like maize, ginger, pineapple and banana. For most of these uses, peatlands have to be drained to sufficiently dry and stabilise them for planting and cultivation. Often, these conversions were supported or encouraged by government policy. For instance, both countries facilitated the issuance of large peatland concessions to major conglomerates for palm oil cultivation. And in Indonesia, peatlands were included in transmigration programmes, where "idle" land was assigned to migrants from overpopulated islands to reduce population pressures (Varkkey et al., 2024; Evers et al., 2017; Mizuno, Fujita, & Kawai, 2016).

Deforestation and the conversion of peatlands disrupt the natural ecosystem balance and affect the provision of ecosystem services. When peatlands are drained, rapid decomposition of previously submerged soil organic matter releases carbon into the atmosphere and into water bodies. This changes peatlands from a net carbon sink to a net carbon emitter. This process also severely dries out the peat landscape, making it highly fire-prone. Peat fires, either accidental or intentional, accelerate carbon release and cause local and cross-border air pollution. The fires spread quickly underground and are notoriously difficult to put out, barring heavy rainfall. Draining peatlands also leads to peat loss through aerobic oxidisation, which removes their sponge- and filter-like capacities, exacerbating floods and droughts. Deforestation destroys the habitats of naturally occurring flora and fauna, leading to biodiversity loss and the reduction of the availability of timber and NTFP for communities that are reliant on them. Converted peatlands are also stripped of their natural beauty and cultural value (Varkkey et al., 2024).

The governance of ecosystem services in Southeast Asia's peatlands is generally guided by policies related to biodiversity or fires and haze. In Malaysia, the National Policy on Biological Diversity 1998 calls for the conservation and sustainable use of the country's different ecosystems, including peatlands. The National Wetland Policy 2004 mandates the sustainable and wise use of wetlands with respect to their ecological characteristics. The updated National Policy on Biological Diversity 2016–25 includes rehabilitating degraded peatland areas as a key indicator. In Indonesia, a series of Regulations of the Ministry of Environment and Forestry (No. 14, 15 and 16 of 2017) was established to govern the functions of peatland ecosystems, water management, conservation, responsible peatland conversion, and peat restoration. Under these laws, peat with a depth of >3 m must be protected. In 2022, the government of Indonesia began to make peatlands explicit parts of its climate policies. It registered its Enhanced NDC to the UNFCCC, which included actions to restore degraded peatlands under the key programme of ecosystem conservation and restoration. The following year, Indonesia introduced its Wetland Management National Strategy to support the achievement of low-carbon development goals by 2045. At the regional level, the ASEAN Peatland Management Strategy (ASEAN Secretariat, 2023) 2024-2030 aims to scale up biodiversity conservation to incentivise ecosystem protection alongside forest and peatland restoration programmes (Varkkey et al., 2024). The APMS is also identified as an important strategy to achieve Target 3 of the ASEAN Biodiversity Plan 2024-2030 to conserve 30% of ASEAN's land, waters and seas (ASEAN Secretariat, 2024).

Policymaking Amidst Uncertainty

Strong policy and governance approaches are needed to protect, restore, and rehabilitate the ecosystem services provided by these tropical peatlands. In the public policy field, good policy

is said to be guided by good evidence. Evidence-based decision-making is the process of policy development that consults facts, the best available research, and credible evidence from the field (Varkkey, 2024). Such an approach is important to ensure that policy decisions are not made based only on political pressures, "gut feel", or generalised theory. However, in peatlands, particularly tropical peatlands, policymakers are faced with a dilemma whereby scientific data are often limited and contradictory. Key categories of scientific uncertainty associated with peatland data include: (1) the mapping of peat extent, (2) emissions factors, (3) the allocation of peat areas to land use classes, and (4) the extent of peat condition changes over time (Varkkey et al., 2024).

Even something as basic as identifying peat areas is difficult, as there is no scientifically agreed-upon way to define peat. It is common in Indonesia and Malaysia that peat is defined as having decomposed organic matter equal to 50 cm depth or greater. The reduction of peat thickness significantly extends peatland areas in the world (UNEP, 2022). This results in peat datasets that vary widely between researchers, as well as between research data and government data, depending on the definitions used. Calculations on greenhouse gas emissions from peatlands can increase in complexity, and it would be anticipated in accuracy, with more granular emission factors (Tier 3), but often only Tier 2 (country-specific) or Tier 1 (default) emission factors are available, especially in the Global South. Advanced remote sensing and satellite technologies can help to identify land use classes on peat, but extensive tree and cloud cover in tropical regions affect accuracy and often need to be triangulated with extensive and costly ground-truthing and triangulation. Finally, historical remote sensing data in tropical regions are often scarce or of inferior quality or resolution, making it difficult to accurately track changes over time. In Indonesia and Malaysia, peatland fires add further complexity, and drivers of peatland deforestation, such as oil palm, can be politically challenging to map openly. Such data uncertainties feed through to calculations and complex spatial analyses, which are often complicated by error propagation (Varkkey et al., 2024).

While efforts to reconcile peatland data are underway, current scientific uncertainties will likely persist over time due to systemic challenges like differing knowledge traditions, varying data transparency standards across regimes, technological limitations, and barriers related to funding and capacity. Inaccurate and incomplete scientific data can lead to weak or misinformed policy and governance decisions. For example, policy decisions made related to some early peatland REDD+ projects in the region were called into question when new scientific data and findings surfaced. Similarly, fire and hotspot data uncertainties and contradictions between regional and national meteorological agencies have complicated cooperation and diplomacy within the Association of Southeast Asian Nations (ASEAN) over haze (Varkkey et al., 2024). This, however, does not mean that decisive policy and governance decisions should not be taken in the absence of scientific certainty.

