# Policy options in peatland conservation and restoration: A review of the UNEP Global Peatlands Assessment and future strategy for global governance

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## SUMMARY

In 2022, the United Nations Environment Programme (UNEP) Global Peatlands Initiative (GPI) published the first Global Peatland Assessment (GPA) examining current knowledge on the state of a newly approximated total extent (500 million hectares) of peatlands across all seven continents. The GPA launch at United Nations Framework Convention on Climate Change (UNFCCC) COP 27 in Sharm-el-Sheikh (Egypt) was a landmark moment for collaborative efforts to provide evidence on the roles of policymakers, academic research and community-led initiatives in supporting global peatland conservation and restoration. Following an assessment of key geographic regions, and of the policy and governance in place to protect, preserve and restore national peatlands, the GPA concluded that policy and governance on peatlands in their current (2022) state offered limited scope to address international agendas without a unilateral national policy approach. This article employs a narrative review methodology to draw together findings from the GPA and information from peer reviewed and grey literature to enable a more comprehensive systematic analysis, interpretation and contextualisation of evidence towards achieving an integration of peatland policy and governance worldwide. Although no new empirical results are presented, the process reveals three consistent challenges, namely: (i) contradictory and fragmented policy frameworks; (ii) insufficient and poorly structured finance for restoration; and (iii) limited inclusion of communities and rights holders. These challenges form the basis for three recommendations to guide the formulation of policy for global and national frameworks. The recommendations are: 1) a commitment to establish national policies that protect, preserve and restore peatlands and align with globally established policy; 2) to develop and provide transparent market policy and mechanisms that allow international financial investment to support gaps in national public funding for restoration, conservation and stewardship of intact and high-integrity peatlands; and 3) to develop and integrate a mechanism for public consultation on peatland conservation and restoration programmes to ensure that agency and concerns for local community, culture and economy are formally recognised at global level. We discuss the rationale for each recommendation in the context of the GPA, to demonstrate how each will contribute to ensuring sustainable peatland governance along with the protection and conservation of peatlands, as a part of future global efforts supported by the UNEP GPI.

**KEY WORDS:** carbon market, climate change, community engagement, ecosystem services, finance

## INTRODUCTION

The international call to protect peatlands as a contribution to delivering climate commitments is neither a novel nor a radical concept (Girkin & Davidson 2024), and several comprehensive reviews on the role of peatland conservation have been published since the early 2000s (e.g., Moore 2002, Leifeld & Menichetti 2018, Günther *et al.* 2020). Described in 2010 as "a low hanging fruit … among the most cost-effective options for mitigating climate change" by Achim Steiner, then Executive Director of the United Nations Environment Programme (UNEP) (Bain *et al.* 2011), peatland conservation nowadays forms part of a burgeoning portfolio of nature-based approaches to climate-change mitigation. However, amongst these it remains cost-effective and easy to achieve whilst also restoring and protecting additional ecosystem services and ensuring sustainable future livings and livelihoods for cultural groups, communities and global society (Bonn *et al.* 2016, Tanneberger *et al*. 2021). National

and regional-level gathering of evidence to underpin international policy development (e.g., Whitfield *et al.* 2011, Chimner *et al*. 2017, Januar *et al.* 2021, Léon *et al.* 2021, Wicaksono & Zainal 2022) has been a key factor in mobilising collaborative global efforts via the supporting vehicle of the United Nations Environment Programme Global Peatlands Initiative (UNEP GPI) and international resolutions like United Nations Environment Assembly (UNEA) Resolution 4/16 (Conservation and sustainable management of peatlands; UNEP 2019), International Union for Conservation of Nature (IUCN) Resolution WCC-2016-Res-043 (Securing the future for global peatlands; IUCN 2016) and many Ramsar resolutions including Resolutions VIII.17, XII.11, XIII.12 and XIII.13 (Ramsar 2002, 2015, 2018a, 2018b).

The urgent need to address peatland losses has been highlighted by several international syntheses including the global overviews of peatland status, use and management presented by Joosten & Clarke (2003) and Bonn *et al.* (2016). Most recently, the Global Peatlands Assessment (GPA) (UNEP 2022) compiled the first United Nations led synthesis of evidence on the extent, status and risks to peatlands, structured around the ecosystem services framework.

Chapter 9 of the GPA specifically identifies twelve recommendations for policy and practice focusing on governance, finance and community participation. In this article we build directly on GPA Chapter 9 by identifying and introducing additional literature to enable a more comprehensive systematic analysis, interpretation and contextualisation of evidence towards achieving an integration of peatland policy and governance worldwide. The intention was to reflect upon and extend the discussion initiated in the GPA by critically evaluating the rationale that underlies its recommendations, assessing supporting evidence, and highlighting implementation gaps across scales. To this end we set out to extract, assess and interpret the policy and governance mechanisms outlined in the GPA, and to extend these with additional insights from peer-reviewed academic publications, grey and policy literature, and regional and national case studies. Through this process we aimed to refine the twelve specific recommendations from the GPA and synthesise them into a smaller set of overarching proposals.

This article has three objectives:

1) to assess current peatland policy and governance frameworks globally;
2) to identify persistent gaps in knowledge and implementation; and
3) to propose evidence-informed recommendations for national policies, financial mechanisms and inclusive governance.

These objectives align with current aspirations of the worldwide community (Nordbeck & Hogl 2024) to overcome the remaining barriers preventing a globally concerted delivery of more effective conservation, restoration and stewardship of peatlands and their carbon stocks.

## APPROACH AND METHODOLOGY

We employed a narrative review approach on account of its suitability for synthesising diverse bodies of academic and grey literature to generate policy-relevant insights in emerging interdisciplinary fields such as peatland conservation and restoration, where standardised data and metrics are often lacking (Greenhalgh *et al.* 2018). This approach enabled an interpretative and holistic analysis incorporating cultural, social and political dimensions that are often overlooked in quantitative reviews (Petticrew *et al*. 2013). In particular, our review included the assessment of cultural ecosystem services, which are often treated as a secondary consideration (Collier 2014, Gearey *et al.* 2014, Schulz *et al.* 2019, Gearey & Everett 2021); and echoed regional knowledge gaps across Africa and South America (Murdiyarso *et al*. 2019), North America (Harris *et al*. 2022, Goodday *et al*. 2024) and Europe (Chen *et al*. 2023). The knowledge gaps were assessed by the GPA as relevant across all continents (Table 1) and formed a basis for the objectives of this article.

Relevant literature sources were identified through key-word searches in academic databases (Scopus, Web of Science, Google Scholar) and in organisational repositories (UNEP, FAO, IUCN, Ramsar Secretariat, European Commission). We prioritised materials published from 2010 onwards to capture recent developments in governance and finance, while incorporating earlier foundational works where relevant. Sources included peer reviewed articles, policy documents, technical reports, policy briefs, interactive maps and case studies. In addition, grey literature published since the GPA was included to ensure that the most recent evidence was captured. The selection of literature was not based on a formal inclusion/exclusion framework but rather on relevance to peatland policy and governance, geographical diversity, and the representation of multiple knowledge systems including Indigenous knowledge, local practices and formal legal instruments. To structure the review we used a four-step process, as follows:

1) Extraction of key themes from the GPA including regulatory measures, stakeholder engagement, financial mechanisms, international collaboration.

