Convention on Wetlands

Ramsar

Restoring drained peatlands: A necessary step to achieve global climate goals

Peatlands are areas with peat soils. Peat is dead, partly decomposed plant material stored long-term under waterlogged conditions. Occurring from the high mountains to the sea, and from high to low latitudes, peatlands can be found in all biomes, particularly in the sub-polar, boreal, temperate and tropical areas of the planet. Many peatlands have been drained, converted or otherwise degraded, and are a restoration priority.

Peatlands cover about 400 million hectares (ha), or 3% of the land surface of our planet. Yet they store more carbon, more effectively and for longer periods, than any other ecosystem on land. Intact peatlands also provide essential ecosystem services such as regulating water cycles, purifying water, and supporting a wealth of biodiversity. Since peat is hidden below ground, it is often unrecognised and can be damaged unknowingly. New, large peatland areas are still being discovered including forest-covered peatlands in the tropics.

Around 50 million ha of peatlands globally are currently drained and have been transformed to grazing land, forestry land and cropland, used for peat extraction or impacted by infrastructure. These drained peatlands are responsible for approximately 4% (2 Gt CO_2 -eq/year) of all anthropogenic greenhouse gas emissions. Achieving the climate goals of the Paris Agreement requires protection of all remaining intact peatland and rapid restoration of almost all drained peatlands.

This will also contribute to delivering the Sustainable Development Goals (SDGs), in particular SDG 6, Target 6.6, on protecting and restoring water related ecosystems and SDG 15, Targets 15.1, on conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, as well as 15.5 on reducing degradation of natural habitats. The United Nations Decade on Ecosystem Restoration 2021-2030 provides the opportunity to rapidly scale up efforts.

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Policy recommendations

- Protecting existing carbon stocks by stopping new drainage of peatlands will enable continued carbon sequestration and biodiversity conservation on these lands. This can be pursued, *inter alia*, through designation of Wetlands of International Importance (Ramsar Sites) and development and implementation of wetland wise use policies and strategies.
- At least 50 percent (25 million ha) of the currently degraded peatland area should be restored by 2030 to enable global warming to remain below 1.5 to 2.0 °C. The sooner restoration is implemented, the better it is for the climate.
- The UN Decade on Ecosystem Restoration provides opportunity to rapidly scale up peatland restoration efforts. Efforts to expand forest cover should not cause further drainage of peatlands, which usually results in net carbon loss.
- By simply blocking drainage systems and reintroducing peat-forming plants when needed, parties can effectively restore peatlands and reduce carbon dioxide emissions as well as initiate long-term biodiversity restoration in line with target 12 in the Ramsar Strategic Plan (2016-2024).
- Possible short-term increases in methane emissions associated with peatland rewetting are offset by avoided carbon losses and can be reduced by available management techniques. Typically, rewetting drained peatlands quickly leads to net climate benefits.
- Peatland protection and large-scale restoration can readily be included in Nationally Determined Contributions (NDCs) under the Paris Agreement and contribute to the achievement of emission reduction targets. Parties are encouraged to include emissions from organic soils and emission reductions from peatland rewetting and restoration in national greenhouse gas inventories.
- Land use policies, including those for agriculture and forestry, should ensure that drainage-based agriculture and forestry do not expand further into peatland areas. Additional efforts are needed to ensure that sectoral policies (e.g., spatial planning, land use including agriculture and forestry, energy provision, road construction, etc.) prevent peatland degradation and promote peatland restoration, including through appropriate incentives.
- Governments, international financing institutions and private investors are encouraged to provide financial resources for large-scale peatland rewetting and restoration to achieve national and international climate change mitigation targets as well as biodiversity conservation in line with the sustainable development goals.

The issue

Peatland conservation and restoration are critical strategies to reduce climate change.

Peatlands cover about 400 million ha (3 percent) of the Earth's land surface. More than 80 percent is still in a largely natural state, comprising numerous peatland types and supporting large biodiversity values. Around 50 million ha have been drained in the past to allow grazing by domestic animals, cropland use or commercial forestry or to support peat extraction and industrial and urban infrastructure.