The precautionary principle is a risk management strategy that has often been adopted in environmental decision-making. It posits that the lack of full scientific certainty should not be used as a reason for postponing measures to anticipate, prevent, or minimise environmental harm (Varkkey, 2024). In the context of peatlands, the precautionary principle is particularly pertinent, given the importance of these ecosystems to the global carbon balance and human well-being. While traditional "scientific" evidence is usually understood as data measured with scientific instruments and experiments carried out in controlled environments, there are many different types of evidence that can and should be used for policymaking. Other types of evidence

include economic, attitudinal, behavioural, and anecdotal evidence, taken together with knowledge from experts and laypersons, informed by history, local knowledge, and culture (Strydom et al., 2010). In the face of scientific uncertainty, local knowledge and field experience become even more important for decision-making. Therefore, precautionary policies and governance measures can be taken in the absence of decisive scientific evidence because they are informed, complemented, and supplemented by other, equally valuable, sources of evidence.

There are various ways to collect such evidence. The traditional approach is researcher-driven, where researchers define the research agenda, collect the data, and analyse the results with minimal or no involvement from those being studied. On the other hand, participatory approaches are research methods that directly involve those affected by the phenomenon being studied. Research that intentionally selects participatory research methods, tools, and processes tends to more meaningfully engage stakeholders and communities in research. While the participants may not be traditionally trained in research, their position as stakeholders in the issue gives them the agency to represent the interests of the people being studied. Collecting evidence through participatory methods often involves democratic processes that aim to reduce power differentials between the researcher and the participants, and value genuine and meaningful participation in the research process (Vaughn & Jacquez, 2020). Simply put, while traditional approaches often view participants as subjects of study, participatory research views them as co-creators of knowledge.

Local systems of knowledge are often excluded from policy processes in favour of traditional "scientific" evidence. However, when taken together as complementary or supplementary to the available scientific evidence, participatory approaches have the potential to create more relevant, meaningful research findings that can be more effectively translated into policy and action (Vaughn & Jacquez, 2020). This approach can ensure local community needs and values are taken into account within national regulatory frameworks and that these policies align with specific geographical contexts (Varkkey, 2024). Appropriately designed policies informed by evidence from participatory approaches can enable the practical application of local knowledge while acknowledging power asymmetries that persist between knowledge systems. Gaps in scientific evidence can also be filled through co-management approaches like community-led monitoring and reporting, while participatory interpretation of data can provide place-based clarity to scientific uncertainties. By engaging local governments and communities from the outset, there is a reduced risk of mismatches between the perspectives and priorities of the community and other stakeholders. Most importantly, such approaches can pre-empt perverse incentives and counterproductive outcomes (Varkkey et al., 2024).

Incorporating Participatory Approaches in Research

The Asia Pacific Network for Global Change (APN) Collaborative Regional Research Programme (CRRP) was created to support research that contributes to the evolving science-policy arena of earth systems and global change. By design, the program aimed to support and encourage participatory approaches to research. Requirements of the activities supported by this program included: (1) collaborative place-based integrative research, particularly from developing countries, and (2) research that is co-designed with stakeholders (non-academic) and has actionable outcomes (APN, 2022). The program prioritises capacity building and strengthened interactions among researchers, policymakers, practitioners, local communities, and civil

society, to provide sound information and evidence for policymaking processes (APN, 2022). Our research team, which consisted of science and social science researchers from Indonesia, Malaysia, and Singapore, has many years of experience researching various aspects of peatland ecosystems, policy, and governance. Our interest in applying for funding under the CRRP was guided by our conviction of the potential for participatory research to fill gaps in our own knowledge that were informed by more researcher-driven projects in the past.

In developing the proposal for our project on "Policy and governance approaches to cooperative mitigation of peatland carbon emissions and transboundary haze in Southeast Asia", we consulted both academic and non-academic sources. Previous open-source datasets and scientific publications were reviewed to identify gaps that remain in the tropical peatland science-policy space. Here, we found evidence in the literature that sustainable development projects in peatlands involving external partnerships with local communities may not be effective in meeting ecosystem objectives, and may be greatly affected by uncertainty over peatland data (Miller et al., 2022; Goldstein, 2022). This indicated that there may be issues in the nature of such partnerships, and how traditional scientific evidence is used to inform and guide these engagements. Therefore, in co-designing our project's objectives, we conducted exploratory discussions with civil society groups that worked closely with communities on the ground. Particularly useful were consultations with representatives from Global Environment Centre (GEC), a civil society group that works closely with peatland communities in Malaysia. In line with cultural convention, civil society groups that are embedded in the communities typically facilitate engagement with researchers. Therefore, this early-stage co-design process with embedded civil society groups had the dual function of gaining insights into issues and priorities of the communities, as well as securing access to them via trusted partners.

From this process, we co-designed the following research objective: "to assess how new corporate, national and regional GHG mitigation priorities (e.g. NDCs, net-zero pledges, carbon trading) and land-use planning and agricultural certification schemes (i.e. RSPO, Heart of Borneo) offer potential to improve sustainable development in SEA's peatlands, in terms of land use policy and governance and community livelihoods". To achieve this objective, we co-designed a project with strong elements of participatory research involving peatland community members in Malaysia and Indonesia. In Malaysia, we identified members of the peatland community in Raja Musa Village (Kampung Raja Musa), who lived adjacent to the Raja Muda Forest Reserve peat area in Selangor, Peninsular Malaysia. This community cultivates oil palm, pineapple, and banana on agricultural peatlands, and has a good existing collaborative relationship with GEC. In Indonesia, we identified members of the Masyarakat Peduli Gambut (Peat Care Community) in the village of Limbung near Pontianak city, West Kalimantan, on the island of Borneo, where one of the members of our research group has an ongoing project. This community cultivates palm oil and various types of vegetables on peat. Both communities face similar problems of fire, floods, and ecosystem degradation in their surrounding peatlands. Two main participatory methods were used to engage these peatland communities in a participatory manner: (1) co-design workshops, and (2) a knowledge exchange session (KES). All participants were fairly compensated monetarily and in-kind for the time spent and knowledge contributed to the research. We note here that the project also included other more researcher-driven methods like stakeholder interviews and researcher/practitioner roundtables, in addition to more technical data analysis research; however, these methods will not be the focus of this chapter.