Table 1. Policy and governance gaps identified by the Global Peatlands Assessment (UNEP 2022).

| **Theme** | **Policy and governance gaps** | **Relevant continents** |
|---|---|---|
| Data and monitoring | Lack of comprehensive data systems on peatland extent, condition and uses. Incomplete national wetland inventories. | Africa, Asia, Latin America, North America |
| Protected areas | Insufficient inclusion of peatlands in protected area networks and lack of buffer zones to prevent encroachment. | Africa, Asia, Latin America, Europe |
| Regulatory measures | Weakness of regulations and enforcement to prevent harmful activities such as peatland drainage for agriculture and forestry. | Asia, Africa, Latin America |
| Sustainable land use | Limited adoption of sustainable land-use alternatives like paludiculture and unclear transition strategies from unsustainable practices. | Asia, Europe, Latin America |
| Governance and stakeholder engagement | Limited involvement and empowerment of Indigenous Peoples and local communities in peatland governance and decision-making. | Africa, Asia, Latin America, North America, Oceania |
| Financial and market instruments | Lack of financial incentives, subsidies and market-based mechanisms to support peatland conservation and restoration. | Africa, Asia, Latin America, Europe, North America |
| International collaboration | Poor international collaboration, insufficient knowledge-sharing platforms, and lack of interdisciplinary research efforts. | Global (all continents) |

2) Mapping of knowledge gaps across different continents, drawing on both GPA analysis and additional literature.
3) Interpretation and integration of evidence from peer reviewed and grey literature, case studies and knowledge systems into a coherent synthesis.
4) Illustration through case studies highlighting both success factors and ongoing challenges in diverse socio-political and ecological contexts.

Case studies were selected to illustrate not only success factors but also good practice and ongoing challenges. They included Indonesia's Peatland Restoration Agency (Badan Restorasi Gambut, BRG; now BRGM), the UK Peatland Code, community-led peatland management initiatives in Southeast Asia and South America, and peatland restoration efforts in the UK and Germany. These examples allowed us to contextualise the evidence within practical governance settings. The twelve recommendations from Chapter 9 of the GPA were then systematically consolidated by interpretative analysis into three overarching themes. Each of these directly reflects a recurrent gap or challenge in current peatland policy and practice that was identified through the review and synthesis:

1) Theme 1 on policy coherence was triggered by evidence of contradictory or fragmented policies, which was identified in both national and regional contexts.
2) Theme 2 on blended finance (mix of public and private funding sources) was informed by documented funding shortfalls and by challenges in structuring finance for restoration, as illustrated in examples from carbon markets, agri-environment schemes and green bonds.
3) Theme 3 on stakeholder engagement developed from evidence highlighting the limited inclusion of communities and rights holders, particularly Indigenous peoples and tenant farmers, in peatland governance and restoration.

This process enabled a multi-scalar perspective that deliberately spanned a broad range of different governance levels:

1) international conventions (e.g. UNFCCC, Ramsar Convention, UNEA resolutions);
2) regional frameworks (e.g. ASEAN, EU Directives);
3) national instruments (e.g. peatland strategies, restoration agencies, subsidy reforms); and
4) local and customary governance (e.g., of Dayak in Indonesia, Selk'nam in Chile).

As for all narrative reviews the approach imposed limitations, including the possibility of selection bias arising from the non-systematic nature of literature sourcing and questionable comparability across diverse governance systems and policy environments. The analysis and outcomes were also dependent on the quality and completeness of the GPA evidence base and cited sources. However, combining the GPA findings with updated literature and case studies made the accumulated evidence appropriate for translation into actionable policy recommendations across global, regional, national and community levels.

The three themes (governance coherency, finance and participation) establish a firm foundation for the three overarching recommendations that emerged. The recommendations are presented and discussed in turn in the following sections of this review. In each section we explain the significance of the theme along with the identified gaps in evidence or practice. We also describe examples of the case studies that informed development of the recommendation.

## RECOMMENDATION 1:

### A commitment to establish national policies that protect, preserve and restore peatlands and align with globally established policy

**Governance in the international policy landscape**

The GPA reviewed a range of instruments for policy and governance (defined in Box 1) whose stated purpose was to halt further degradation or destruction of peatlands and instead facilitate their conservation, restoration and sustainable management. These included regulatory, financial and market mechanisms as well as partnerships, co-management approaches, and educational or social measures such as capacity building and behavioural change programmes. No single approach is sufficient on its own. Effective outcomes require tailored combinations of instruments that reflect local geography, peatland condition, socio-economic roles, and political objectives linked to climate and biodiversity targets. Our analysis demonstrated significant fragmentation in the current policy landscape. International frameworks exist but their coverage is limited. For instance, only 172 countries are parties to the Ramsar Convention on Wetlands, and only 657 'Wetlands of International Importance' have been designated that include one of the four inland wetland categories containing peat (forested peatlands, non-forested peatlands, alpine wetlands, tundra wetlands) (Ramsar 2012). There are exemplary transboundary efforts such as the Brazzaville Declaration between Congo and Democratic Republic of Congo (DRC) aiming to establish cross-border coordination on management of the Congo Basin Cuvette Centrale peatland area, as well as regional initiatives like the Association of Southeast Asian Nations (ASEAN) cooperation and knowledge-sharing with European partners. These initiatives demonstrate the potential for collaboration beyond single-country initiatives. However, translating international commitments into national actions remains a major gap. Our review confirmed that policy often affords low priority to peatlands unless backed by a strong national mandate.

The GPA noted that peatland strategy in many countries is not harmonised with legislation, resulting in ad hoc or even conflicting legal instruments. The analysis also highlighted contradictions in policy that undermine peatland conservation, both within and between countries. In Europe, climate and energy goals have sometimes clashed with peatland protection, allowing the installation of over a thousand wind turbines on Scotland's carbon-rich peat bogs (Heal *et al*. 2020, Chico *et al*. 2023) as well as promoting farming on drained peatlands - which produce ~ 20 % of European Union (EU) agricultural $CO_2$ emissions - through EU agricultural subsidies. In Central Africa (DRC), the auctioning of new oil concessions that overlap the Cuvette Centrale peatlands was widely criticised as incompatible with global climate commitments. These cases illustrate how short-term economic or sectoral targets can conflict directly with peatland preservation goals, pointing to systemic weaknesses in governance. Separate government ministries for environment, energy and agriculture sectors have repeatedly and widely proved to lack coordination such that one government department can be implementing policies that degrade peatlands whilst another is charged with conserving them. Our analysis concluded that, without high-level policy coherence and enforceable protections, even well-founded peatland focused initiatives risk being negated by contradictory agendas.

Box 1. Definitions.

***Policy***

A set of rules and procedures that are typically used by public institutions to make decisions or take actions to achieve defined goals (Lerche & Said 1970, Fox & Meyer 1995).

***Governance***

The formulation and implementation of rules, procedures and processes, and policy. These can be informal (e.g., cultural norms) or formal (e.g., international agreements, policy) and aim to achieve environmentally sustainable outcomes through multi-level interactions (from local to international) among state, market and civil society actors (Folke *et al*. 2005, Lebel *et al*. 2006, Cundill & Fabricius 2010).

The GPA found that the nature of legal protections and the relevant designations assigned to peatlands vary by country. The 1976 Ramsar Convention on Wetlands provides the only international-level mechanism for protecting wetlands specifically and, despite its shortcomings (see above), resolutions and recommendations on peatland conservation and sustainable use adopted by its Conference of Parties (COP) have led to the establishment of important protected areas around the world. The GPA highlighted the role of this Convention as a mechanism for cooperation that has facilitated key transnational agreements such as the 2018 Brazzaville Declaration. In that instance the Convention supported sustainable management in the central Congo Basin by establishing a single transboundary site comprising three Ramsar Wetlands of International Importance and containing 45 % of the basin's peatland area (Complexe Transfrontalier Lac Télé - Grands Affluents - Lac Tumba) (Dargie *et al.* 2019).