Peatlands worldwide store more carbon (approximately 600 Gigatonnes) than any other type of ecosystem and for longer periods. However, drained peatlands, both those in use and those that have been abandoned in a degraded state, cause a larger loss of ecosystem services and more environmental damage per unit of land area than any other terrestrial ecosystem. It is estimated that greenhouse gas emissions from drained peatlands (by microbial oxidation and peat fires) are responsible for about 4 percent (~ 2 Gt CO_2-eq/year) of global anthropogenic emissions.

Global land use including agriculture and forestry is likely to remain a net carbon source throughout the 21st century, unless existing intact peatlands remain intact and currently drained peatlands are rewetted. Currently the 15-20% of drained peatlands emit in total >5 times more carbon than the 80-85% of undrained peatlands in total sequester. To make global peatlands carbon neutral, 80-85% of the drained peatlands have to be rewetted. Thus, policies and actions are needed to restore virtually all drained peatlands worldwide to allow peatlands to fulfil their natural role as a global carbon sink.

This creates a huge challenge: meeting the Paris Agreement and reaching carbon neutrality means that by 2050 some 50 million ha of drained peatlands, half of which being in agricultural use, need to be rewetted and restored: almost *two million hectares per year*. This needs an enormous upscaling of restoration practice, innovative approaches, clear and comprehensive guidance, as well as supportive government policies.

Guidance is in place to aid this effort, based on experiences from restoration already undertaken. This includes *Global guidelines for peatland rewetting and restoration*[1], providing a comprehensive state of the art restoration guidance, supplemented by practical guidance[2] presenting specific restoration methods and techniques.

Rewetting, coupled with revegetation, is the key strategy for peatland restoration

Peatlands exist because waterlogging prevents plant decomposition, resulting in peat formation. In natural peatlands ("mires") a strong interrelationship exists between plants, water and peat (figure 1). If one component changes, the others change too. Peat accumulation occurs within a narrow range of water levels. Accumulation is hampered by low water tables promoting peat oxidation, high water tables reducing plant productivity, and strongly fluctuating water tables. Wet peat is easily eroded by water, frost and wind when exposed and not protected by vegetation. Peatland restoration involves ditch, canal and gully blocking to raise water levels to around the peat surface and disperse water over a large area to prevent erosion. Rewetting is essential to initiate the re-establishment of peat-forming vegetation. In some cases, plant reintroduction is also needed.

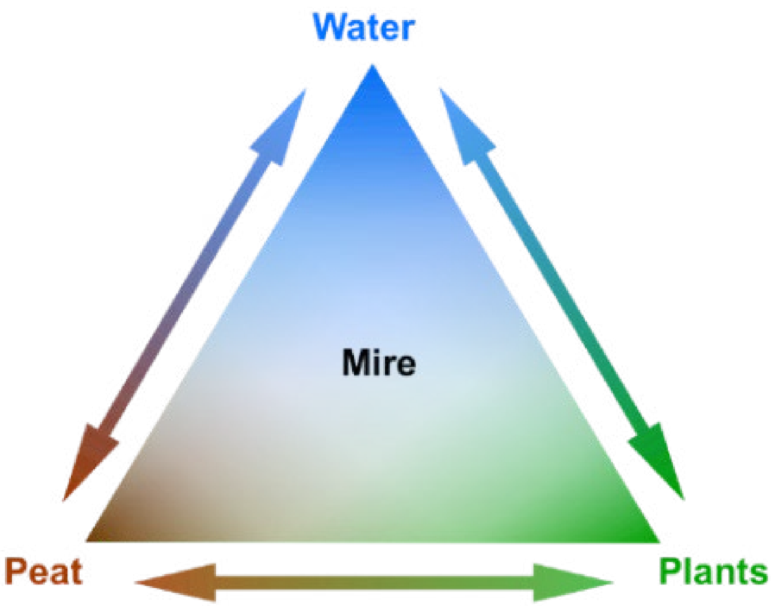


Figure 1.
Natural peatlands ("mires") comprise three essential components: water, plants and peat. If one of these components changes, the others will change too, affecting the peatland and its functions (source: Hans Joosten).