Co-Design Workshops: Our community co-design workshops were developed to be different from traditional researcher-driven focus group discussions (FGD). An FGD is a qualitative method used to gain an in-depth understanding of certain issues, by obtaining data from a purposely selected group of individuals rather than from a statistically representative sample of a broader population (Nyumba et al., 2018). A traditional FGD would be highly structured, presenting a series of pre-set questions to the participants, supported by scientific data, and participants would be asked to respond to these questions. Some elements of our peatland community co-design workshops were comparable to traditional FGDs; groups were kept small, participants were encouraged to speak to each other (in their own language, either Bahasa Indonesia or Bahasa Malaysia) rather than with the researchers, and the facilitator's role was to maintain a conducive and respectful environment for discussion. However, in the spirit of participatory research, our co-design workshops were designed to be more flexible. The researchers identified broad themes that we were interested in based on our prior knowledge and discussions with selected community or civil society members. These themes were then presented to the groups with little to no supporting scientific data, and the participants could spend as much or as little time on a topic and could even skip topics if they wanted.

In both locations, groups were self-defined based on local preference: in Indonesia, there were two groups based on gender, and in Malaysia, participants organised themselves into three groups according to agricultural activity (palm oil cultivators and other crop cultivators) or involvement in community fire prevention (Sahabat Hutan Gambut Selangor Utara, or Friends of North Selangor Peat Forests). The exercise was held at locations familiar and comfortable for the community members - the Indonesian session was at the home of the head of the village, while the Malaysian session was held at GEC's field office in Kampung Raja Musa. To further encourage the co-creation of knowledge, we incorporated two participatory exercises. The first was a community mapping exercise (see Figure 1) where each group was given materials to draw and label their own map of their community and the surrounding area, with room for discussion after. Second was a prioritisation exercise where each group collaboratively decided on a list of priorities for their community. Each group member was then given a specific number of stickers, which they could distribute across these priorities as they wished (see Figure 2). Both these exercises encouraged the participants to identify issues and priorities that were important to them, and, as far as possible, were not influenced by the researchers, or what they thought the researchers were interested in.

Figure 1: Community mapping exercise from one of the groups in Malaysia

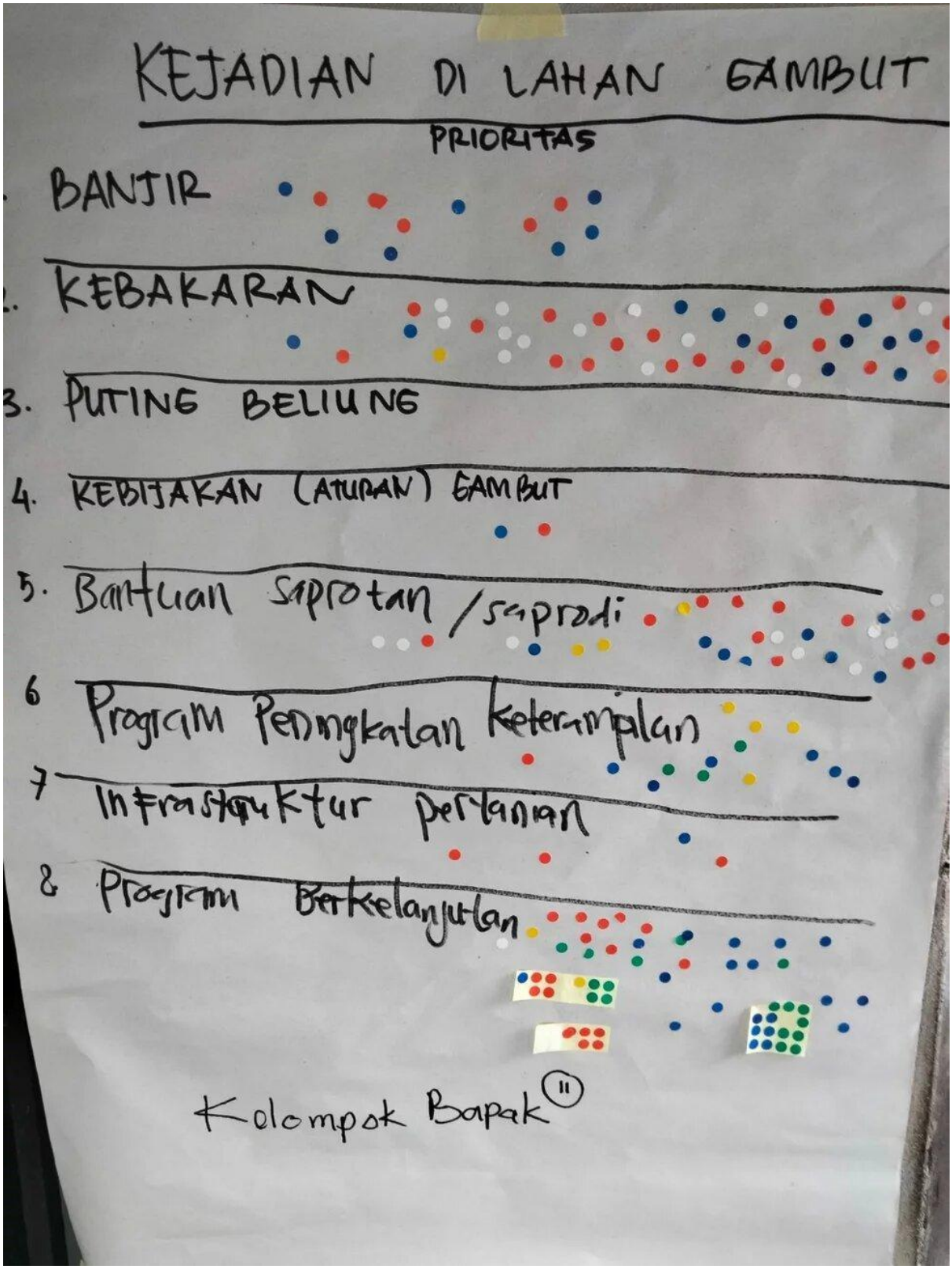

Figure 2: Prioritisation exercise outcome for a group in Indonesia. High priority topics included sustainable agriculture projects ("program berkelanjutan"), fire ("kebakaran"), and infrastructure for agricultural production ("bantuan saprotan/saprodi")