Beyond the Convention on Wetlands, where a common signatory framework is understood, the coordination of transboundary peatland policy between countries with different legal systems and environmental law presents additional challenges. However, the GPA highlighted regional and cross-continental successes in this process with examples including ASEAN, which has adopted policies and guidelines to facilitate coordinated action to address peatland degradation, large-scale fire management and associated transboundary haze pollution (ASEAN 2021a, 2021b). Outcomes have included the National Action Plans on Peatlands adopted in five member states including the Indonesian national plan for protection and management of peatland ecosystems 2020–2049 (MEFRI 2021). The ASEAN agreement has also been developed across continents, with supporting policy development within the UK Peatland Strategy (IUCN UK 2018, Reed & Barbrook-Johnson 2022) as well as between the ASEAN Member States.

In Europe, key transnational directives are increasingly focusing on the role of buffer zones around protected areas where certain uses by the local community are permitted, thus protecting core areas whilst still enabling people to derive sustainable livelihoods from the land. Peatlands may be included in wetland buffer zones to filter out nutrients from surrounding agricultural land (Walton *et al.* 2020). For example, the EU Water Framework Directive (2000) highlights the importance of peatlands as 'buffer habitats' for water purification. Peatland conservation, management and restoration areas must also be considered when formulating the legally required River Basin Management Plans; and any peatlands adjacent to water bodies should be included in spatial planning. However, evidence of successful outcomes from this initiative has yet to be shown and the last-mentioned requirement has been largely neglected (Peters & von Unger 2017).

**National-level perspectives**

The translation from international and transnational to national level policy pivots on whether there is a fundamental national commitment to furthering the protection and preservation of peatland systems. The GPA recognised a range of national-level peatland governance instruments across each continent that demonstrated efforts in this direction. In these examples, however, a lack of statutory protection had often prevented tangible conservation action. Indeed, it was found that many of the identified regulations relating to peatland conservation and restoration were contradictory and counter-productive in execution (Table 2). We recommend that a global commitment

Table 2. Challenges of policy and governance in peatland protection and conservation (summarised from UNEP 2022).

| **Challenge** | **Description** | **Location** | **Key references** |
|---|---|---|---|
| Policy incoherence | Policies for peatland conservation are often undermined by conflicting policies in agriculture, energy and land use management. | Global | Carmenta *et al.* (2017)<br>Ekardt *et al*. (2020) |
| Lack of peatland-specific protection | Peatlands remain largely unprotected from infrastructure development, mining and conversion to agricultural use. | Global | Turetsky *et al*. (2015)<br>Harris *et al*. (2022)<br>Qiu *et al*. (2021)<br>Cole *et al*. (2022) |
| Poor enforcement of conservation policies | Even when peatlands are designated as protected, enforcement of regulations is poor owing to resource constraints and lack of monitoring. | Multiple countries in Europe, Asia, Africa and Latin America | Kingsford *et al*. (2021) |
| Conflicting land use priorities | National policies often prioritise food production and agricultural development, leading to continued peatland drainage and degradation. | Global (especially Southeast Asia, Europe and Africa) | Regina *et al*. (2015)<br>Buschmann *et al*. (2020) |
| | Mining: Energy policies, fossil fuel extraction and mining for battery minerals pose threats to peatlands in multiple regions. | Indonesia, Canada, Russia, Latin America | Meijaard *et al*. (2020)<br>Lassila (2021)<br>Heal *et al*. (2020) |
| Private land ownership challenges | Most peatlands in Europe are privately owned, making it difficult to enforce conservation policies without incentives for landowners. | UK, Europe | Shrubsole (2021) |
| Limited resources for conservation | Protected peatlands are often small patches in managed landscapes, with insufficient resources allocated for their effective conservation. | Congo Basin, Indonesia, Europe | OECD (2019)<br>OECD (2020a)<br>OECD (2020b) |
| Indigenous Peoples and Local Communities (IPLC) recognition | Indigenous communities play a crucial role in peatland conservation, but their contributions are under-recognised in policy frameworks. | Canada, Russia, Papua New Guinea, Africa, Latin America | WWF *et al*. (2021)<br>Noon *et al*. (2022)<br>Goodday *et al*. (2024)<br>Austin *et al*. (2025) |
| Gaps in peatland classification | Many countries classify tree-covered peatlands as forests, leading to policies that promote drainage instead of conservation. | Chile, Southeast Asia | Quinn *et al*. (2010)<br>Nath *et al*. (2017)<br>Alam *et al*. (2021) |
| Ineffectiveness of moratoria and regulations | Temporary peatland protection moratoria (e.g., in Indonesia) have had mixed success, with continued deforestation and degradation. | Indonesia | Dohong *et al*. (2018)<br>Budiman *et al*. (2021)<br>Wicaksono & Zainal (2022) |

is made to develop national policies that are truly effective in preserving and restoring peatlands in alignment with transnational and international resolutions, agreements and regulations.

Whilst many nations include peatland conservation and restoration in climate or farming related policies and strategies (Girkin & Davidson 2024), the number of countries with overt peatland restoration policies is low. Such policies are often associated with peatland restoration and protection components of the UNFCCC Nationally Determined Contributions (NDCs), with a total of 43 out of 195 NDC submissions (in 2022) being specific in terms of peatlands (29 for Europe, three for Africa, four across the Americas and seven for Asia).

Some notable success from peatland focused policies is evidenced by existing national peatland conservation and restoration initiatives. For example, in 2014 the Indonesian government introduced Regulations on the Protection and Management of Peatland Ecosystems, requiring that all peatlands in the country should be identified and mapped using a Peatland Hydrological Unit (PHU) approach. This delineated each peatland and adjacent land bounded by the nearest river or coastline as a management unit, and more than 50 % of the 24 million hectares of PHUs in the country have now been designated as conservation areas. This work has been implemented via the government's Peatland Restoration Agency (originally known as Badan Restorasi Gambut or BRG), which has claimed to have restored 2.4 million hectares of peatland between 2016 and 2020 (Wicaksono & Zainal 2022). However, this is a contested figure. Concerns have been raised about the actual progress of restoration efforts based on discrepancies in the data and a lack of independent verification. NGOs such as Greenpeace (2021) claim the estimate is based on self-reported data from associated extractive industries (oil palm and pulpwood plantation companies) and that average water levels on 'improved' plantation sites are 40 cm below the peat surface, which is deeper than required by legislation. It should also be noted that, in this instance, 'restoration' does not imply full rewetting with reinstatement of natural peatland vegetation.

The establishment of BRG (BRGM since 2020 when its remit was broadened to incorporate the restoration of mangrove habitats) demonstrates the value of a centralised body with the authority and mandate to coordinate peatland policy, restoration and fire prevention across sectors (Page *et al.* 2009). Comparable arrangements could be transformative in other peatland-rich countries. The extensive boreal peatlands of Canada and Russia, along with north-west European blanket bogs, all face challenges of fragmented governance where responsibilities are split between agriculture and environment ministries (Joosten & Clarke 2003). In the UK there is a government department responsible for protecting, expanding and promoting the sustainable management of woodlands/forests but no counterpart for peatlands, despite the latter contributing a much larger area of semi-natural habitat (Bonn *et al.* 2014). Peatland-rich countries must establish dedicated peatland agencies or inter-ministerial task forces. Such bodies could help to harmonise objectives across government departments, ensure long-term funding commitments, and give peatlands parity with other land use sectors in national policy frameworks (Evans *et al.* 2021).