1 Convention on Wetlands. (2021). Global guidelines for peatland rewetting and restoration. Ramsar Technical Report No. 11. Gland, Switzerland: Secretariat of the Convention on Wetlands.

2 Convention on Wetlands. (2021). Practical peatland restoration. Ramsar Briefing Note No. 11. Gland, Switzerland: Secretariat of the Convention on Wetlands.

Greenhouse gases, fluxes and balances

Whereas natural peatlands have been cooling the global climate for many thousands of years, drained and degraded peatlands are significant sources of greenhouse gas emissions, mainly carbon dioxide but also nitrous oxide and methane. The drier conditions following drainage also increase the risk of peat fires, which further increase the emissions of CO_2 to the atmosphere. Besides emissions, smouldering peat fires cause widespread haze with damaging effects to human health.

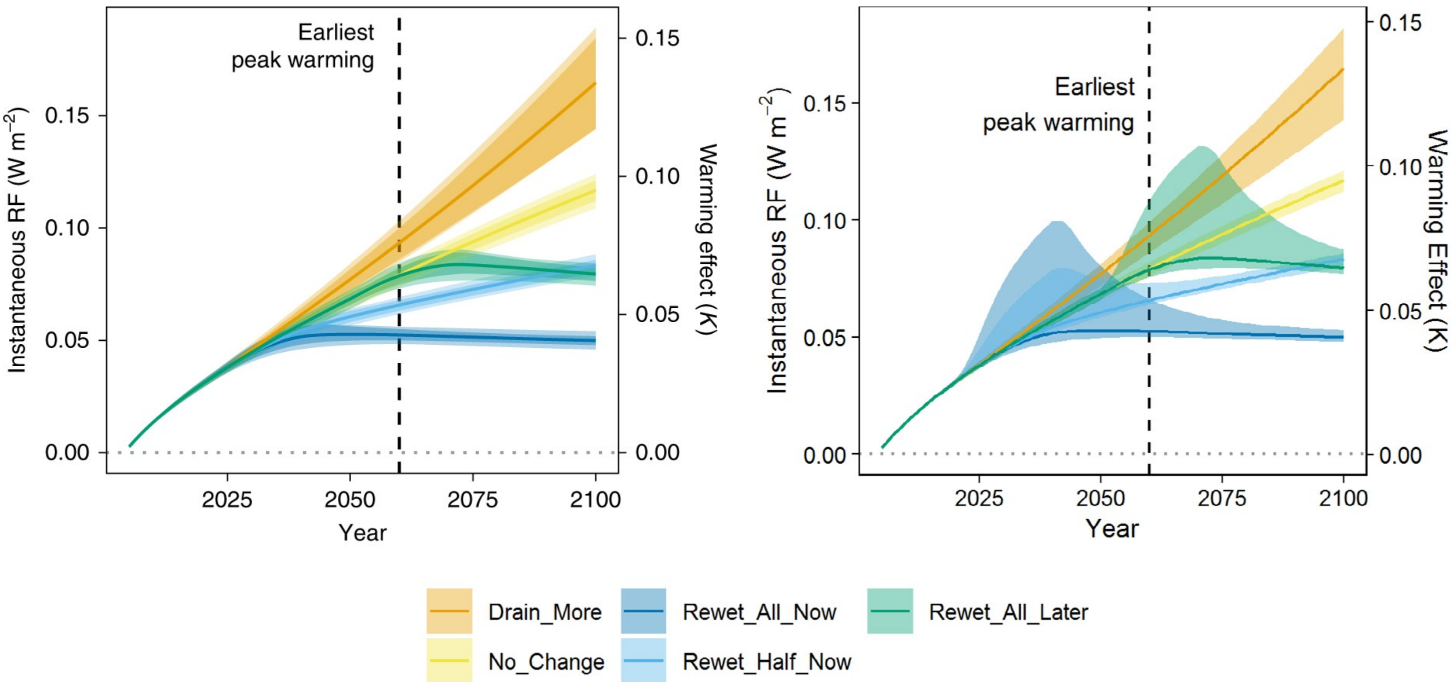
With a stable and high water table – as in a natural state – the accumulation of organic material over time ('peat accumulation') leads to a net sequestration of CO_2. Rewetting is therefore the main way to reduce greenhouse gas emissions. Introduction of peatland plants may help to jump-start the recovery.