Knowledge Exchange Session: The idea for a KES as part of this project originated from our reflection on the importance of reciprocity in community-based research. We researchers would

be obtaining so much knowledge from each community, so there should be a platform where the community groups could obtain new and actionable knowledge too, from beyond their own knowledge circle. This would also be in the spirit of the CRRP funding requirement of capacity building and strengthened interactions among communities. We noted that while the peatland communities in Indonesia and Malaysia have much in common, there were things that were done or understood very differently between the two groups. Therefore, we proposed an online session where representatives from both groups would have an opportunity to meet and exchange knowledge on areas of common interest, in their own languages as well (even though Bahasa Indonesia and Bahasa Malaysia are different languages, speakers can generally understand each other quite well). Upon mutual agreement and arrangement, three community representatives from Malaysia and three representatives from Indonesia met online, facilitated in person by researchers from both sides (see Figure 3). The Malaysian side was held at a villager's field office in Kampung Raja Musa, while the Indonesian side was held at the nearby Universitas Tanjungpura to mitigate internet connectivity issues. In preparation for this session, we researchers analysed the findings from the respective co-design workshops to identify points of overlap and divergence (see Figure 4) among the two groups. These points were presented to the community representatives at the beginning of the session, but they were free to direct the discussion as they wished. The participants also exchanged contacts for sustained cross-border communication in the future. The participants shared that they did not have the opportunity to meet with fellow farmers from other countries before, and the session was a valuable learning experience for them.

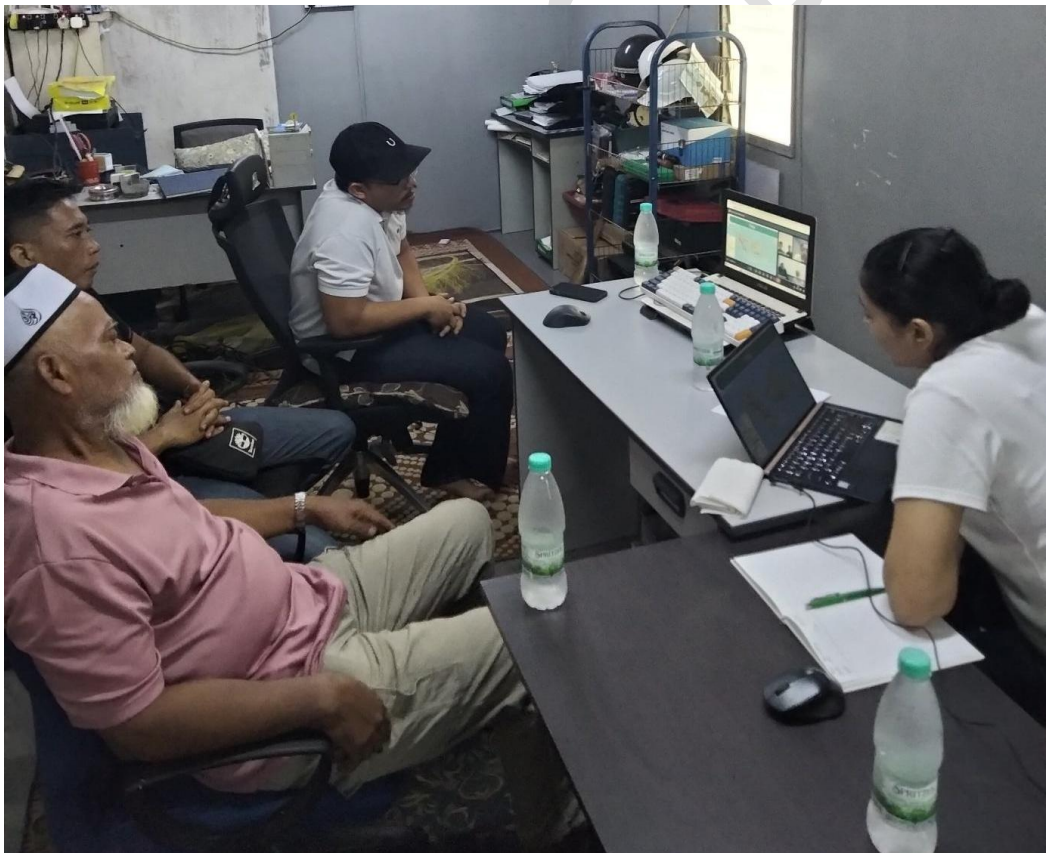

Figure 3: The KES, as observed from the Malaysian side. Photo included with informed consent from participants.

Figure 4: Points of overlap and divergence revealed during co-creation workshops. The main focus for Indonesia is livelihoods and sustainability of programs, while the points for Malaysia were conservation and land encroachment. Peatland ecological services collectively identified included carbon storage, water management, and fire prevention.

Participatory Knowledge to Inform Policy

The community participatory approaches implemented in this project were carried out during fieldwork in Indonesia and Malaysia, interspersed between researcher-driven methods. The value of these participatory methods became clear when the findings obtained through participatory methods often differed significantly from what was collected through interviews and roundtables with NGOs and other practitioners. Interestingly, this included data collected from stakeholders who claimed to work closely with communities, like local governments and civil society. Just like researchers, the information provided by these stakeholders may be (intentionally or unintentionally) filtered through their own personal agendas or policy biases. The following preliminary analysis of our project's findings focuses on the ecosystem services provided by peatlands in terms of climate regulation and fire prevention. It reveals three interesting ways in which participatory methods produced more nuanced and practical understandings of how peatlands should be managed and governed, as detailed below.