The GPA identifies the key to success of national peatland conservation and restoration policies as sustained, coherent and accessible funding to support the implementation of restoration programmes. In Scotland (UK), the Peatland ACTION programme was implemented in 2013 and is currently planned to continue until 2030, while England will complete the initial stage of its 25-year Peat Action Plan in 2025. The primary purpose of these provisions is to ensure that peatlands will play their full part in the UK Net Zero Strategy, which outlines how the government plans to deliver its greenhouse gas emissions target of net zero by 2050. Contributions to other environmental goals including natural flood management and improvements in water quality, along with protection of biodiversity and the historic environment, are also expected (Defra 2021).

The EU's new Nature Restoration Law (2024) sets binding targets for rewetting and restoration of managed peatlands, within and outside of protected areas, to be reached by 2030, 2040 and 2050. Paludiculture (the cultivation of crops on wet or rewetted peatland) offers a significant potential contribution to the achievement of both climate and biodiversity goals while providing continued income for farmers whose livelihoods depend on peatlands, by switching from drainage-based to 'wetter' agriculture producing high-quality fibres and biomass for a growing bioeconomy (Wichtmann *et al*. 2016). However, until 2023, the EU Common Agricultural Policy (CAP) largely excluded from its subsidy schemes (designed to support only drainage-based agricultural activities) any payments to farmers for the development, maintenance or expansion of paludiculture. This contradiction was resolved for the 2023–2027 funding period. Paludiculture does now qualify for funding, with specific conditions to preserve peatlands (EEB 2022). One example of the new opportunities this opens for paludiculture is highlighted by the establishment of four pilot projects

to showcase and develop different paludiculture practices in Germany.

Although now apparently solved in the case of the EU CAP, the identified incoherence in peatland protection within countries is a global problem, with implementation of peatland focused policies often confounded by incompatible objectives managed by different governing bodies or institutions and driven by economic priorities (Carmenta *et al.* 2017, Ekardt *et al*. 2020). To address this, we add a sub-recommendation that national peatland plans should be backed by all relevant ministries (e.g., environment, energy and agriculture) so that their individual policy agendas do not conflict. In practice, this could be achieved via an inter-ministerial task force or integrated agency overseeing the alignment of peatland policy objectives across sectors.

Important initial steps for nations committing to align more effectively with internationally agreed policy on peatlands include designating more intact and high-integrity peatland ecosystems for conservation, engaging local communities as partners in peatland protection within protected areas, and imposing moratoria on land use activities that degrade, drain and burn peatlands. However, for these policies to be effective, they must be sufficiently comprehensive and supported by effective programmes for peatland mapping and monitoring as well as for enforcement (FAO 2020, Barbier & Burgess 2021). When combined with strict sanctions and penalties for non-compliance, these policies could also reduce illegal peatland conversion (Barbier & Burgess 2021).

**RECOMMENDATION 2:**

**To develop and provide transparent market policy and mechanisms that allow international financial investment to support gaps in national public funding for restoration, conservation and stewardship of intact and high-integrity peatlands**

**Peatland restoration supported by public funding**
For Scotland, Glenk *et al.* (2021) conducted valuations of ecosystem services such as drinking water provision and concluded that the net benefits of peatland restoration alone would lead to annual savings for the government of £191 million (in GBP/British pounds), equivalent to ~€217 million (in EUR/euro). In recognition of the many valuable public benefits provided by peatlands, a growing number of countries are introducing peatland policies and strategies, many of which allocate public funding to peatland conservation, restoration and sustainable management. Public funding for action on peatlands includes grants to establish or maintain protected areas, integration of restoration and sustainable management into agri-environment schemes, and the removal of perverse incentives. Indeed, a range of economic instruments is available to complement regulation. These might involve, for example, financing restoration programmes and withdrawing subsidies that encourage unsustainable use of peatlands, with a view to reshaping management practices towards eliminating further peatland degradation. Incentives and other payment schemes may be funded from public budgets held by national governments, but alternatively through payments for ecosystem services from the private sector or blended public and private arrangements (UNEP 2022).

Our analysis highlighted countries and regions that have started to allocate dedicated funds to peatlands, providing prototypes to learn from. EU Member States are beginning to allocate funds for rewetting peatlands during 2030–2050 in compliance with the new Nature Restoration Law (see previous Section). For instance, Germany committed €48 million of public funding under its National Peatland Protection Strategy (2021) to run the four paludiculture pilots already mentioned, alongside restoration of lowland peatlands. National programmes are also being scaled up. The German "nature-based climate protection action programme" (Aktionsprogramm Natürlicher Klimaschutz, 2023–2026) is supported by €4 billion of government funding over four years and prioritises peatlands, with half of the budget earmarked for peatland restoration. The devolved countries of the UK have attached funding commitments to specific peatland restoration targets. For example, Scotland's Peatland ACTION programme restored ~25,000 ha over ten years starting with £250 million (~€284 million) in 2013. The current Scottish peatland restoration target (20,000 hectares per year until 2030) is supported by another investment of £250 million over ten years. In England, the goal of the government's Peat Action Plan, established in 2021, was to fund the restoration of at least 35,000 hectares of peatland by 2025 as the initial stage in a 25-year programme. These cases demonstrate growing political will for peatlands to receive public investment commensurate with their importance for climate and ecosystems. However, such initiatives are the exception rather than the norm. Many countries, especially in the tropics where impacts on peatlands are largest, rely on limited donor funding and have not mobilised domestic finance at scale. The net result is a large financial gap that cannot be filled by public budgets alone.

**The funding gap**

The conservation and restoration of tropical peatlands is estimated to require financial inputs of $40 billion (in USD/US dollars) per year but would reduce their annual $CO_2e$ greenhouse gas emissions by 800 million tons (1.5 % of global emissions); i.e., the cost per ton of saved $CO_2e$ emissions would be $50. Calculated on a similar basis, the cost of rewetting 40 % of all drained peatlands by 2050 would be $19–46 billion per year from 2022 until 2050 (Barbier & Burgess 2021). Current spending by national governments is sufficient to meet only a fraction of these needs, and few national governments could pay the full cost of peatland conservation and stewardship at the level required. Even for the high-income UK, the gap between committed or planned spending on environment and the total funding needed to reach their net-zero and other nature-related targets for 2050 is estimated at $57–120 billion (Green Finance Institute 2021). Our review found similar shortfalls elsewhere, underlining that public funding at established levels is insufficient to halt peatland degradation at the necessary rate or scale.

One mechanism that has been suggested as a means of reducing such shortfalls involves taxation to ease pressures on peatlands and generate additional revenue. Building on work by Barbier *et al.* (2020) and Barbier & Burgess (2020), Barbier & Burgess (2021) suggested introducing taxes for reinvestment into peatland restoration and associated community initiatives, to further reduce the likelihood of damage to peatlands through drainage and land use change.

However, despite recent investments of public funds in peatlands, the scale of investment required is so greatly in excess of current allocations that a pronounced gap can still be expected between funding available in the public sector and the funds needed to protect, restore and sustainably manage peatlands at the scale needed to meet global climate and nature goals. The consequence of under-investment is not only continued degradation (and greenhouse gas emissions), but also higher future costs. As drained peatlands degrade further through time, the price of restoring them will rise. In other words, the cost to society will only escalate if the essential remedial works are postponed. To minimise the total price, we must act immediately to protect peatlands and arrest their degradation. This economic reality makes the need to mobilise new funding sources a matter of urgency.

Thus, a critical challenge that emerged from our analysis is to secure sustainable sources of sufficient funding. To fill the funding gap there is a need for financial and technical inputs from the international and donor communities to help low- and middle-income countries adopt policies and strategies to protect, restore and sustainably manage peatlands.