Generally, the further the water level is below the peat surface, the higher the emissions resulting from peat decomposition, in a largely linear relationship. Zero carbon dioxide emissions occur when the annual average water level is near the peat surface.

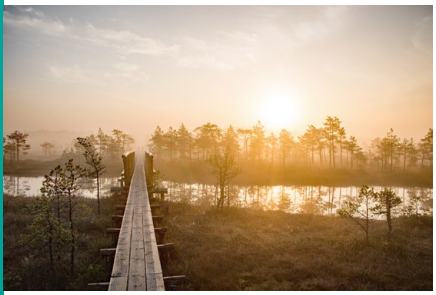
In an intact or rewetted peatland, a small part of the accumulating plant material is decomposed anaerobically (without oxygen) resulting in the emission of methane (CH_4), a greenhouse gas 28 times stronger than carbon dioxide, but with a much shorter residence time in the atmosphere. There can sometimes be an initial methane peak upon rewetting, but the longer-term climate effect of rewetting is always better than maintaining the drained status quo. This is because of methane's shorter atmospheric lifetime compared to carbon dioxide and nitrous oxide, which build up cumulatively over time in the atmosphere (see Figure 2, right). Usually, rewetting drained peatlands quickly leads to net climate benefits: the overall climate effect (expressed as the combined fluxes of carbon dioxide, methane, nitrous oxide and dissolved organic carbon) is strongly improved, and the carbon sink function begins to recover. Furthermore, management techniques are available to prevent or reduce possible methane emissions.

Recovery after rewetting can further be accelerated by reintroducing peat-forming plants, which may allow to achieve a neutral climate impact more quickly than solely by rewetting.

Figure 2.
Radiative forcing (RF) is the difference between the solar energy coming into the Earth's atmosphere and the amount reflected back to space; it is a key measure of the greenhouse effect. The graphs show radiative forcing and global climatic warming effects of peatland management without (left) and with (right) an initial 10 times larger methane peak for 5 years after rewetting, under various scenarios. Drain_More: Assumes that the area of drained peatland continues to increase from 2020 to 2100 at the same rate as between 1990 and 2017; No_Change: The area of drained peatland remains at the 2018 level; Rewet_All_Now: All drained peatlands are rewetted in the period 2020–2040; Rewet_Half_Now: Half of all drained peatlands are rewetted in the period 2020–2040; Rewet_All_Later: All drained peatlands are rewetted in the period 2050–2070 (source: Günther *et al.* (2020). Nature Communications 11:1644).



Policy perspectives and the role of the Ramsar Convention on Wetlands



Global policy frameworks increasingly promote the restoration of peatlands, including, *inter alia*, the 2030 Agenda for Sustainable development and its SDGs and UN Environment Assembly resolution 4/16 on the conservation and sustainable management of peatlands. The post-2020 Global Biodiversity Framework of the Convention on Biological Diversity will in time also provide an important reference point.

Some NDCs under the Paris Agreement of the UN Framework Convention on Climate Change as well as land degradation neutrality targets under the UN Convention to Combat Desertification explicitly incorporate peatland protection and restoration efforts. However, even if all countries meet the targets included in the NDCs submitted to date, it is unlikely that warming will stay under 2°C. Hence scaling up commitments and actions is needed.

The Convention on Wetlands provides a framework that is extensively used by its 172 Contracting Parties for the protection of wetlands including peatlands, and that can be leveraged in stepping up action (see box). Under the Convention, parties commit to work towards the wise use of all wetlands; to designate suitable wetlands for the list of Wetlands of International Importance and ensure their effective management; and to cooperate internationally on transboundary wetlands, shared wetland systems and shared species. The 2,431 Ramsar Sites designated as of September 2021 include 629 sites, covering a total area of 61,098,170 ha, that encompass forested and non-forested peatlands. National wetland inventories prepared by parties to the Convention provide a basis for monitoring wetland extent and reporting under the Convention on SDG Goal 6 Indicator 6.6.1: “Change on the extent of water related ecosystems”.