Importance of bridging knowledge gaps: During interview sessions in both Indonesia and Malaysia, policymakers and policy-adjacent stakeholders often describe how climate change, its associated risks and mitigation strategies, are too "complicated" concepts for peatland communities to understand. Trying to educate these communities about climate change is often described as a fruitless endeavour. Data collected from our community participatory approaches does corroborate these findings. Communities in both Indonesia and Malaysia admit that they find concepts related to climate change hard to understand. Because of this (real or perceived) knowledge gap, peatland ecosystem policies related to the climate are often adopted and implemented in a top-down manner, where peatland communities receive and

carry out instructions with little understanding of how they will contribute to the climate or to other co-benefits. This hinders real buy-in from the communities and can explain why such top-down policies are often ineffective (Varkkey, 2024).

In contrast, communities reported having a clear understanding of the causes of fires in peatland areas, and how the resultant haze negatively affects their health and livelihoods. This matches well with the findings from stakeholder interviews, where fires and haze are often used as a more accessible entry point to engage with communities. Policymakers, project owners, and NGOs often focus on communicating how fires and haze can make community members sick and damage their crops, to encourage behavioural change. While the effort to adapt climate messaging to suit the audience is commendable, this approach raises important questions about the role of knowledge in participatory decision-making. In accordance with the green principle of participatory democracy, peatland communities have a fundamental right to express their views, be listened to, and directly participate in and influence decisions that affect their lives and livelihoods. However, the perception that communities cannot understand certain types of risks often excludes them from the decision-making process. This perception becomes a self-fulfilling prophecy, as there appear to have been minimal attempts to share climate knowledge with these communities in the first place (Varkkey, 2024).

Our findings further show that even though policymakers are aware that peatland communities have a good understanding of fires and haze, local wisdom is still often sidelined in favour of conventional scientific knowledge. This often results in counterproductive outcomes. For example, Indonesia's fire bans have made communities afraid to use fire to clear and cultivate lands, despite this practice being rooted in traditional wisdom for generations. As a result, peatlands are left to accumulate flammable biomass, increasing the risks of fire. Similarly, blocks placed in canals for peatland rewetting without consulting local communities can disrupt the day-to-day activities of local communities that use the canals for transport and/or fishing. Misinformed policy can also result in perverse incentives, like the over-focus on firefighting over fire prevention, community members becoming reliant on wages for restoration projects, and the lack of prioritisation of infrastructure for alternative livelihoods like eco-tourism (Varkkey, 2024). Our research reveals that both policymakers and communities have valuable knowledge that can be useful in informing the management and governance of peatland ecosystems. One type of knowledge should not be prioritised over the other, or gatekept, for effective evidence-based policymaking.

Sustainability, but not in the way you would think: During our fieldwork, a word that often came up in both the stakeholder interviews and the co-design workshops was "berkelanjutan", which translates to sustainability. Sustainability is obviously an important theme in our research. However, upon further discussion, it was revealed that the meaning of sustainability differs in nuanced ways among different groups of stakeholders. For the local communities, the concept was often understood as the sustainability of ecosystem services or environmental sustainability in general, referring to the importance of implementing policy and governance approaches that would ensure the sustainable use of peatlands. For the community members who took part in our co-design workshops, the focus was on the sustainability of programs and assistance provided by external parties, in addition to income certainty. Therein lies the mismatch between the expectations of communities versus those of the stakeholders.

Community members raised the issue of research groups, civil society organisations, or government agencies coming to run programs or provide assistance only on a short-term basis, which is not enough to foster sustained action. We heard from our interviewees that these programs often have strong elements of education and capacity building. Therefore, external parties that run one-off programs with communities would assume that the community would have the ability and interest to carry on the program activities long after they have left. However, there may be remaining knowledge gaps, funding limitations, and time constraints that hinder the ability of communities to sustain the programs themselves after the external parties have left. There is broad literature on program sustainability in the public health sphere (Shediac-Rizkallah & Bone, 1998; Scheirer, 2005; Calhoun et al., 2014), but less so in the literature on environmental or ecosystem services. In the context of public health, (Scheirer, 2005) identifies five factors that influence the extent of program sustainability: (a) a program can be modified overtime, (b) a "champion" is present, (c) a program "fits" with the target organisation's/community's mission and procedures, (d) benefits to participants are readily perceived, and (e) stakeholders in other organisations provide support. Therefore, policy and governance tools created to engage community members in the sustainable management of peatland ecosystem services should be cognizant of these factors in their design.

Livelihoods as the starting point: The KES held between community representatives of Limbung and Kampung Raja Musa revealed interesting information about community interests and prioritisation. As explained above, we, the researchers, presented the representatives with a summary of the points of overlap and departure from the previously run co-design workshops. However, the representatives had free rein on the direction of the ensuing conversation. Interestingly, both community representative groups were most interested in sharing and discussing best agricultural practices and farm-to-market mechanisms to support their livelihoods in peatland areas. For instance, the Malaysian representatives were interested to learn the specific combination of fertilisers used by community farmers in Limbung to maximise yield. Both sides were also interested in the types of crops grown, and in understanding why they did or did not plant specific crops. There were in-depth comparisons of market prices for crops and fertiliser prices, where both sides attempted to figure out currency equivalents. Middlemen and farm-to-market transport arrangements were also of interest to both sides. This is corroborated by the results of the co-design workshop prioritisation exercises, where livelihood-related issues received a high number of stickers across the board.