**Private financing and carbon markets**

The funding gap could be filled by the private sector, which is increasingly investing in peatlands as a response to a variety of risks and opportunities (Reed *et al*. 2022a). The ASEAN Secretariat, with assistance from the International Fund for Agricultural Development (IFAD) and the Global Environment Centre (GEC), is currently developing an Investment Framework for Haze-free Sustainable Land Management in ASEAN, aiming to leverage $1.5 billion to support implementation of the ASEAN Peatland Management Strategy for 2022–2030. Peatland carbon markets are currently operating in six countries in Europe (UK, Germany, Netherlands, Finland, Switzerland, France) and forthcoming in two more (Ireland, Sweden). The UK is now introducing peatland biodiversity credits which are explicitly bundled with carbon in the Peatland Code (IUCN UK 2024); the rationale being that peatland carbon is unlikely to be the cheapest available owing to high restoration costs, but offers important co-benefits for nature and water. The ancillary ecological benefits are typically bundled with carbon and offered as higher-priced "premium carbon" or "carbon+" credits (UNEP 2022). Alternatively, for a buyer requiring carbon-only in preference to the bundled premium carbon product it is possible to unbundle, selling the carbon to one buyer and each of the co-benefits to others - thus effectively "stacking" the payments for carbon, biodiversity and water services (Lau 2013, Torabi & Bekessy 2015). Although this can in theory increase total revenue, it introduces complexity because each market may impose additionality rules that prohibit stacking (Robertson *et al*. 2014, Reed *et al*. 2025a).

In addition to voluntary offset markets for carbon and biodiversity, there are voluntary markets for peatland restoration projects that deliver water quality benefits (principally reductions in water colour originating from dissolved organic carbon) as well as natural flood management (Reed *et al*. 2025a; Figure 1). Companies sourcing products from peatlands are increasingly seeking reductions and removals of supply-chain emissions through changes in tillage, raised water tables and conversions to paludiculture from arable or horticulture on lowland peats, or through ditch/gully blocking, revegetation and habitat restoration on other peatlands ("insetting"

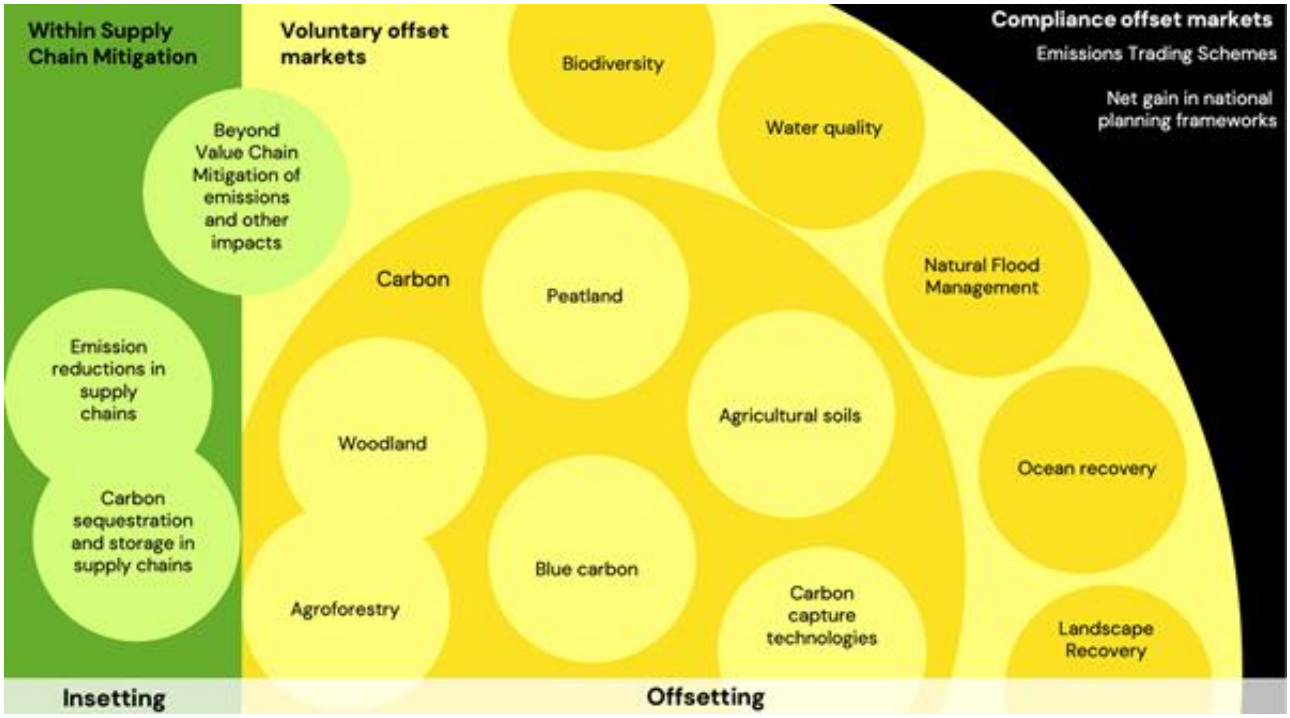


Figure 1. Ecosystem market typology, adapted from Reed *et al*. (2025a).

in Figure 1). Compliance markets are also now considering the integration of nature-based carbon units, with Australia's Safeguard Mechanism (a compliance emissions trading scheme) already allowing their use, and consultations being conducted in Europe and the UK with policy decisions currently pending. Both the European and the UK Emissions Trading Schemes (ETS) already permit the potential use of such measures. While the European Commission continues to consult on related reforms (European Commission 2023), the UK ETS consultations have now concluded, with policy responses published and the implementation of agreed changes under way (UK ETS Authority 2025, UK Government 2024, 2025).

The delivery of multiple outcomes, whether via voluntary or compliance markets, offsetting or insetting, has tended to focus on reducing and mitigating trade-offs between services (e.g., Galicia & Zarco-Arista 2014, Zheng *et al*. 2019). For example, privately funded Landscape Enterprise Networks map business dependencies on natural capital at landscape scales across Europe (Reed *et al*. 2022a), and publicly funded Regional Land Use Partnerships in Scotland do this at wider spatial scales (Reed *et al*. 2022b, Scottish Government 2023a). Such landscape-scale schemes have potential to integrate funding from insetting and offsetting markets, and coordinate to minimise trade-offs between ecosystem services as well as meet the needs of local communities.

**Market and policy mechanisms**

A commitment is needed to develop market and policy mechanisms to responsibly scale peatland conservation and restoration using both public funding and private finance. Financial and market instruments with potential to pay for and incentivise conservation, restoration and sustainable management of peatlands are likely to include carbon and other ecosystem markets as well as a range of green finance mechanisms that provide returns to investors from nature-based solutions. A system designed to blend public funding for peatlands with private payments for ecosystem services may help de-risk and leverage private investment whilst securing the supply of projects to markets and retaining leverage for governments to ensure fair access to funding and benefits for local communities. Examples of blended finance mechanisms include the use of agri-environment schemes to pay the majority of project costs, with carbon finance providing a minimum proportion (currently set at 15 % in the UK Peatland Code) of these costs but retaining 100 % of the credits (units) generated. This would effectively subsidise carbon projects to make them more investible.

The Scottish government is currently considering a number of alternative options as part of Peatland ACTION (Scottish Government 2023b, Reed *et al*. 2024). For example, governments can become guaranteed buyers of units from projects by contracting with individual projects to purchase a minimum proportion of units at a pre-agreed price, or by offering a floor price at which it will buy any proportion of units. Price floor guarantees are attractive to projects, as they provide a guaranteed buyer for all units generated if the market crashes, and projects can still sell to the market if they can achieve higher prices there. However, this model represents a greater risk to public funds, which could be forced to prop up failing markets in the future. Another approach is to establish a project finance vehicle seeded with public money to attract private investment that delivers loans to project developers, repayable with interest. It is possible to integrate a public first loss element into such funds, so that private investors receive the first returns on the fund whereas government receives returns only after a set revenue threshold has been reached. This element would increase risk to public funds but in some market contexts may be required to attract the private investment needed to make schemes operational.

