POSITION PAPER: CARBON SEQUESTRATION & WETLANDS RESTORATION

1. INTRODUCTION

The restoration/management of wetlands has great potential to deliver climate mitigation benefits through increasing carbon sequestration and storage and avoiding emissions from degraded ecosystems. This position paper explores the feasibility of manage/restore wetlands based on the climate mitigation potential of their restoration.

The following key factors must be considered, prior to restoration, when prioritising wetlands for restoration for carbon benefits:

- Whether protection/management of the existing wetlands to reduce pressures is more efficient for protecting carbon stocks and sequestration than active restoration of degraded wetlands
- Avoiding losses of carbon from habitats is more efficient in climate mitigation than restoring degraded habitats whilst others decline. Conservation of intact habitats is therefore key to ensure the protection and permanence of existing carbon stocks. Moreover, protection can be more efficient as restoration may not fully re-

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establish carbon sequestration and storage potential, and it may take decades to improve in condition. Protection of existing intact habitats may be more efficient in terms of carbon storage potential because restored habitats may not fully re-establish in terms of their carbon sequestration and storage potential, and it may take over a decade to improve habitat condition and re-establish carbon cycling. For example, in rewetted wetlands, carbon storage 10–20 years after restoration has been found to still be lower than that of pristine wetlands and the speed of recovery has been found to vary greatly across wetland types and pedo-climatic conditions².

- The potential trade-offs between biodiversity conservation and increasing carbon capture and storage must be managed to ensure climate benefits do not come at the cost of the biodiversity and ecosystems that sequester and store carbon. **Restoring the biodiversity value of the wetland should be the primary objective.** In some cases, habitat restoration may involve a decision between managing land for carbon or enhancing biodiversity.

- The **feasibility of restoration** considering the current state of the ecosystem, its context, and potential to recover.

- Restoration is complex and reflects the dynamic nature of natural systems. Key factors affecting the potential of restoration to deliver long-term carbon benefits must be assessed at the site level. **Additionally, it is critical to ensure the permanence of carbon gains through long-term protection and management of pressures in restored sites.** Climate change will increasingly modify the ability of restored habitats to reach the condition of undegraded habitats and will increase the risk of losing carbon gains in natural hazards such as forest fires, droughts, floods, and landslides.

- It is important to assess the factors affecting the success of restoration for carbon benefits, including site conditions, the time needed to

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achieve restoration, the costs and benefits of restoration actions, the permanence of carbon gains, and how to monitor carbon flows.

- There is a general lack of information on carbon stocks and flows in managed systems and the effects of management measures on carbon fluxes are not well documented.

- Another complexity is that studies refer to different habitat conditions (i.e., pristine, degraded, managed). This is clearly seen in the case of wetlands where degraded wetlands can be important net emitters of carbon, while pristine wetlands have carbon flows that are close to zero, or act as small sinks (Evans et al, 2017).

- Wetland management measures could significantly influence the carbon balance, being able to strengthen the carbon retention capacity, but also reverse this function and increase carbon emissions into the atmosphere. Therefore, a climate approach in management and restoration measures should be considered in any strategy to mitigate climate change promoting the conservation or recovery of ecosystems and the strengthening of their capacity to sequester carbon. An adequate wetland management, both currently and adapted to future climate projections, requires a deep knowledge of the most relevant factors that influence wetland functioning, as well as the response of these factors to changes in the conservation status, land uses in the catchment area, and the climatic changing factors.

Restoration and management measures are important to improve the resilience of habitats to climate change impacts. Forests and wetlands are particularly important ecosystems to restore in terms of carbon benefits. Coastal wetlands such as estuaries, salt marshes and coastal lagoons are also important carbon sinks as they can accumulate carbon over much longer periods of time than most terrestrial habitats.

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2. EU POLICY OBJECTIVES FOR BIODIVERSITY & CLIMATE

The European Commission has proposed a set of legally binding nature restoration targets in the new Proposal for a Nature Restoration Law. It is a key element of the EU Biodiversity Strategy, which calls for binding targets to restore degraded ecosystems, in particular those with the most potential to capture and store carbon and to prevent and reduce the impact of natural disasters. The proposal combines an overarching restoration objective for the long-term recovery of nature in the EU’s land and sea areas with binding restoration targets for specific habitats and species. These measures should cover at least 20% of the EU’s land and sea areas by 2030, and ultimately all ecosystems in need of restoration by 2050. In the specific targets the Proposal focus on Peatlands, as these ecosystems stores nearly 30% of global soil carbon. Restoring drained peatlands could save up to 25% of Europe’s land-based greenhouse gas emissions.

Living Lakes network should advice policy makers that all wetlands may be included in these targets, and not only peatlands.