This focus on livelihood-related matters, even when presented with other prompts for conversation, is perhaps not surprising. While peatland communities are stewards of precious ecosystem services, their priority is, of course, their own livelihoods and survival, often just for the short term. Therefore, even while being guided by national regulatory frameworks and international commitments, policies and governance mechanisms should be designed to firstly support and empower peatland community livelihoods, with other outcomes like ecosystem services and environmental sustainability as a co-benefit. Current policymaking, especially that guided primarily by scientific data, often foregrounds climate and other ecosystem benefits first, with livelihoods as a co-benefit. While this framing may seem cosmetic, the way these policies are perceived by communities, whether it is prioritising their needs and values over others, can be the deciding factor for success, especially since the communities are often the essential implementers of the policies on the ground. Indeed, a study on carbon farming in Australia (Fleming et al., 2019) found that strong framing of such projects in terms of economic (livelihoods) incentives can improve the level of acceptance among affected communities.

Decolonising Tropical Peatland Research

In Southeast Asia, ecosystem services research, and environmental research more generally, is often initiated, led, funded and conducted by researchers and institutions in the Global North. At worst, this type of situation may contribute to a phenomenon known as "parachute science" or "helicopter research", where researchers often "parachute" down from an ivory tower in the wealthy North into a foreign community in the Global South for fieldwork. After gathering their data, these researchers are "helicoptered" out of the field to return home, without engaging with or acknowledging the contributions of the local researchers and community members in any meaningful way (Science Friday, 2021). Indeed, northern-based researchers and funders often make strenuous efforts to avoid such suggestions of academic 'neo-colonialism'. However, despite the best efforts of local researchers and the good intentions of Northern partners and funders, imbalances of power and values can persist. Terms such as "capacity development" and "knowledge transfer" suggest that Southern know-how is lacking. Local researchers often retain a subordinate role in the transaction whereby certification, "advanced methods" and training are transferred south in exchange for a northward flow of data, samples, human resources and compliance with an externally determined agenda (O'Reilly et al., 2022).

Even in circumstances where such projects are conducted with the active participation of local partners, such research is often designed and justified based on Northern concerns and priorities. Since these projects are often funded by the Global North, this may not be surprising, and to a certain extent, would be expected. However, this tendency has implications for environmental policy and governance. For example, scientific data that identifies tropical peatlands as globally important carbon sinks has led to intense international scrutiny of Southeast Asia's peatland management. However, there has been little reflection on how historical human activity in temperate peatlands in the Global North countries has reduced their capacity to store carbon. Such scrutiny has also meant that research concerning forest fires in the Global South often focuses on direct causes such as unsustainable business and agricultural practices. However, discussions of peat fire events in affluent countries often focus on the "bigger picture". A recent report by the European Environment Agency (2025), for example, features the increasing role of climate change in causing forest fires on that continent (O'Reilly et al., 2022).

Such framings can have profound implications on the allocation of blame and responsibility for resolving global environmental issues. By extension, they can also have serious implications for international frameworks and national regulations, which are increasingly informed by international commitments. Research in the North tends to highlight the negative environmental impact of Southeast Asian peatland policies that have largely been informed by developmental priorities. However, the region has seen decades of local peatland research, with Indonesian and Malaysian researchers having vast experience in sustainable peatland use and conservation (O'Reilly et al., 2022). In fact, the Global Peatlands Initiative (2022) at the UNFCCC COP26 hailed the progress achieved by Indonesia in peatland restoration and research.

Fairer, more balanced global knowledge systems are vital to developing truly global responses to environmental challenges that are fair, relevant, and workable. Achieving this will require a fundamental transformation in how knowledge is produced, validated and shared. The true benefits that Northern funding, expertise, training and outputs bring to research and

policymaking in the Global South must therefore be critically appraised (O'Reilly et al., 2022). Our project's funder, APN, is based in Japan and is financed by other Global North countries like the USA and New Zealand. While the primarily English-speaking research world still attaches primacy to the 'purest' science undertaken in the most prestigious universities and published in the highest impact journals as evidence to support policy (O'Reilly et al., 2022), the CRRP program makes a conscious effort towards addressing some of these long-standing concerns about Northern-funded research by requiring participatory methodologies for funding eligibility. The funder also evaluates evidence of meaningful local involvement as part of the selection process. Our project's principal investigator was from Universiti Malaya, a local public university in Malaysia, with co-researchers from Nottingham University Malaysia and Monash University Indonesia, both Global North university branch campuses, in addition to local Indonesian and Singaporean institutions. Indeed, many researchers and institutions in Southeast Asia have successfully carved out a niche as local "tour guide" partners to Northern academics (O'Reilly et al., 2022). However, cognizant of such potential power imbalances even within the working research group, the project made a real effort to ensure that local researchers actually took the lead in delivering the project.

Efforts to decolonise research in Southeast Asia can also be seen through national regulations that govern access to research sites and communities. For example, Indonesia has recently introduced an extensive Research Visa application and screening process for all foreign researchers intending to conduct research activities in Indonesia. As part of this process, an Indonesian research institution is needed to facilitate the application and payment for the visa. Research ethics clearance must be obtained at both the Indonesian level (BRIN, the National Research and Innovation Agency) and from the researcher's home institution. The foreign researcher who will stay in Indonesia must provide "proof of domicile" or a local address, and report to a local police station as a temporary inhabitant during the research term. If relevant, a foreign researcher is recommended to learn Bahasa Indonesia, and engage locals to participate in the research activities. If the research is about wildlife and other biological specimens, an additional permit must be obtained from the Ministry of Environment and Forestry (MoEF) (Vogeley, 2023). The Indonesian government will evaluate the application based on the alignment of the research's objectives to Indonesia's national interests and the best interests of local stakeholders.

For our project, Monash University Indonesia functioned as the local partner. While the process may seem tedious, and it may not be the primary (political) reason for its introduction, this process functions as an important barrier against parachute science and helicopter research in Indonesia. Foreign researchers are made accountable not only to their home institutions, but also to their local partners, community members, and national government where the research is carried out. It challenges the normalised extractive research models by requiring foreign scientists, Northern or not, to treat local people as real partners in knowledge production, instead of flying in, collecting samples and leaving Adame, 2021).