Several other blended-finance mechanisms to promote upscaling of restoration are emerging. The UK Nature Finance Forum's "Revenues for Nature" programme is piloting multiple models to channel private investment into initiatives such as landscape enterprise networks, mitigation banking and payments for ecosystem services (Green Finance Institute 2025). Similarly, international funds such as the World Bank's BioCarbon Fund and the Green Climate Fund use concessional loans, grants and guarantees to leverage private capital. However, it is crucial to ensure additionality, meaning projects must deliver benefits that would not arise without the investment (Helmcke *et al.* 2025). Voluntary carbon standards (e.g. the UK Peatland Code) explicitly require an additionality test to verify that restoration was not already mandated and would not happen in a "business as usual" scenario. Policymakers should therefore introduce clear regulations so that when public money supports restoration, private finance truly funds extra outcomes, by refusing to issue carbon credits for activities already funded by other programmes (Garvey *et al*. 2025).

Challenges relating to market pricing of voluntary carbon credits remain a significant barrier to upscaling peatland restoration. At present, voluntary carbon markets often treat credits as interchangeable, yet the context in which they are generated varies greatly. Avoided emissions from tropical peatland deforestation and drainage prevent the release of exceptionally large carbon stocks per hectare (Dargie *et al.* 2017), while restoration of temperate peatlands in developed countries generally delivers smaller annual emissions reductions, although these come with important co-benefits such as improved water quality and flood mitigation (Evans *et al.* 2021). The costs of action also vary. In tropical regions, the opportunity costs of not converting peatlands to agriculture or logging are high, whereas in Europe or North America, restoration costs are more closely linked to land management and hydrological interventions (Leifeld & Menichetti 2018). Pricing credits uniformly treats these fundamentally different interventions as equivalent and risks underfunding high-cost, high-impact projects and overvaluing low-cost ones.

Critics of the voluntary market highlight an "increasingly… chaotic mix of codes" and variable integrity across standards, with concerns that some credits do not represent genuine additional reductions (VCM Primer 2022). This market failure can be addressed through clearer national guidance and regulatory oversight. We therefore propose that governments and standard-setters should develop tiered pricing mechanisms or premium credit categories that reflect both the carbon density and the socio-ecological context of each project. For example, credits from avoided tropical peatland conversion could justifiably command a higher price than those from temperate restoration, with differentiated tiers based on carbon outcomes and verified co-benefits (e.g., biodiversity, water regulation, cultural services). In addition, transparent additionality requirements must be enforced so that carbon revenues supplement, rather than replace, existing public subsidies. By embedding these safeguards in national regulation, peatland credits can be priced fairly, ensuring that both tropical and temperate projects attract adequate finance and that investors are incentivised to support the most impactful interventions.

The GPA has highlighted power imbalances within voluntary carbon market governance that allow larger corporate actors and public institutions to disproportionately shape decision-making, leaving smaller rural enterprises with little influence over key policies and funding decisions. Establishing a global mechanism for developing robust certification standards for peatland restoration will not only reduce power imbalances for peatland governance but will also attract more private investors and ensure long-term funding stability (Reed *et al*. 2025b).

**RECOMMENDATION 3:**

**To develop and integrate a mechanism for public consultation on peatland conservation and restoration programmes to ensure that agency and concerns for local community, culture and economy are formally recognised at global level**

**Community benefits**

There is increasing interest in developing policy mechanisms to ensure meaningful and lasting community benefits from peatland ecosystem markets. These benefits, defined by the Scottish Land Commission as tangible and measurable social and economic advantages delivered through land ownership, use and management, have often been narrowly implemented (Scottish Land Commission 2020). As Daniels-Creasey (2024) observes, community involvement has frequently been limited to short-term employment or volunteering opportunities, with few lasting improvements and minimal participation in key decisions around land use change. Moreover, concerns have been raised about transparency regarding project objectives, financial structures, (particularly) the role of private investment in carbon and biodiversity markets, and the long-term implications for local people.

In a recent assessment of voluntary carbon codes in the UK (including the Peatland Code), Nayak *et al*. (2025) found that, although the intention of Voluntary Carbon Market (VCM) mechanisms was good, community engagement was limited and rural communities had no meaningful or transparent involvement in decision-making processes. Many tenant farmers and crofters reported feeling excluded, and inconsistencies in consultation practices were cited as making it difficult for smaller landowners to navigate the complex requirements of VCMs and thus to benefit from carbon sequestration initiatives. Many landowners and farmers also struggled to understand how VCM frameworks work, often due to a lack of educational resources and technical support. This has left many smaller actors vulnerable to exploitation by better-informed intermediaries such as land agents and carbon traders, who may take advantage of their limited understanding.

The GPA noted that equitable and sustainable policy outcomes are more likely to emerge when decision-making processes recognise and balance the diverse values of nature and address social and economic power asymmetries among actors (e.g., Wong 2013, de Vente *et al*. 2016, Reed *et al*. 2018). The consideration of power relations should incorporate factors such as gender and age, which further affect how resources are redistributed and the levels of engagement and leadership that individuals can access (e.g., Groot & Abma 2018, Nchanji *et al*. 2021). Guidance from the Scottish Land Commission (2020) on community benefit underscores the importance of adopting consistent frameworks for benefit sharing, noting that clear principles and agreed processes can both reduce negotiation costs and increase trust among stakeholders. By explicitly recognising these costs and planning for them in programme budgets, governments and investors can ensure that the benefits of participatory peatland restoration are not outweighed by the financial overheads of implementation.

To address challenges around community benefits from peatland restoration projects, Reed *et al*. (2025c) call for a more robust and equitable approach to the governance of community benefits including:

- the development of guidance on rights and responsibilities for investors entering land markets;
- formalised approval processes for acquisitions to ensure community interests are considered from the outset;
- the co-design of gender-responsive participatory approaches to natural capital investment, with practical training for project developers on effective and inclusive community engagement (this may require reforms to land tenure and the creation of community natural capital funds to support fair benefit distribution across public, private and community actors); and
- proportionate benefit-sharing arrangements explicitly linked to impact assessments and supported by long-term monitoring frameworks that track community involvement and the delivery of social and economic outcomes over time.

**Pitfalls in connecting with local communities**

Our analysis found that limited community involvement is a persistent weakness in peatland governance. Many peatland initiatives have been designed in a top-down manner, overlooking local rights or traditional management practices. This can lead to resistance, conflict and missed opportunities for collaboration. One example comes from Ireland, where rural communities have for generations held customary turbary rights to cut peat for domestic fuel, and peat cutting has become a culturally embedded practice that once engaged whole communities in summer but has mostly been replaced by large-scale mechanical extraction. Efforts to conserve peatlands

encountered pushback because some policies failed to acknowledge the local traditions and livelihood needs. Bullock & Collier (2011) document the obstacle as a paradoxical attitude stemming from the deep cultural connections amongst Irish peatland communities, in that people understood the environmental value of peatlands yet also fiercely defended their rights to extract peat. Based on an investigation of present day perceptions of peatlands in two locations in Scotland, Byg *et al*. (2017) similarly consider that people whose lives are closely bound up in peatland landscapes see them in complex and sometimes contradictory ways, and that this diversity needs to be recognised and accommodated if policymaking is to have the support of both local people and the wider public. Subsequent research into the role of Irish peatland conservation in the climate crisis (Flood *et al*. 2024, Nolan *et al*. 2025) has effectively reinforced this conclusion.