In the following pages it will be explained the reasons to maintain this position.

Member States must design restoration plans, during the 2 following years, which maximise synergies between climate mitigation and adaptation and biodiversity conservation, including restoration of habitats protected under Annex I of the Habitats Directive. And wetlands should be a clear objective for these national plans

There has also been significant progress in the climate agenda. The EU has committed to climate neutrality in 2050, and the Commission has proposed a target of 55% reduction in greenhouse gas (GHG) emissions by 2030 compared to 1990 levels in its 2030 Climate Target Plan3. The proposed target is a “net” target, meaning increases in the carbon sink are included in the target. Therefore, the agriculture and forest sectors have an important role to play, contributing through carbon sequestration in soil and vegetation to reach the targets and compensate for unavoidable GHG emissions from other sectors.
Land-based action to restore and protect wetlands can contribute to meeting the global ambition set by the Paris Agreement of keeping global warming within a 1.5 °C limit. However, given the urgency to reduce GHG emissions and the possible time lag between restoration measures and the actual achievement of carbon removals, it is important that nature restoration action does not come ‘in lieu of’ the needed GHG emission reductions. In addition, failing to reduce GHG emissions will lead to changes in the climate which will threaten the integrity of ecosystems and their ability to continue sequestering and storing carbon in the long-term. Therefore, restoration can play an important role in climate action only when it is achieved alongside rapid emissions reductions across all sectors.6

These political developments provide significant room for Member States to be ambitious in their restoration plans and highlight where cost-effective restoration measures can achieve the maximum climate mitigation and adaptation potential while contributing to biodiversity conservation objectives.

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3. THE ROLE OF WETLANDS RELATED TO CARBON

Wetlands have demonstrated to be one of the most efficient long-term carbon stocks (figure 1) compared to other ecosystems. According to the meta-analysis developed by ETC-UMA\textsuperscript{7}, **wetlands have a high blue carbon sequestration potential when in a good environmental status and effectively managed**, particularly seagrass meadows and salt marshes, and are a powerful tool to address the environmental, climatic and socio-economic challenges in the region. Degraded wetlands on the contrary can become carbon emission sources, which proves that the conservation, effective management and restoration of wetlands are effective low-cost nature-based solutions against the impacts of climate change, including water scarcity.

Figure 1: Carbon stocks per type of terrestrial ecosystem\textsuperscript{8}


Intact wetlands are important habitats in terms of carbon sequestration and storage. Although the carbon sequestration rates per hectare of most peatland habitats is smaller than that of forest habitats, carbon stocks are proportionally higher as they continuously accumulate carbon in growing peat layers.

Wetlands have the highest carbon stocks of any terrestrial habitat making them a key ecosystem for carbon storage. They contain 30% of total organic soil carbon despite covering only around 5–8% of the world’s area.

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4. WHICH WETLANDS MUST BE CONSIDERED?

Regarding Climate regulation, as active ecosystems, not only the peatlands or the considered Blue carbon Ecosystems have an important role in the regulation of the climate change.

All wetlands, including inland wetlands, play an important role in the global Carbon cycle\(^\text{10}\) because of their high capacity to fix and store C from the atmosphere\(^\text{11}\). Therefore, wetlands are one of the most important ecosystem types for global C sequestration, despite the small area they occupy\(^\text{12}\).

**Freshwater wetlands** are important carbon sinks with an estimated \(~450\) gigatons of carbon stored in their sediments. However, when disturbed they can become significant sources of carbon emissions. Understanding carbon dynamics in freshwater wetlands is a research priority to maximise carbon drawdown opportunities through effective management\(^\text{13}\).

Different studies highlight the importance of the conservation status on the climate change mitigating capacity of **Mediterranean wetlands**\(^\text{14}\). Based on the results of these studies, the degradation or restoration level influence the C balance and GHG exchanges and, consequently, determine the mitigating/warming role of these wetlands on a short to medium time scale. Studies, made in Spain unveiled that freshwater and brackish coastal marshes showed a strong capacity for C capture, especially for well preserved and restored sites (up to \(~950\ g m\(^{-2}\) yr\(^{-1}\)), with a paramount role of helophytes.

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Differences among the study sites revealed the importance of alterations and restoration for C-storage and GHG exchanges with the atmosphere.

Specifically, a highly altered sites showed increased rates of aerobic and anaerobic respiration compared to undisturbed sites, with a substantial decrease in C storage capacity. Furthermore, degraded sites showed an increased relative contribution of emitted C-GHG with strongest warming capacity compared to CO2, such as methane. Management practices resulting in instability of the organic sediments favored degradative metabolism, with release of stored C and concomitant increases in CH4 emissions. Hydro-morphological alterations and water pollution may convert healthy ecosystems contributing to C sequestration and climate change mitigation into C emitting ecosystems.