Concluding Thoughts

With further analysis and triangulation of the various sources of data collected, we will develop a policy brief to be shared during a dissemination event involving various international, regional and national policy, policy-adjacent, and community stakeholders. This brief will recommend

novel guidelines for the development of more inclusive, bottom-up policies that centre on the needs and priorities of peatland communities while encouraging their buy-in. In line with the precautionary principle, the policy brief will highlight the importance of incorporating local knowledge and local communities in the policymaking process, to support more holistic, evidence-based policymaking even amidst scientific uncertainty. To further avoid a one-way extraction of data and knowledge, we will develop community capacity-building materials that build on, and take feedback from, knowledge gained through our participatory methodologies. In the spirit of our KES, these materials will serve as an additional conduit for further knowledge exchange between Indonesian and Malaysian peatland communities. These materials and other datasets produced through this research will be made available in a Peatland Data Toolkit (handbook), which will be made publicly available through our project's website (SEAPeat, 2025).

Of course, the participatory methods described in this chapter are not exhaustive. Future participatory research in tropical peatland communities can also include a range of novel methodologies. Public Participatory GIS (PPGIS) is a particularly powerful tool as it enables communities to spatially represent their knowledge, perceptions, and concerns through paper or web maps, allowing for more grounded land-use planning and spatial representation of communities' landscape values such as areas of cultural importance and land-use preferences (Brown & Kyttä, 2014; Hognogi et al., 2025). Participatory mapping can also be used to derive missing spatial data that is important for decision-making, such as land tenure boundaries or indigenous lands. Participatory scenario planning can also be employed to explore potential futures with local stakeholders under different management scenarios, commonly used through the lens of complex systems approaches to encourage shared visioning (Mitchell et al., 2015). Participatory video and photovoice methods can be used to empower community members to document and narrate their lived experiences, which in turn can be compiled and analysed spatially through the qualitative GIS approaches (Lechner et al., 2019). Citizen science and participatory monitoring tools are especially valuable in remote peatland areas. They can be used to support community-led environmental reporting and data verification (Hognogi et al., 2025). This not only improves mapping in data-deficient landscapes but also helps build trust in the data itself. Incorporating these and other creative participatory techniques will expand the scope and impact of community-led knowledge production, ultimately supporting more inclusive and equitable peatland decision-making and governance.

Research that explicitly prioritises local agency, knowledge co-production, and ethical engagement is more likely to produce a nuanced, contextually rich understanding of peatland ecosystems and better inform policymaking towards the maintenance of the important ecosystem services these peatlands provide to humankind. Indeed, the participatory methods included in our research have pointed towards the potential for community-based knowledge co-production to reveal important policy directions that may not be immediately obvious through traditional methods like stakeholder interviews and indeed, uncertain scientific data. Our experience underscores the transformative potential of participatory research methodologies in addressing complex environmental challenges, offering a replicable model for interdisciplinary, community-engaged scientific investigation. Incorporating such approaches in future research will go a long way in decolonising tropical peatland research and dismantling structures of historical marginalisation of local knowledge systems that often delimit effective research and policymaking related to ecosystem services in the globally important, but data-sparse peatlands of the Global South.

Acknowledgements

This chapter is an output of grant IF070-2022, "Policy and governance approaches to cooperative mitigation of peatland carbon emissions and transboundary haze in Southeast Asia" (CRRP2022-03MY-Muhamad Varkkey), supported by the Asia Pacific Network on Global Change Research Collaborative Regional Research Programme. We thank all the participants of our research in Indonesia, Malaysia, and Singapore for contributing their time, knowledge, and kind support for the project. We also thank the KES participants for the permission to use their photo in this chapter.

References

Adame, F. (2021). Meaningful collaborations can end 'helicopter research'. Nature, 595(7868), 311. https://doi.org/10.1038/d41586-021-01795-1.

APN (Asia-Pacific Network for Global Change Research). (2022). Policy and Governance Approaches to Cooperative Mitigation of Peatland Carbon Emissions and Transboundary Haze in Southeast Asia, [Retrieved from: https://www.apn-gcr.org/project/policy-and-governance-approaches-to-cooperative-mitigation-of-peatland-carbon-emissions-and-transboundary-haze-in-southeast-asia/].

ASEAN Secretariat. (2023). ASEAN Peatland Management Strategy 2023–2030. Community Relations Division (CRD). [Retrieved from: https://asean.org/wp-content/uploads/2023/10/APMS-5-Apr-Web.pdf].

ASEAN Secretariat. (2024). ASEAN Biodiversity Plan 2024–2030. ASEAN Centre for Biodiversity, [Retrieved from: https://asean.org/wp-content/uploads/2024/10/48-Final_ASEAN-Biodiversity-Plan.pdf].

Brown, G., & Kyttä, M. (2014). Key issues and research priorities for public participation GIS (PPGIS): A synthesis based on empirical research. Applied Geography, 46, 122–136. https://doi.org/10.1016/j.apgeog.2013.11.004.

Calhoun, A., Mainor, A., Moreland-Russell, S., Maier, R. C., Brossart, L., & Luke, D. A. (2014). Using the Program Sustainability Assessment Tool to assess and plan for sustainability. Preventing Chronic Disease, 11, 130185. https://doi.org/10.5888/pcd11.130185.

European Environment Agency. (2024). Responding to climate change impacts on human health in Europe: Focus on floods, droughts and water quality (EEA Report No. 3/2024) [Retrieved from: https://www.eea.europa.eu/en/analysis/publications/responding-to-climate-change-impacts/responding-to-climate-change-impacts/@@download/file]

Evers, S., Yule, C. M., Padfield, R., O'Reilly, P., & Varkkey, H. (2017). Keep wetlands wet: The myth of sustainable development in tropical peatlands–Implications for policies and management. Global Change Biology, 23(2), 534–549. https://doi.org/10.1111/gcb.13422.