In a somewhat similar example from Indonesia, policies imposing blanket bans on peat fires and drainage have come into conflict with the traditional practices of some Indigenous communities. Miller (2022) describes how corporate concessions and government regulators attempted to impose a one-size-fits-all enforcement of 'fire-free commons' on practitioners of the customary *adat* land management system, which involves controlled burning of the peat swamp forest to prepare the ground for agriculture, based on inter-generational Indigenous knowledge about safe burning practices. This not only created tension and enforcement challenges but also dismissed the value of Indigenous tradition.

The challenges of connecting between global and local have long been recognised, and mismatched objectives may be encountered across both spatial scales and power hierarchies (Nchanji *et al*. 2021). We found numerous other instances where such disconnects have impeded peatland initiatives. An instance of conservation-focused researchers discovering that local perceptions of peatland values may contrast starkly with their own is reported from the tropics by Cole *et al*. (2022). These authors caution that people whose livelihoods depend directly on forested tropical peat swamp may attach much higher value to heavily degraded (i.e., deforested and drained) parts of the ecosystem than to undisturbed parts, because the former can better meet immediate local needs, e.g., for farmland, resources and economic returns. Fleming *et al*. (2021) maintain that the challenge of restoring damaged and degraded peatlands in Indonesia will require an "integrated research" approach that brings together different disciplines across multiple scales to promote a shift in the social norms of local communities and wider stakeholder groups, involving a "transformational change" in behaviours.

**Minorities and gender considerations**

It is clear that power asymmetries and divergent values are at play and that, without deliberate efforts to reconcile these, well-meaning conservation policies can falter - or even exacerbate social inequalities. We observed that certain groups within communities, notably women and young people, are often afforded limited representation in peatland decision-making despite their being affected parties and potential knowledge-holders. Such generational and gender prejudice means valuable perspectives (e.g., women's knowledge of medicinal plants and peatland water management) may be overlooked and the social uptake of restoration projects impeded (e.g., because women frequently play key roles in natural resource management). Using a 'minorities and gender' lens is crucial to ensure that everyone's needs, rights and contributions are considered irrespective of their gender, age or socio-economic status. The contributions of women should also be encouraged and included because feminine perspectives can complement those that underlie existing policies and practices, improving their effectiveness. It is also worth recognising that women often face challenges and barriers that are not shared by the traditionally dominant half of many societies, and addressing these impediments could result in the introduction of hitherto underutilised knowledge and contributions towards achieving environmental sustainability. Methodological guidance that incorporates the 'minorities and gender' dimensions of interactions between society and the environment is required.

**Harnessing cultural heritage and knowledge**

There is also a need for universal recognition of the powerful part played by cultural heritage and local - including Indigenous - knowledge in peatland conservation and management (Robins *et al*. 2022, Armanto *et al*. 2025, Austin *et al*. 2025). With collaboration, the risk of mismatch between the perspectives of conservationists, industrialists, policy-makers and local/Indigenous communities increases (Sayer *et al*. 2018) unless all parties are engaged from the outset. Community knowledge systems, particularly those rooted in Indigenous, local and traditional practices, offer critical insights into the sustainable management and conservation of peatlands worldwide. Table 3 presents a series of geographically dispersed case studies that illustrate how community knowledge, ranging from customary law and spiritual practices to social norms and

Table 3. Examples of community knowledge contributions to managing peatlands (adapted from UNEP 2022).

| **Community / Region and example of community knowledge** | **References** |
|---|---|
| **Southeast Asia:** Indigenous communities in lowland swamp forests rely on 534 known useful plant species, integrating deep ecological knowledge into subsistence and cultural practices. Through *adat* (customary law), they govern harvest timing and quantities, and designate protected areas including fish sanctuaries. Rules also address land use and fire control, e.g., there are fines for damaging neighbouring peatlands via fire—demonstrating localised environmental regulation rooted in tradition. | Giesen 2015 |
| **Ngaju Dayak, Kalimantan (Indonesia):** The Ngaju Dayak *awan pailangek* concept reflects a communal system of land rights and inheritance tied to labour investment. This principle ensures land and water bodies are collectively managed unless worked or improved. The result is a durable common property regime that encourages stewardship and prevents privatisation of untouched resources. | Thornton *et al*. 2020 |
| **Patagonia (Chile and Argentina):** A coalition of Indigenous and local actors, along with global allies like the GPI, established the Patagonian Peatlands Initiative. This collaboration is grounded in Indigenous stewardship and community identity. The *Turba Tol Hol-Hol Tol* pavilion at the 2022 Venice Biennale showcased a culturally rooted artistic and scientific representation of Selk'nam knowledge and Patagonian peatlands, exemplifying cross-cultural integration of local wisdom in conservation advocacy. | Macchiavello & Marambio 2022)<br>Thambinathan & Kinsella 2021 |
| **Religious communities in Indonesia:** Community-based religious knowledge has been leveraged for environmental goals. Islamic fatwas issued by religious leaders explicitly prohibit peatland burning, anchoring restoration efforts in faith-based ethical systems. This knowledge intersects environmental and spiritual domains, influencing behaviour and reinforcing collective environmental responsibility within local Muslim communities. | Praharawati *et al*. 2021<br>Trihadmojo *et al*. 2020 |
| **Rural citizens in Finland:** Community knowledge in Finland reflects diverse place-based relationships with peatlands. People value these areas for cultural and practical reasons, from berry harvesting to national energy production. Understanding these narratives helps inform conservation by addressing local values and perceptions, illustrating how national and global goals intersect with personal and communal identities. | Grammatikopoulou *et al*. 2019 |
| **Global Indigenous and local communities:** Indigenous knowledges are often sidelined in global policy arenas, but frameworks like *Two-eyed Seeing*, *Indigenous métissage* and *Living on the Ground* represent efforts to legitimise and integrate Indigenous worldviews. These frameworks emphasise co-learning and epistemological diversity, highlighting the value of Indigenous women's leadership and advocating for equity in knowledge-sharing, especially on matters of climate adaptation and peatland resilience. | Santos 2014<br>ECOSOC 2022<br>Levac *et al*. 2018 |
| **Various communities (global behavioural insights):** Understanding behaviour through community-based norms and social context is critical. Studies show that effective peatland conservation must include social learning, community engagement and culturally relevant behavioural interventions beyond rational economic incentives. This includes integrating local customs, habits and moral structures to support sustained change in land-use practices and peatland restoration. | Michie & Johnston 2012<br>Davis *et al*. 2015<br>Klöckner 2013<br>Hargreaves 2011<br>Steg & Vlek 2009<br>Kwasnicka *et al*. 2016<br>Kinzig *et al*. 2013<br>Levin 2010<br>Breadsell *et al*. 2019 |

behavioural influences, shapes and informs peatland stewardship. These examples not only highlight the ecological knowledge embedded within Indigenous and local governance systems but also underscore the potential for collaborative approaches that integrate multiple forms of knowledge. From religious rulings in Indonesia to collaborations between artists and scientists in Patagonia, these cases demonstrate that inclusive and culturally resonant strategies are essential to ensuring that long-term peatland resilience is embedded in national policy.