Some figures to compare Carbon capture in restoration of different types of wetlands:

- **Permanent Freshwater and brackish marshes**, typical wetland type of the Mediterranean Spanish coast, show a big capacity for C capture, especially in the restored sites (\(\sim 950 \text{ g C m}^{-2} \text{ yr}^{-1}\)) (9.5 t ha\(^{-1}\)yr\(^{-1}\)) with a paramount role of helophytes.\(^{17}\)

- Some global estimates indicate that salt marshes rank among the most effective ecosystems in carbon sequestration with an average of 242.2 g C m\(^{-2}\) yr\(^{-1}\).\(^ {18}\)

- While long-term carbon sequestration rates in peatlands are 26.6 g C m\(^{-2}\) yr\(^{-1}\).\(^ {19}\)

So that, **Carbon sequestration in Coast Permanent Freshwater and brackish marshes**, typical wetland type of the Mediterranean coast, could fix up to 35 times more carbon than peatlands per year.

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5. ARE WETLANDS BLUE CARBON ECOSYSTEMS?

What means “Blue Carbon”?

All biologically-driven carbon fluxes and storage in marine systems that are amenable to management can be considered as blue carbon. Coastal blue carbon focuses on rooted vegetation in the coastal zone, such as tidal marshes, mangroves and seagrasses. These ecosystems have high carbon burial rates on a per unit area basis and accumulate carbon in their soils and sediments. They provide many non-climatic benefits and can contribute to ecosystem-based adaptation. If degraded or lost, coastal blue carbon ecosystems are likely to release most of their carbon back to the atmosphere. There is current debate regarding the application of the blue carbon concept to other coastal and non-coastal processes and ecosystems, including the open ocean. ²⁰

Since the carbon balance into wetlands function in the same way as marine systems and are even amenable to management, Living Lakes network, should lead a policy advocacy process to get that in the Climate negotiations under the IPCC, all biologically-driven carbon fluxes and storage in wetlands systems can be considered as “Blue Carbon”. This could open new opportunities (technical, new methodologies, financial instruments and tools) for the development of Wetlands restoration projects.

6. Case-studies: Mediterranean wetlands

When considering a Mediterranean wetland restoration or management project as a carbon project, it would be one that intended:

1. to enhance the atmospheric carbon (GHG) removal service of a wetland ecosystem,
2. to protect the carbon stock accumulated,
3. to develop a new carbon ecosystem.

How this is achieved would depend on the specific ecosystem and site. The spectrum of wetlands activities includes conservation (avoiding the release of GHGs to the atmosphere) and restoration/creation (establishment of CO$_2$ uptake from the atmosphere and/or reduction in CH$_4$ emissions) That means a wetlands project can protect the ecosystem against degradation (e.g. caused by the removal of vegetation or the loss and/or oxidation of wetland soil carbon) or can sequestrate carbon by creating carbon sinks in the form of growing vegetation (e.g. by mowing vegetation or planting helophytes), by enhancing carbon storage in soils and sediments (e.g. by creating the necessary hydrological conditions or removing soils first surface), by managing the water dynamic of the wetland (rewetting) or by reinstating salinity conditions to reduce CH$_4$ emissions.

FGN is actually coordinating the LIFE Wetlands4Climate project, that will demonstrate that Mediterranean wetlands can be managed and restored as carbon sinks, conserving its ecological integrity and ecosystem services. The project will develop new mechanism or methodologies to compensate CO$_2$ under restoration/management of Mediterranean wetlands, and the project is actually collaborating with the Spanish Standard “Registro Huella de carbono” from the Spanish Ministry of Ecological Transition (MITECO) to get this methodology approved.

Nature-based Solutions, such as those that could be implemented in Mediterranean Wetlands, offer a way to build resilience to the consequences of warmer temperatures while helping to limit further temperature rises by acting as carbon sinks. Achieving the full potential of Mediterranean Wetlands, however, requires improved protection measures, adequate management measures and restoration, actions that will not only mitigate climate change but also increase other ecosystem services while delivering adaptation benefits. These works will contribute to the Paris Agreement and to the
achievement of other international objectives in the 2030 Sustainable Development Agenda, such as the Sustainable Development Goals of Life Below Water (SDG14) and of course, Climate Action (SDG13).

In 2024 LIFE Wetlands4Climate will hopefully have approved a methodology in a National Standard to compensate Carbon Footprints in Mediterranean Wetlands management/restoration projects. Measures and data on carbon balances (carbon removals), on environmental benefits and cost/efficiency of the different management/restoration measures that can be implemented will be available in 2024.