Fleming, A., Stitzlein, C., Jakku, E., & Fielke, S. (2019). Missed opportunity? Framing actions around co-benefits for carbon mitigation in Australian agriculture. Land Use Policy, 85, 230–238. https://doi.org/10.1016/j.landusepol.2019.03.050.

Global Peatlands Initiative. (2022). UNFCCC COP26 Global Peatlands Pavilion summary report [Report]. Global Peatlands Initiative. [Retrieved from: https://www.globalpeatlands.org/unfccc-cop26-global-peatlands-pavilion-summary-report/].

Goldstein, J. E. (2022). More data, more problems? Incompatible uncertainty in Indonesia's climate change mitigation projects. *Geoforum, 132*, 195–204. https://doi.org/10.1016/j.geoforum.2021.11.007.

Hognogi, G. G., Pop, A. M., & Bătinaș, R. H. (2025). Map-based participatory activities in building peatland boardwalks. Journal for Nature Conservation, 86, 126958. https://doi.org/10.1016/j.jnc.2025.126958.

International Peatland Society (IPS). (2025). What are peatlands? IPS Secretariat. [Retrieved from: https://peatlands.org/peatlands/what-are-peatlands/].

Lechner, A. M., Owen, J., Ang, M., & Kemp, D. (2019). Spatially integrated social sciences with qualitative GIS to support impact assessment in mining communities. Resources, 8(1), 47. https://doi.org/10.3390/resources8010047.

Vogeley, J. (2023). New research permit instruction [Guidance PDF]. Monash University. [Retrieved from: https://www.monash.edu/__data/assets/pdf_file/0007/3264199/New-Research-Permit-Instruction-by-JV-Feb-2023-1.pdf]

Miller, M. A., Tonoto, P., & Taylor, D. (2022). Sustainable development of carbon sinks? Lessons from three types of peatland partnerships in Indonesia. Sustainable Development, 30(1), 241–255. https://doi.org/10.1002/sd.2241.

Mitchell, M., Lockwood, M., Moore, S. A., & Clement, S. (2015). Scenario analysis for biodiversity conservation: A social–ecological system approach in the Australian Alps. Journal of Environmental Management, 150, 69–80. https://doi.org/10.1016/j.jenvman.2014.11.013.

Mizuno, K., Fujita, M. S., & Kawai, S. (Eds.). (2016). Catastrophe and regeneration in Indonesia's peatlands: Ecology, economy and society (Vol. 15). NUS Press.

Nyumba, O. T., Wilson, K., Derrick, C. J., & Mukherjee, N. (2018). The use of focus group discussion methodology: Insights from two decades of application in conservation. Methods in Ecology and Evolution, 9(1), 20–32. https://doi.org/10.1111/2041-210X.12860.

O'Reilly, P., Varkkey, H., & Choiruzzad, S. A. B. (2022). Of parachutes and helicopters: Reconstructing the decolonisation agenda in environmental research. Fulcrum: Analysis on Southeast Asia, ISEAS – Yusof Ishak Institute. https://fulcrum.sg/of-parachutes-and-helicopters-reconstructing-the-decolonisation-agenda-in-environmental-research/.

Page, S. E., Rieley, J. O., & Banks, C. J. (2011). The global and regional importance of the tropical peatland carbon pool. Global Change Biology, 17(2), 798–818. https://doi.org/10.1111/j.1365-2486.2010.02279.x.

Rieley, J., & Page, S. (2016). Tropical peatland of the world. In M. Osaki & N. Tsuji (Eds.), Tropical peatland ecosystems (pp. 3–32). Springer. https://doi.org/10.1007/978-4-431-55681-7_1.

Science Friday. (2021). The problem with 'parachute science' [Audio segment]. Science Friday. [Retrieved from: https://www.sciencefriday.com/segments/parachute-science-problem/]

Shediac-Rizkallah, M. C., & Bone, L. R. (1998). Planning for the sustainability of community-based health programs: Conceptual frameworks and future directions for research, practice and policy. Health Education Research, 13(1), 87–108. https://doi.org/10.1093/her/13.1.87.

Scheirer, M. A. (2005). Is sustainability possible? A review and commentary on empirical studies of program sustainability. American Journal of Evaluation, 26(3), 320–347. https://doi.org/10.1177/1098214005278752.

SEAPeat (Southeast Asia Peatland Team). (2025). Policy and Governance Approaches to Cooperative Mitigation of Peatland Carbon Emissions and Transboundary Haze in Southeast Asia, [Retrieved from: https://seapeat.wixsite.com/home].

Strydom, W. F., Funke, N., Nienaber, S., Nortje, K., & Steyn, M. (2010). Evidence-based policymaking: A review. South African Journal of Science, 106(5/6), Article 249. https://doi.org/10.4102/sajs.v106i5/6.249.

United Nations Environment Programme (UNEP). (2022). Global peatlands assessment: The state of the world's peatlands. [Retrieved from: https://doi.org/10.59117/20.500.11822/41222].

Varkkey, H., Ashfold, M., Anshari, G., Lechner, A. M., Seah, S., Wijayanti, N., Alkaf, F. T., & Masran, S. A. (2024). Mitigating carbon emissions and haze in Southeast Asia's peatlands: Opportunities and challenges in integrating policy and governance (Trends in Southeast Asia No. 21/2024). ISEAS – Yusof Ishak Institute. [Retrieved from: https://www.iseas.edu.sg/wp-content/uploads/2024/09/TRS21_24.pdf].

Varkkey, H. (2024). Participatory climate governance: Insights from Indonesia's peatlands. Heinrich-Böll-Stiftung Southeast Asia, [Retrieved from: https://th.boell.org/en/2024/09/04/indonesias-peatlands].

Vaughn, L. M., & Jacquez, F. (2020). Participatory research methods: Choice points in the research process. Journal of Participatory Research Methods, 1(1). https://doi.org/10.35844/001c.13244.