We contend that conservation and environmental management cannot be sustainable or ethical if research and practice do not consider community knowledge systems, perspectives, priorities and values (Tengö *et al*. 2017). Local ecological knowledge comprises observational knowledge, knowledge acquired through practical experience, and knowledge in the form of people's beliefs (Berkes *et al*. 2000, Merten *et al*. 2020). Integrating different forms of knowledge can enable research outcomes to be more relevant in the local social context and can be useful in detecting and understanding longer-term environmental changes that may be missed by shorter-term 'scientific' measurements (Merten *et al*. 2020). On this basis, the UN Declaration on the Rights of Indigenous Peoples (UNDRIP 2007) and the Convention on Biological Diversity (CBD 1992) have encouraged governments to recognise and protect traditional ecological knowledge and Indigenous knowledges for environmental management and conservation (Fabiano *et al*. 2021 for the CBD; see Articles 8(j) and 10(c)). Global initiatives such as the Millennium Ecosystem Assessment, The Economics of Ecosystems and Biodiversity (TEEB) and the Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES) have also highlighted the importance of traditional ecological knowledge and Indigenous knowledges with IPBES giving special attention to the culturally specific relational values that connect humans with their natural environment (Fabiano *et al*. 2021, Pascual *et al*. 2022).

**Community engagement strategy**

Integrated approaches for 'People and Planet' are crucial if we are to progress towards environmental sustainability and the Sustainable Development Goals (SDGs) by 2030. Different forms of knowledge (e.g., Indigenous, informal and localised as well as scientific, formal and universalised) may be reconciled by seeing each as context specific (Merten *et al*. 2020). There is, therefore, a push for co-produced research through collaboration and efforts to connect and speak across knowledge systems, designing policies in a way that enables the practical application of knowledge and deals with the power asymmetries that persist between knowledge systems (McElwee *et al*. 2020).

To effectively integrate meaningful public engagement in peatland restoration, it is critical that engagement strategies are inclusive, transparent and systematically structured (Nixseaman & Cook 2024, Reed *et al*. 2025a). Detailed community mapping should be conducted to fully understand local characteristics, priorities, historical contexts and specific vulnerabilities, ensuring particularly that marginalised and vulnerable groups are comprehensively identified and included. Adequate resources should be allocated explicitly to address barriers to participation such as logistical constraints, access to suitable venues, appropriate communication methods (including language and technology considerations), and support services like childcare or interpretation. Robust mechanisms should be established for clear, timely and transparent communication regarding project objectives, potential impacts, timelines and decision-making processes. Moreover, regular monitoring, evaluation and review of the engagement process itself should be carried out, employing pre-agreed indicators and metrics to assess effectiveness and responsiveness. This should include feedback loops enabling adaptive management, ensuring that engagement strategies continually evolve to meet community needs and align with broader project objectives, ultimately fostering trust and legitimacy in peatland restoration initiatives. Specific action may be necessary to overcome participation barriers for tenants and other rights holders, ensuring that all groups with a legitimate interest in land use decisions can engage fully in peatland-related market opportunities.

Defining which communities are affected by peatland restoration is complex, since benefits and costs extend well beyond landowners. In the UK, restoration projects frequently generate rewards for landowners in the form of carbon finance or agri-environment payments, while tenant farmers who manage the land may not directly share these benefits unless explicitly included in the projects (Mulier 2025). To address this imbalance, the government's Environmental Land Management (ELM) scheme now allows tenant farmers to participate directly in environmental contracts, even without landlord consent, thereby broadening access to payments (Defra 2023). In addition, downstream communities can experience indirect benefits from peatland restoration, such as reduced flood risk and improved drinking water quality (Armstrong *et al.* 2010).

Water companies and catchment partnerships have developed models to return some of these benefits to local stakeholders, as illustrated by the work of United Utilities in the English Pennines and Scottish Water's restoration programmes in the Highlands (Reed *et al.* 2013).

More broadly, communities may be defined not only by residency but also by use, proximity and cultural connection. Those who live on peatlands, those who farm or manage them, those in downstream catchments, and those who visit for recreation all hold a stake. To ensure equitable benefit sharing, peatland restoration initiatives should therefore adopt explicit stakeholder mapping and consider a range of mechanisms, from joint management agreements to community trust funds or catchment-based governance platforms (Reed *et al.* 2025b). Embedding these processes will help clarify "who counts" as the community and ensure that financial, cultural and ecological benefits are distributed fairly across diverse groups.

While inclusive stakeholder engagement and co-creation are critical, they also bring substantial transaction costs. These include labour for facilitation, consultation meetings and workshops; marketing and outreach costs; and technical expenses such as monitoring, verification and accreditation (Matzdorf & Lorenz 2010). In practice, these costs can amount to a large share of total budgets; agri-environment and carbon offset schemes have shown transaction costs in the range 10–30 % of total project expenditure (McCann *et al.* 2005). If not addressed, the addition of community co-creation costs to already high verification and accreditation costs could risk eroding the financial viability of projects. To mitigate this, restoration programmes can streamline procedures by using existing institutions (e.g., farmer cooperatives, local water boards or conservation trusts) as intermediaries, rather than creating a new governance structure for each project. Standardised templates for agreements, digital platforms for consultations and targeted facilitation funding can also help reduce administrative burdens.

## CONCLUSION

Strategies for peatland conservation, restoration and sustainable management have been adopted by at least 23 countries, which are collectively responsible for more than half the world total of greenhouse gas emissions from peatlands (Reed *et al*. 2019). Nonetheless, the global effort remains insufficient. It is estimated that 169 countries host peatlands (UNEP 2022), many of which are crucial for ecosystem services and biodiversity yet continue to degrade and produce emissions. Thus, there is a pressing need to further expand and deepen governance mechanisms. This review has demonstrated that no single policy instrument can ensure the conservation and sustainable use of peatlands. A diverse, context-specific mix of governance tools is essential. These include expanding protected area networks to encompass peatland habitats, integrating buffer zones and regulatory mechanisms that work with and for local communities, and adopting a landscape-scale multi-stakeholder approach that prioritises the natural hydrology of peatland ecosystems. Legal definitions of peatlands must also be clarified to support coherent management, particularly where conflicts exist between peatland and forest policies, which often result in degradation through drainage or fire.

National policies must ensure sustainable practices in sectors like peat extraction, plantations and afforestation, including mandatory rewetting and restoration of degraded sites, and avoiding tree planting in peatlands where this undermines biodiversity and fails to deliver climate benefits (Temperton *et al*. 2019). Prioritising the protection of intact peatlands and the restoration of degraded ones is critical (Fleischman *et al*. 2020). Subsidies that incentivise damaging practices such as drainage for agriculture, forestry or mining should be reformed, with redirected funding used to support restoration and sustainable land use. Financial and market-based tools, including carbon markets and green finance, must be designed to incentivise conservation while ensuring equity through mechanisms such as blended public-private financing and payments for ecosystem services. Importantly, peatland governance must be inclusive and equitable. It should be co-developed with local communities and especially Indigenous Peoples who, despite comprising only 6 % of the global population, steward 80 % of the Earth's biodiversity. The Venice Agreement on Peatlands (2024) embodies this principle, bringing together Indigenous and local initiatives to promote locally led conservation, restoration and knowledge-sharing in response to the UNEA Resolution on Peatlands (UNEP 2019) and now needs to be enacted across national policies for peatland conservation.

The GPA has demonstrated that effective peatland governance requires a holistic and inclusive approach that considers social, spatial and temporal dimensions. While the international support - both financial and technical - of publications such as the GPA remains critical to help countries meet global commitments, commitments and action at national level are needed to ensure that peatlands continue to provide vital services for people and the planet.

We conclude by reiterating the three recommendations for national to regional to international level success in peatland restoration. These recommendations are:

1) A commitment to establish national policies that protect, preserve and restore peatlands and align with globally established policy.
2) To develop and provide transparent market policy and mechanisms that allow international financial investment to support gaps in national public funding for restoration, conservation and stewardship of intact and high-integrity peatlands.
3) To develop and integrate a mechanism for public consultation on peatland conservation and restoration programmes to ensure that agency and concerns for local community, culture and economy are formally recognised at global level.

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## AUTHOR CONTRIBUTIONS

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