The UN Decade on Ecosystem Restoration (2021-2030), as well as the Bonn Challenge for forest landscape restoration and many regional, national and local initiatives could help harnessing political will for an enormous upscaling of peatland restoration, also on land used for agriculture and forestry. The need to rewet 50 million ha of drained peatlands by 2050, combined with increasing global demands for food, fodder, fibre and fuel implies that these areas cannot all be abandoned after rewetting. Rather, drainage-based land use must be replaced by land-use that does not require drainage, i.e., “wet” farming and forestry (‘paludiculture’).

Peatlands in the Ramsar Convention on Wetlands:

The definition of ‘wetland’ contained in Article 1 of the convention encompasses all peatlands.

Parties to the Convention have recognized the importance of peatlands for climate change, biological diversity and the global water cycle, among others.

The 4th Ramsar Strategic Plan 2016 – 2024 recognizes peatlands as an under-represented wetland type in the Ramsar Site network and includes a target to significantly increase their area, numbers and ecological connectivity (Target 6).

Resolution XII.11: encourages Contracting Parties, as appropriate, to consider limiting activities that lead to drainage of peatlands and may cause subsidence, flooding and the emission of greenhouse gases, and to utilize their inventories to map the distribution of peatlands with a view to determining the extent to which they sequester carbon.

Resolution XIII.13 on *Restoration of degraded peatlands to mitigate and adapt to climate change and enhance biodiversity and disaster risk reduction*, encourages contracting parties to pursue peatland conservation and/or restoration that reduce emissions and increase removals, as a way *inter alia* to contribute to their NDCs.

Guidance on identifying peatlands as Wetlands of International Importance (Ramsar Sites) for global climate change regulation as an additional argument to existing Ramsar criteria were adopted in Resolution XIII.12. Resolution VIII.17 encompasses *Guidelines for Global Action on Peatlands (GAP)*.

The Scientific and Technical Review Panel of the Convention has produced materials to aid parties in the wise use of peatlands, notably Briefing Note No. 9: *Guidelines for inventories of tropical peatlands to facilitate their designation as Ramsar Sites*, Briefing Note No. 10: *Wetland restoration for climate change resilience* and, most recently, in 2021, Technical Report No. 11: *Global guidelines for peatland rewetting and restoration* and Briefing Note No. 11 with practical, hands-on methodological guidance for restoring drained peatlands.

Limitation and further research

Many policy frameworks at the national level do not reflect the importance of peatlands, including e.g. in the agricultural and forestry sector. New policies may also be needed for a move from peatland degradation to peatland conservation and restoration, such as support for rewetting, or for controls on afforestation of peatlands. The allocation of more financial resources to peatland restoration is urgently needed because lack of adequate financial incentives for sustainable peatland management remains a key barrier to progress.

Continued effort is needed for the identification and mapping of both natural and drained peatlands (Lindsay *et al.* 2019), e.g. through national wetland inventories. The 2013 Wetlands Supplement to the 2006 Intergovernmental Panel on Climate Change's Guidelines for National Greenhouse Gas Inventories enables countries to include peatland in their national greenhouse gas inventories. However, emission reporting from drained and restored wetlands, including peatlands, often still relies on default emission factors. More precise measurement and reporting and more coherent documentation of biodiversity values and climate change impacts, combined with socio-economic information, will allow improving our policy options substantially, and will be the most efficient way to restore drained peatlands with the broadest possible support from society.

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Note

This version of Ramsar Policy Brief No. 5 was amended on 19.11.2021

Further reading

There are plenty of publications documenting the need and methods for peatland restoration, most notably Ramsar Technical Report No. 11 on peatland restoration and the related Ramsar Briefing Note No. 11 with practical guidance on restoration.

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The Convention on Wetlands

The Convention on Wetlands, also known as the Ramsar Convention, is a global inter-governmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.